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Theoretical and applied principles of the phenomenon of counteracting psychophysiological research by using a polygraph

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■ **Abstract**. The relevance of the research is conditioned upon the fact that nowadays, in the practice of psychophysiological research, polygraph examiners are increasingly faced with the phenomenon of opposition from the subjects, who thus try to distort or distort the results obtained through using instrumental methods of psychodiagnostic. The purpose of this research is to highlight and analyse the various ways in which insincere persons can counteract these studies and the signs that indicate their use. The main components of the methodological toolkit are the dialectical method of scientific knowledge of real phenomena and general scientific and special methods of polygraphy. The author substantiates the techniques and methods of counteracting psychophysiological research by using a polygraph through the relevant signs that indicate them. It has been established that currently, the most common forms of counteracting psychophysiological research using a polygraph are physical (mechanical) methods that have external physical manifestations through the targeted mechanical action of the person under investigation and perform a distracting function from the instrumental testing procedure. The author considers physiological methods that involve a change in the examinee's psychophysiological state through the effect of excessive physical activity on the body performed or applied on the eve of a polygraph examination, which causes fatigue or demonstrates exhaustion of human strength. It was noted that, based on the identified signs and methods of counteraction, the polygraph examiner decides on the time of postponement of the examination procedure or further refusal to conduct it. The practical significance of the work consists in the fact that the methods of counteracting the research procedure, and signs of psychophysiological reactions used by insincere individuals, substantiated in it, will avoid errors in the work of a polygraph examiner, and will obtain a high level of reliability of the results of research using a polygraph

■ **Keywords**: lie detection; polygraph examiner; polygraph examination; psychophysiological reactions; concealment of information; deception; experiment

■ Introduction

The level of demand for psychophysiological examinations using a polygraph in various spheres of life (both in the private sector, business, and law enforcement) is currently growing rapidly. The widespread use of polygraphs in the modern world to conduct special studies based on them to clarify specific facts of events in a person's life and activities demonstrates their importance in making specific decisions by the initiators of these checks. Therewith, not all persons who are referred for this procedure complete it. The reason for this is the insincerity of individuals when answering specific test questions posed by a polygraph examiner, which allows them to record such reactions using a special scientific and technical device – a polygraph – and evaluate them as false. To achieve this goal, candidates for the polygraph examination procedure try to resort to tricks to bypass the polygraph, using various techniques and methods of influencing their bodies. It is the so-called opposition to the research procedure. Modern polygraph practice knows various forms of opposition from insincere people, which polygraph examiners emphasise

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when conducting special tests of candidates for research. However, practice demonstrates that these methods of counteraction are not sustainable, they are constantly changing, improving, and new ones appear, which confirms the relevance of exploring the theoretical and applied foundations of the phenomenon of countering lie detection in the light of the requirements of the times. In addition, there is a significant necessity to find new and optimise existing ways to prevent such counteraction.

In theory, there is a distinct, specific division of different methods of their use, according to the relevant signs for detecting them, since this adversely affects the behavioural activity of a person, their psychological and physiological state, and impedes concentration during a polygraph examination [1]. Emphasising the phenomenon of opposition to the polygraph procedure allows polygraph examiners to better understand the intricacies of the human psyche and physiology, which is reflected in the reflex activity and response of individuals to test questions during this study. The scientific originality of the study is in the classification of countermeasures and the author's characterisation of the signs of their use by an insincere individual, which will minimise in practice the situations of uncertainty in decision-making by polygraph examiners, and avoid mistakes in determining the state of a person who has voluntarily agreed to a psychophysiological examination with using a polygraph, but who deliberately prepared and committed deliberate deception during this procedure.

Considering the above, the study involves performing several tasks, namely:

– to cover the essence of the phenomenon of resistance to conducting psychophysiological polygraph examinations using disingenuous individuals who undergo the procedure to deliberately distort or misrepresent the results of the process;

– to provide a detailed description of ways to counteract the conduct of psychophysiological research using a polygraph;

– to identify signs that indicate opposition to the polygraph procedure;

– to propose one of the possible variants of tests for interviewees that can be used by practical polygraph examiners to identify signs of resistance to psychophysiological research using a polygraph.

The purpose of the study is to reflect the fundamentals of the existing phenomenon of opposition to psychophysiological research using a polygraph by insincere persons undergoing this procedure, to avoid problematic situations for polygraph examiners when analysing and evaluating the reactions obtained, which are reflected in the form of curves on computer polygraphs, and to ensure the objectivity of the results of the research performed.

Literature Review

Over the years, well-known scientists and polygraph researchers have devoted attention to this issue. For example, C. Honts [2], exploring attempts to impede technological procedures for assessing the reliability of such studies, proposes a theoretical model to explain the mechanism of effective countermeasures, the definition of which, in his opinion, is explicitly connected with approaches to the central nervous system. The well-known psychophysiologist J. Matte emphasises the measurement of the autonomic nervous system in his work "Forensic psychophysiology using the polygraph: Scientific truth verification, lie detection" [3], which highlights the mental, physical, and pharmaceutical countermeasures that polygraph subjects can use to "deceive" the device by changing "normal" physiological reactions. In this context, attempts to bridge the gap between outdated practices and proven testing and analysis protocols are being made by D. Krapohl & P. Shaw [4]. By analysing the practice of evidence-based polygraphy, they propose alternative technologies and methods to increase the reliability of these studies. Finding methods to improve the accuracy of the results is the subject of J. Swiec [5], who highlights the theoretical aspect of using the brain-computer interface in lie detection. Other researchers [6] propose a new solution to this problem by using artificial intelligence systems.

The results of practical research in this area are essential for highlighting the issue. Thus, the work of M. Stevenson & G. Barry [7] describes the results of their field research on the impact of breathing exercises performed before testing on the test results. Therewith, E. Mac Giolla & T. Luke [8] present the results of applying a cognitive approach to improve the ability to recognise lies. Instead, M. Pishghadam, H. Raoufian & A. Gazerani [9] describe the evaluation of a lie detection system by nonlinear analysis of electro-oculography signals. The theoretical foundation of the problem of counteracting psychophysiological testing is complemented by experimental studies by K. Suchotzki & G. Matthias [10] on the identification of behavioural and autonomic correlates of deception, in particular, in the context of the impact of adverse motivation on them.

A comprehensive analysis of using countering polygraph examinations is provided by the scientific work of the prominent American psychophysiologist, psychologist and psychogeneticist D. Lykken "Blood Tremors: The Use and Abuse of Lie Detectors", dated back to 1981, in which the author emphasises the strengthening of responses to control questions when assessing physical countermeasures [11].

However, the relevance of exploring this phenomenon of counteraction has not been abandoned to this day. In recent years, the field of lie detection has seen a trend toward technological progress from the classic polygraph to neuroscientific brain imaging, which was the subject of the work of B. Paul, L. Fischer & T. Voigt [12]. The modern scientific literature presents the results of exploring the specifics of concealing information through using specific methods of counteraction during polygraph examination by persons with different types of mental health: A. Uchaev & Y. Alexandrov [13] even identify the specific features of information concealment in the process of polygraph testing of persons with analytical and holistic types of mental health, which generally demonstrates positive results. A group of researchers with the participation of Hyeon-Gi Hong [14] focuses on exploring the psychophysiological reactions of people with different psychopathic tendencies to the hidden information test.

In scientific works on this subject, the issue of counteracting psychophysiological research by using a polygraph is considered fragmentarily, in the context of the relevant subjects of research.

Materials and Methods

The methodological tools of the study correspond to the outlined purpose of the research and the subject. The most popular is the dialectical method, in particular in the context of the relationship with the theory and practice of reflecting the content of the phenomenon of opposition to psychophysiological research by using a polygraph, which is used by insincere persons undergoing this procedure, who purposefully use it to distort or misrepresent the results of such a research process. In addition, general scientific methods were used, such as *analysis* – to process the array of existing information on the phenomenon of counteracting psychophysiological research using a polygraph; *synthesis* – to present an idea of the mental and physiological processes occurring in the minds of the persons under investigation using a polygraph under the influence of various drugs, precursors or any adverse actions taken by insincere individuals to circumvent the polygraph; *generalisation* – to systematise and evaluate the available results of polygraph examinations, which, through the relevant features, indicate that persons use appropriate techniques or methods to counteract psychophysiological examinations using a polygraph for their benefit. These methods allow for establishing algorithms for detecting deception and counteracting the research procedure, which is frequently used by individuals in the polygraph procedure to circumvent the polygraph by distorting or misrepresenting the results obtained with its help. These methods were used at all stages of the study, in particular, when defining the scientific problem, setting the purpose and objectives of the study; detailing the content of the information presented; analysing innovations and providing proposals for the application of modern approaches to displaying results, techniques and methods of counteracting psychophysiological research using a polygraph.

The theoretical foundation of the research was the results of exploring the materials of modern Ukrainian and international polygraph practice. The research is based on the innovations of Ukrainian and international scientists and polygraph researchers, who reasonably prove the necessity of exploring the phenomenon of counteracting psychophysiological research using a polygraph and suggest optimal methods for such research.

The empirical foundation of the study is international data published in the official documents of the American Polygraph Association [15] as the founder of key design in the development of the polygraph process, which devotes considerable attention to the quality of psychophysiological research using a polygraph and the evaluation of the results obtained with its help.

Results and Discussion

1. The essence of the phenomenon of opposition to the procedure of polygraph examination. A prominent place in modern practical polygraphy is occupied by the phenomenon of opposition to the process of examining by persons undergoing this procedure. This category is defined as a deliberate, purposeful action on the part of a person undergoing a psychophysiological test using a polygraph designed to distort the results of this research procedure. Thus, counteraction includes a specific adverse effect that a person deliberately uses in the psychophysiological research procedure to distort, misrepresent, alter, or conceal important information for the customer – the so-called initiator of the research.

Thus, it is a specific purposeful activity that can directly or indirectly influence the course and results of a polygraph examination and distort the results of this activity. Note that both computer polygraphs and various behavioural reactions can indicate opposition. After all, the test subject can resist during registration, pre-test, or post-test interviews. Therefore, the detection of such facts is difficult and complex. It is usually difficult for people to recognise deception by observing someone's behaviour or listening to a person, and theorists are constantly trying to establish comprehensive reasons for this [16]. Although in recent years there have been trends to shift the attention of polygraph examiners from observing non-verbal

behaviour to analysing the content of speech [17], the introduction of qualitative test formats, designed as targeted techniques [18], researchers are now unanimous in the fact that there are no simple verbal signs of deception that can be detected by people, nor is there a universal research strategy [19].

The issue of counteracting research by using a polygraph is not new to the theory and practice of the polygraph process. Attempts to "deceive" the polygraph began from the very beginning of the industry's inception and development, as "what can be invented can be circumvented" [20].

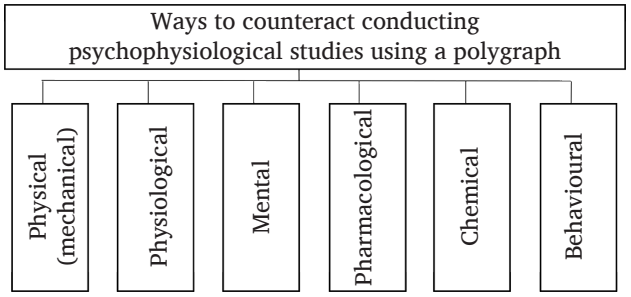
2. Methods of counteracting the polygraph examination procedure. In the context of the problem explored, notably, first of all, the factors that affect the objectivity of the results of the psychophysiological examination of persons using a polygraph. They play a key role in informing the person about this research procedure and its specific features. Thus, due to the possession of relevant knowledge, the person being explored has the opportunity to resort to a specific method of counteracting the objective research result. International practices of the polygraph examination process call them countermeasures rather than methods of counteraction. They refer to this interpretation based on its definition in the American Polygraph Association's (APA) Glossary of Terms, which states that *counter-measures* are usually methods used to mislead the observer [21].

In this context, the polygraph examiner conducting the research is considered an observer. Such methods of counteraction are both overt (detection of which does not require additional checks) and covert (can be detected only through additional checks).

Concerning their identification, the world's leading scientists and researchers in the study and development of polygraphs have implemented various constructions of countermeasures that were organised into appropriate forms (classes, types, groups). The most common classification is the one proposed by D. Krapohl [22], which combines four classes: physical, psychological, pharmacological/chemical and behavioural measures.

In the author's opinion, it would be more appropriate to terminologically call them not countermeasures, but the phenomenon of counteraction. This phrase is more capacious, as it includes the broader meaning of a particular action, namely, the process and method of using something that causes an adverse reaction in an individual to achieve the purpose. In addition, it is advisable to develop ways to define the phenomenon of counteraction not by classes, but by types or groups, as a narrower understanding of the essence of filling them with content.

Considering the achievements of Ukrainian and international empirical practice of polygraph examination, based on a thorough analysis [1, p. 228-249], all the ways insincere persons can counteract this study can be divided into six groups (Fig. 1).



■ **Figure 1.** Classification of methods for conducting psychophysiological examinations using a polygraph
Source: developed by the author based on research by O.I. Motliakh [1]

Consider these methods in more detail.

2.1. Physical (mechanical) methods of counteraction. These are the methods that have external physical manifestations through directed mechanical action by the examined person. On the one hand, they are simple psychophysiological reactions, and on the other hand, they are difficult for a polygraph examiner to detect, as they are very similar to the natural physiological reactions that occur in examinees when they are asked questions and provide answers. Physical (mechanical) methods of counteraction are usually resorted to by straining a specific muscle group of the arms, legs and other parts of the body, and by mechanically pressing the limbs together or against adjacent parts of things and objects to cause physiological pain and unpleasant reactions that can distract from the polygraph examination procedure [1]. This type of method includes actions related to clenching the lips, clenching the teeth, biting the tongue, cheeks, etc. Frequently, to use physical methods of opposition, a person uses various small improvised objects, such as pins, stationery buttons, snaps, which are placed in shoes, clothing items and pressed at the right time to cause pain (sensations). In addition, they wear related things: rings, jewellery, and hair clips that squeeze or rub on a particular part of the body, making the person being examined uncomfortable and diverting their emotions to other things. Occasionally, uncomfortable (tight) clothes and shoes are worn for this purpose, which adds to the problem by being too small, compressing parts of the person's body, causing irritability or increased emotional arousal, which is designed to interrupt the insincere person's excitement in answering questions.

A fairly common way of physical (mechanical) counteraction is to change the rhythm of breathing. It is the only one of the physiological indicators recorded by the polygraph. This method is used by persons who do not have knowledge of the technical capabilities

of the polygraph and are convinced that reducing breathing or, conversely, increasing its frequency will flatten or suppress the physiological reactions they detect. However, a change in breathing demonstrates a specific change in its indicators. For example, the intensity of the increase in respiration, which is not inherent in the normal human rhythm, results in hyper- or hypoventilation and the appearance of breath-holding (apnea) or deep breaths [21]. Therewith, relatively stable synchronous changes in heart rate and blood pressure are triggered. Individual deep breaths, both after verification and control questions and at other points during the test, prolonged breath-holds, or unstable, "ragged" breathing. In addition, it can be an artificial modification of breathing parameters for inhalation and exhalation, a decrease or increase in its frequency (for example, frequent shallow breathing). Other breathing parameters can be deliberately changed, such as the ratio of inhalation and exhalation times, and long pauses between them. Counteraction using the breathing method requires a sufficiently high level of self-control and does not always affect the overall result of a psychophysiological examination using a polygraph. Respiratory rate without the appropriate emotional mood of the individual changes other vegetative indicators with a significant delay, which is associated with changes in the level of gas metabolism in the body. When a person breathes rhythmically, emotional changes occur smoothly and are associated with other psychophysiological indicators and do not demonstrate sharp fluctuations in respiratory amplitude.

2.2. Physiological methods of counteraction. These methods involve changing one's psychophysiological state for a long time in such ways as excessive physical activity (immediately before the study), prolonged fasting, exhaustion due to sleepless nights, etc. [1]. These countermeasures are specific, as they cannot always be detected visually, let alone verified in any other way. Excessive physiological exertion by a person on the eve of the study can cause muscle crepitation, pain, or physical ailment. Combined, this will cause the examinee to become lethargic or, conversely, irritated, which adversely affects the quality of the polygraph examination using a polygraph. A person in this state will demonstrate atrophy to everything that surrounds them and what happens to them. Physiological reactions in this state will be minimal, even in issues that are significant for the study.

Prolonged fasting and lack of sleep on the eve of the examination will cause one of the following conditions: lethargy, inattention, or indifference. Considering the time duration of such research, the person will fall asleep, and their physiological reactions to the activity will be minimal.

Drinking a significant amount of fluids before the procedure to stimulate frequent urination is one of the physiological ways to counteract it. The subject ultimately concentrates not on the polygraph procedure but on meeting a physiological demand. In this case, the specialist frequently has to take breaks in the investigation, after which the person requires time to restore their emotional state and fully return to the working rhythm. It complicates the polygraph examiner's work, and after clarifying the reasons for the frequent stops and low participation of the examinee in the further conduct of the examination, it can be terminated or postponed to another day and time. If this syndrome is repeated next time, it can be confidently stated that one of the physiological methods used by the person to counteract such research is used.

2.3. Mental methods of counteraction. Methods of this group involve changing the functional state of the person under investigation using a polygraph when the body's reactions to a stimulus (irritant) are artificially suppressed. Psychological methods are based on the tight connections established between human mental health and its physiology. The human body is unique in its ability to selectively reflect both external and internal factors. Thus, the body can actively respond to only those stimuli that it actualises out of the many stimuli that affect it simultaneously, and vice versa, ignoring the rest of the stimuli that are not important to it. It allows for a purposeful and active influence on the physical and mental state, selectively orienting the reflective function of the mental to specific external or internal factors. A person can actively use this property in the course of polygraph examinations, setting a specific purpose. From the standpoint of psychological analysis, a psychophysiological examination using a polygraph is stressful for a person, since the purpose is complex (to hide certain information with words and behaviour and, therewith, not to "give away" a physiological reaction) and the person's behaviour is determined by poly-motivation. In this context, experts in this field argue that "such dichotomous states as hypertrophied interest or complete indifference to the testing situation adversely affect and distort the entire procedure, as the higher the level of motivation, the more pronounced the reactions and vice versa, the lower the level of motivation, the less pronounced the indicators are (over-motivation increases the level of activity and tension excessively, resulting in undesirable emotional reactions such as anxiety, excitement, stress, frustration, etc. and unmotivated causes apathy, boredom, indifference, passivity, etc)" [23].

In addition, the motives can be more or less opposed to each other, i.e., there is a "struggle of motives". This phenomenon can throw a person off balance for a while and cause a more pronounced stressful state than during a regular survey. The "internal disorder" can be eliminated by searching for an

additional motive that would allow a person to make a final decision about the form of behaviour. In such conflict situations, the greatest difficulty is in developing an additional motive, which frequently results in a refusal to master the situation and a passive submission to the course of events. Such a situation can be avoided by using mental self-influence designed to control emotional and autonomic reactions, which can be used by the person being examined on a polygraph. The most common psychological methods of counteraction are imagery, hypnosis, biofeedback, placebo, rationalisation, dissociation, mental stress, personality traits, and mental disconnection [21]. Their detailed characteristics are presented in Table 1.

■ **Table 1.** Mental methods of counteracting psychophysiological research using a polygraph

Imagination	A sensory-visual image of objects or phenomena of reality that is stored and reproduced in the human mind without their actual impact on the senses. This refers to the process and result of the mental reproduction of images of objects and phenomena that do not affect the human senses at a particular moment [21]. The individual is immersed in memories that can evoke positive emotions, and their physiology enters a state of calm
Hypnosis	A temporary state of consciousness is defined by sharp concentration and susceptibility to suggestion. It is frequently compared to ordinary short-term sleep, but this is not the case, since the state of hypnosis occurs as a result of the special effects of the hypnotist or purposeful self-hypnosis, unlike natural sleep [21, p. 43]. The outcome of successful hypnosis depends both on the skills of the hypnotist and on the hypnotisability of the subject and the characteristics of their body. People who are in a state of hypnosis retain their memory, but in this state, they do not lose the ability to lie or resist the suggestion
Biological feedback	A set of physiological, preventive and therapeutic procedures during which a person is provided through an external feedback loop, organised mainly using a microprocessor or computer equipment, with information about the state and changes in particular physiological processes [21, p. 11]. To some extent, this kind of biological feedback is used by a polygraph examiner when presenting a stimulating test to the subject by their first or last name, using the method of known falsehood. Knowing about this method from other available sources, the person tries to use it to influence their physiological indicators by observing the graphs of a computer polygraph in real-time
Placebo	This method of counteraction is multidirectional in its application. It is used, for example, during drug trials to prevent psychotherapeutic effects. It is a change in a person's state due to their belief in the efficiency of the probable impact of a specific neutral thing, and the brain, through self-hypnosis, adjusts its work rather than the work of other organs [21, p. 64]. Unscrupulous subjects of polygraph examinations demonstrate their awareness of the procedure, but their minds are elsewhere, drawing distracting pictures of the past in their imagination
Rationalisation	The unconscious desire of an individual to logically justify their ideas and behaviour even when they are irrational. Rationalisation serves as a mechanism of psychological defence, in which only that part of the perceived information is used in a person's thinking, and only those conclusions are drawn that make one's behaviour appear well controlled and not contrary to objective circumstances [21, p. 71]. The rationalisation is an attempt to establish harmony between the desired and the actual situation, i.e. to explain behaviour that is not explained by an objective analysis of the situation, or an attempt to justify a failure or mistake
Dissociation	A mental process that belongs to the defence mechanisms of the mental system. It involves distancing oneself from unpleasant experiences: a person begins to perceive what is happening to them as if it were happening to someone else, not to them personally [21, p. 28]. A person can resort to dissociation already during the interview before the survey
Mental stress	Mental stress involves a prolonged mental workload and directly affects mental activity, as it can impair the functions of memory, thinking, attention, and perception [1]. Excessive brain activity causes tachycardia, increased blood pressure, changes in the electrical activity of the heart muscle and brain, and increased pulmonary ventilation and oxygen consumption. The long-term process of such functional changes in the body causes the development of inhibitory processes in the central nervous system, a decrease in attention, and fatigue, which complicates the procedure for conducting a polygraph examination
Features of the ndividual	A set of personality traits determined by a person's social nature. Each of the subjects is primarily a subject of socio-cultural life, which is developed in the context of social relations, communicative interaction, and subject activity. By engaging in specific cultural, historical, and other relationships, a person acquires specific individual characteristics that indicate a tendency to oppose polygraph examinations [1]
Imaginary disconnection	The most effective way of suppressing psychophysiological reactions is when a person tries to completely ignore the content of the questions and answer them automatically, switching their attention to some real or fictional object [1]

Note: compiled based on the analysis of scientific encyclopedic literature and the author's practical research

2.4. Pharmacological methods of counteraction. These methods are the result of using some pharmacological agents by the subject. An individual who has to be examined using a polygraph will try to conceal some information from the initiator (customer) of such a procedure, it is quite obvious that they can

use pharmacological agents as a way to counteract the examination. As a result, emotional tension is reduced, and memory begins to suffer due to the impaired functioning of nerve cells that enable the storage and reproduction of information. The intensive development of the pharmaceutical industry has increased the range and possibilities of using drugs that vary in time and effect, which remove people from the normal physiological rhythm, depressing or exciting their nervous system. This condition allows them to be temporarily or permanently distracted from pressing issues and demonstrate insincerity in their actions and thoughts. Polygraph examiners use a special test to determine the state of a person who has voluntarily agreed to participate in a psychophysiological examination using a polygraph. Based on its results, the polygraph examiner receives specific information about the candidate's condition. The current practice of polygraph examination demonstrates the presence of the following most popular types of pharmacological drugs used to counteract the relevant studies:

– *antidepressants* (Latin *antidepressantia*; Greek anti – against + Latin *depressus* – depressed) (imipramine, fluoxetine, citalopram, trazodone, etc.) are psychotropic substances that can improve mood, relieve tension, anxiety or stimulate mental activity. They are commonly used to treat neuroses and mental disorders [21]. A significant number of such drugs are synthetic, using which can cause serious side effects on the human body, and their use should be performed under close medical supervision. In the case of an overdose of antidepressants, a hyper reaction to a stimulus question is possible, even including the appearance of non-decaying curves on computer polygraphs. Two states are possible: the first is when the skin-galvanic response curve is within the normal range, but one of the stimuli activates its state of continuity. The second condition is when, in the case of an increased dosage or overdose of stimulant drugs, a "pendulum" phenomenon can be observed even when the "background" is recorded. Unfortunately, the presence of this phenomenon cannot serve as a ground for a polygraph examiner to decide whether the examinee will oppose the procedure, as it may be a normal reaction to their weakened nervous system. Using antidepressants will necessarily be reflected in computer polygraphs, as the graphs of the curves will change due to an increase in heart rate, which will cause the human body to quickly fatigue. Cardiac arrhythmia, dizziness, severe headaches, increased sweating, increased body temperature, body tremors, impaired coordination, and nausea are possible. The external signs of the examined person will be evident, which will affect their increased emotional arousal or, on the contrary, a decrease in reactions to activity and loss of interest in everything around them. Excessive anxiety, irritability, unusual coordination of movements, gestures, illogical statements, etc. can occur;

– *barbiturates* (Lat. *barbiturate*) (barbamil, veronal, papaverine, luminal, etc.) are hypnotic drugs, called hypnotics. The action of barbiturates is designed to depress the central nervous system. They are commonly used in medicine as sedatives, hypnotics, and anticonvulsants [21]. Depending on the purpose, these and other types of such drugs are divided into groups of the ultra-short, medium, and long-acting. Considering their availability on the market, they can be used for purposes other than their intended ones, including as a possible pharmacological method of counteracting a psychophysiological examination using a polygraph;

– *neuroleptics* (Greek: *νευρον* – nerve, nervous system; Greek: *ληψη* – abstinence) (aminazin, tizerzin, leponex, melleril, etc.), the purpose of which is a calming effect. Like barbiturates, drugs of this group are used for medical purposes, but their availability allows for non-medical use, which is used by unscrupulous candidates for polygraph examinations for a specific purpose [21]. The result of using neuroleptics is a decrease in the patient's reactions to internal and external stimuli, which is reflected in a decrease in affective tension, suppression of irritation and fear;

– *analgesics* (from the Greek *ἀν* – without, against + *ἄλγησις* – pain) (analgin, ibuprofen, pentazocine, etc.), or painkillers, is a drug of natural, semi-synthetic or synthetic origin intended to relieve pain – analgesia. The principle of action of this group of drugs is based on blocking the human central nervous system, which significantly complicates the polygraph examiner's psychophysiological examination using a polygraph [21]. An overdose of these drugs can cause dizziness, weakness, headaches, euphoria, and even hallucinations in the subject. Physiological reactions of a person under the influence of analgesics are unpredictable and even in some cases inadequate;

– *tranquilisers* (from Latin *tranquillo* – to calm) (elenium, seduxen, nozepam, phenazepam, etc.) are psychotropic drugs that can eliminate or mitigate neurotic manifestations, fear, anxiety, emotional stress, sleep disorders. They distinguish themselves from other similar pharmaceuticals, such as neuroleptics and antidepressants, by the absence of pronounced side effects and are well tolerated by their users [21]. Their action is targeted at the subcortical areas of the central nervous system of individuals, and the result of using tranquilisers is well reflected in computer polygraphs. Thus, they can reduce the frequency and amplitude of the respiratory curve, pulse rate, and amplitude of the skin reaction but do not disturb the ratio of response to neutral and meaningful questions. This allows differentiating reactions from any test format. Persons who had taken

tranquilisers in therapeutic doses on the eve of a psychophysiological examination using a polygraph demonstrated clear reactions that were reflected in the curves of computer polygraphs and did not affect their decoding by polygraph examiners. However, their adverse effects on the human body exist and demonstrate the process of reducing the "activity" of the centres of the reticular formation, limbic areas of the brain, and as a result, the overall activity of the cerebral cortex. An overdose of tranquilisers causes adverse reactions in the form of calmness, reduced anxiety, fear, euphoria, or drowsiness, which thereby reduces the quality of the polygraph examination;

– *opiate group drugs*. A drug (from the Greek *narkoticos* – one that causes numbness; dizziness) is a substance of natural or artificial substances that can cause physical dependence due to the replacement of one of the substances involved in natural metabolism, and mental dependence. Opium – a potent drug obtained from sun-dried milky juice extracted from unripe capsules of the opium poppy (Papaver somniferum). Contains about 20 alkaloids. In conventional medicine, due to its high content of morphine alkaloids, it was used as a powerful painkiller. In general, narcotic drugs affect the nerve centres of the brain and can produce mood elevation or excessive drowsiness, morbid, unusual cheerfulness – euphoria, and sometimes impaired consciousness. Therewith, drugs of the opium group, which include natural and synthetic substances containing morphine-like compounds, are "sedatives" and inhibit the functioning of the human brain. Using natural narcotic substances of the opium group results in withdrawal symptoms, which are expressed in anxiety, tension, or irritability.

2.5. Chemical methods of counteraction. They can be divided into two groups. The first – as chemically produced narcotic drugs (cocaine, heroin, LSD, amphetamines). The second – as chemicals for external and internal use (fatty acids that are part of various cosmetic creams, formaldehydes, glues, deodorants) [21]. Both groups of chemicals are not classified as medicines, although the development of the medical industry does not exclude the possibility of using for their own needs cocaine, heroin and amphetamines, etc. Using chemicals causes several problems both for human health and for the polygraph examination procedure. In particular, they cause a violation of the natural electrical resistance of the skin, which reduces the sensitivity of impulses transmitted from the body of the examinee to the polygraph sensors, and then through the registration channel to the computer polygraph. The application of various chemicals to the palms and extremities of the hands establishes a protective film invisible to the eye, therewith, visible to the polygraph as an ultra-sensitive scientific and technical device. The absence of skin-galvanic reaction indicators on the computer polygraph curve sharpens the polygraph examiner's attention to determine the real cause, which is either a malfunction of the sensors serving this channel or using an external chemical method by the examinee to counteract such a testing procedure. No less problematic for conducting psychophysiological examinations using a polygraph are chemicals used internally by unscrupulous individuals, including narcotic drugs such as cocaine, heroin, LSD, amphetamines, and household products such as glue, deodorants, and solvents. Their use (sniffing) in the human body causes an unpredictable reaction (excitement, inhibition, rejection) and reduces the ability to perceive information, remember and reproduce it.

2.6 Behavioural (communicative) methods of counteraction. The term behaviour is a collective generic term. For polygraphy, the most significant interpretation is that it refers to visible manifestations of behaviour that can be observed and internal states associated with external manifestations. Behaviourism is one of the areas of psychology that replaced empirical psychology and explains human behaviour by mechanical, reflective acts in response to external stimuli. Sociability (from the Latin *cjmmunicabilis – connecting, communicating*) is a person's ability to communicate and establish social ties, contacts, and fruitful interaction with other people. Communicability is a derivative of the word communication (from the Latin *communicatio* – unity, transmission, connection, message, related to the verb *communico* – to make common, to communicate, to connect, derived from the Latin *communis* – common) – a process of information exchange between two or more persons, communication through verbal and non-verbal means to transmit and receive information.

From these concepts, behavioural (sociability) is derived, which in polygraphy can be used by an unscrupulous examiner as a way to counteract. It is manifested in the attempt of such a person to influence the polygraph examiner and the assessment of the results of the examination in a unique way. It can be manifested in:

– an attempt to covertly influence the polygraph examiner by providing them with information that is distracting from the subject of the examination;

– openly ignoring or sabotaging the rules and process of conducting a polygraph examination;

– demonstration of untimely reactions of the body (crying or laughing while the polygraph examiner is familiarising themselves with the general rules of this examination procedure), etc.

A significant difficulty in detecting behavioural (sociable) counteraction is when a person uses methods of purposeful change in the functional state and actively manages physiological and behavioural reactions.

A unique way of such counteraction is the appearance of sharp pain in internal organs (heart,

stomach, kidneys) or head, teeth, and joints with a demonstration of moaning, shouting, crying, gestures, unauthorised removal of sensors in the middle of the test recording, etc. Such emotional and physical movements appear in the examinees abruptly after the start of the examination, when the polygraph examiner starts asking questions that threaten their condition, and before that everything was normal. Admittedly, one should not state unequivocally that this is a manifestation of opposition to the study, as a sudden change in a person's health can occur, particularly in a situation of high emotional stress, but one should not dismiss the human skill of disguising oneself from a threatening situation. In this case, the polygraph examiner stops the examination and, at the person's request, reschedules it for another day and time.

There are cases when, in the course of an examination that has already begun, people remember their urgent matters and begin to put pressure on the polygraph examiner, pushing them to accelerate the completion of the testing procedure. The polygraph examiner must demonstrate the firmness of character and inform the examinee that they will listen to the advice given to them, but they do not guarantee the quality of their work, which can significantly affect the assessment of the results obtained and the possibility of a mistake resulting from non-compliance with the requirements of this procedure [24].

Situations of communicative influence on a polygraph examiner using psychological techniques in the form of cajoling, bribery, and physical threats, including blackmail and intimidation, are no exception. In general, such forms of influence on a polygraph examiner are legally punishable activities, and the examinee is warned about them. In the event of any of the above situations that complicate the process of further conducting the examination, the polygraph examiner stops the examination and informs the initiator (customer) of their decision with justification.

Using any of the methods of counteracting polygraph examinations by insincere persons demonstrates the emergence of specific signs that can be detected and expose the "tricksters". In an attempt to influence the objectivity of the results, a person commits specific actions that leave appropriate traces of reflection, which allow stating opposition to the polygraph examination [25].

The resulting traces of reflection will manifest themselves in different ways in each case, in particular:

– there can be a change in the behavioural reactions of the examinee, which is achieved by biting the lips, pressing on the tips of the fingers and toes, placing sharp objects under body parts, using nervous finger movements, artificial stuttering, delaying answers (pauses) to questions posed by the polygraph examiner or, on the contrary, their false start;

– short-term switching of one's activity from the research procedure to other vital processes, when the physical presence of a person briefly replaces the intellectual one. Thus, the person is present during the research procedure, but their mind is elsewhere;

– replacement of one load with another (artificial replacement or artificial stimulation). Redistribution of behavioural reactions from one activity to another, in particular, replacing excessive physical activity with using tonic drinks, foods, or drugs.

The above-mentioned countermeasures that can be used by the examinees in the process of conducting psychophysiological examinations using a polygraph can be divided into two conditional groups in terms of reflecting their features: a) direct mechanical action; b) indirect (remote) activity process.

The features of the first conditional group of countermeasures include:

– artificial change in respiratory parameters. An artificial decrease in the depth or frequency of breathing will necessarily result in forced breathing, which is easily differentiated on the pneumogram curves. A polygraph examiner should be aware that the ratio between inhalation and exhalation is a relatively constant value;

– counteraction with fingers. It can be performed in different ways, for example, by pressing your fingers on the surface of a table, the armrest of a chair, or the knees. Prevention of this type of countermeasure is based on the correct positioning of the subject's body. Thus, the person should sit in a comfortable chair, preferably in a chair specially designed for such studies, with the hands partially hanging from the armrest. This position deprives the examinee of the support under the fingers, which in turn prevents them from using resistance to the psychophysiological examination with the polygraph;

– counteraction by biting the tongue. This method is easy to track if the polygraph examiner's testing methodology is such that it allows for a clear record of the time the examinee responds to the question (stimulus);

– counteracting by tightening the sphincter muscles ("clenching" the anus). It is detected by using special sensors to collect information, which is located on the seat of the chair and act as a tremor cushion [1].

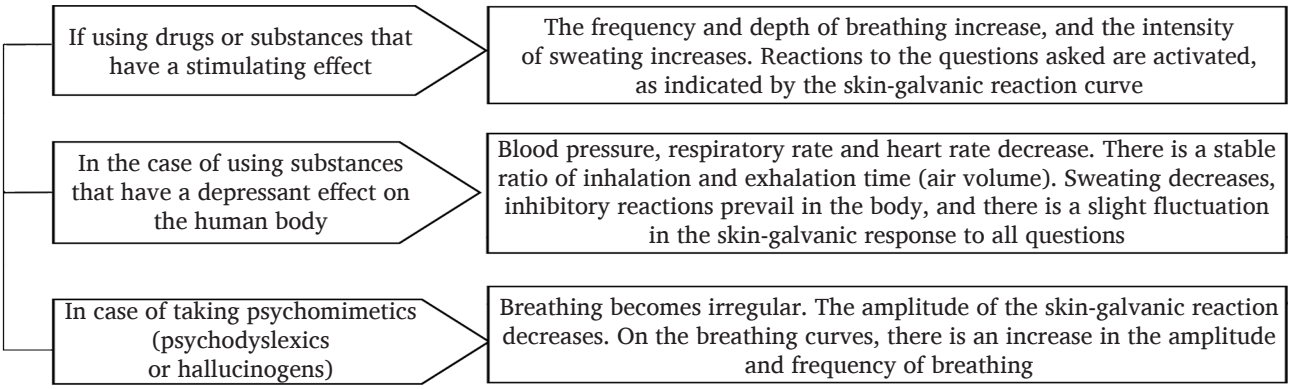
Signs of the second conditional group of counteraction include:

– *signs of a person's use of mental methods of counteraction* (adverse attitude to the examination procedure; manifestation of distrust of anyone, even the polygraph examiner; inducing adverse emotions, etc.) *The result of using mental coping techniques causes* a sharp drop in heart rate or blood pressure immediately before the start of the questions and maintains them at a low level throughout the test. The practical absence of physiological reactions on a computer polygraph during the test recording process is no exception;

– signs of using pharmacological methods of counteraction (*when using sedatives and hypnotics; taking stimulants; taking tranquilisers; using various solvents (chemicals); using narcotic substances and their precursors, etc.*) The results of using pharmacological countermeasures by the subject cause a significant activity of their physiological reactions to questions (stimuli) or, on the contrary, a sharp decrease in vital processes, including the appearance of apathy to everything around them and the procedure for conducting psychophysiological research using a polygraph, in particular;

– signs of short-term switching of their activities as a way of counteraction in the form of active and passive physical processes. The first one – in the form of tension of the individual's brain activity to control their physiological reactions, which are designed to block behavioural reactions to the questions posed by the polygraph examiner. The second – as a passive process of participation in the polygraph examination procedure, when a person demonstrates a relaxed state of their body by using relaxation techniques;

– signs of replacing one load with another as a way to counteract the study (artificial replacement or artificial stimulation). Artificial replacement of physical activity by stimulating the trophic (nutritional) function of the nervous system with appropriate foods, drinks, drugs such as tea, coffee, cocoa, chocolate, tonic drinks and tobacco products, and pharmacological drugs, in particular: ascorbic acid, dibasol, ginseng and Eleutherococcus prickly, Chinese Schisandra, neurantine, phenamine, etc. To some extent, they stimulate the processes of the human body and cause an increase in physiological reactions due to increased blood circulation in the vessels and increased pressure, short-term liveliness and activity of the individual, and rapid recovery of the body. However, one should be careful with their use, since when taking and using such and other stimulants to improve mental performance, it should be remembered that they stimulate the body's reserves, but usually do not restore them. Repeated use of these stimulants after some time will no longer be able to give a positive result and will cause the opposite effect [1] (Fig. 2).



■ **Figure 2.** The main consequences of stimulant use

Source: author's development

The majority of polygraph examiners [9; 17; 19] in their practice frequently use both tests common in the world practice of polygraph examination and tests developed by themselves to detect the resistance of persons examined using a polygraph. The test below is based on a search format and provides preliminary information for further decision-making [1]. A modification of this test is used, for example, in the case of repeated testing, when the polygraph examiner could not decide based on the results of the first examination due to suspicion of possible opposition from the examinee (Table 2).

■ **Table 2.** A sample test for detecting opposition to a polygraph examination

No. s/n	**Test questions**
1.	Have you prepared to prevent me from checking you in any way today?
2.	Have you prepared to deceive me in any way today?
3.	Have you slept more than six hours today?
4.	Have you received advice from professionals on how to deceive a polygraph?
5.	Have you ever received advice on how to deceive a lie detector?
6.	Have you ever received advice on how to deceive a lie detector?
7.	Have you been looking for ways to cheat on a polygraph online?

Table 2, Continued

No. s/n	Test questions
8.	Have you read any special literature on how to deceive a polygraph? Did anyone train you to learn how to lie on a polygraph?
9.	Have you used any drugs today?
10.	Have you used any drugs in the last twelve hours?
11.	Have you smelled anything illegal today?
12.	Have you smoked anything illegal today?
13.	Have you used any drops today?
14.	Have you had any injections today?
15.	Have you taken any pills today?
16.	Have you taken any sedatives today?
17.	Have you lubricated your fingers with anything today?
18.	Have you used deodorants today?
19.	Have you consumed strong alcohol in the last 24 hours?
20.	Have you had any alcohol today?
21.	Are you sure I'm easy to deceive?

Such specially prepared tests allow the polygraph examiner to understand the manifestations of psychophysiological reactions of a person in the process of conducting a polygraph examination who demonstrates unstable physiological reflections of their body, which can be a consequence of their purposeful opposition to such a specific procedure.

Conclusions

Modern practical polygraphy focuses on urgent and problematic issues that arise in its field. One of them is opposition to psychophysiological examination using a polygraph, which is committed by insincere persons who voluntarily pass such a procedure at the initiative of the customer. This adverse phenomenon should be thoroughly explored, and effective methods of counteracting its spread should be developed. In this context, the category of counteraction is defined as deliberate and conscious actions of the person undergoing the audit designed to distort the results of the said procedure.

It is noted that the counteraction is designed to distort the results of the study, i.e., to change or conceal the information sought by the initiator of the study.

The author provides a thorough analysis of the existing techniques and methods of counteracting the psychophysiological examination, which is used by insincere persons undergoing this procedure with the deliberate purpose – to circumvent the polygraph and deceive the polygraph examiner.

It is proved that there are precise reflections that indicate using the phenomenon of counteraction in polygraph examinations by insincere persons, and they are reflected through specific available signs. They can be divided into two conditional groups in terms of reflecting these features: both direct mechanical action and indirect (remote) activity. The most common ways to counteract the polygraph examination procedure are physical (mechanical), physiological, mental (imagery, hypnosis, biological feedback, placebo, rationalisation, dissociation, mental stress, etc.), pharmacological, chemical, and behavioural.

To detect opposition to the psychophysiological examination using a polygraph, which is committed by insincere persons undergoing this procedure, polygraph examiners are recommended to use special marker tests that have proven to be effective in practice. The results of the application of these marker tests are used to make the polygraph examiner's decision regarding both the person under examination and the further conduct of this procedure.

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Теоретико-прикладні засади феномену протидії проведенню психофізіологічних досліджень із застосуванням поліграфа

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■ **Анотація**. Актуальність дослідження зумовлена тим, що в умовах сьогодення в практиці психофізіологічних досліджень фахівці-поліграфологи дедалі частіше стикаються з феноменом протидії з боку досліджуваних осіб, які таким чином намагаються викривити або спотворити результати, отримані на підставі використання інструментальних методів психодіагностики. Висвітлення й аналіз різних способів протидії проведенню цих досліджень з боку нещирих осіб й ознак, які вказують на їх застосування, і становить мету цієї наукової статті. Основними складовими методологічного інструментарію є діалектичний метод наукового пізнання реальних явищ, а також загальнонаукові та спеціальні методи поліграфології. Обґрунтовано прийоми та способи протидії проведенню психофізіологічних досліджень із застосуванням поліграфа через відповідні ознаки, які на них вказують. Встановлено, що нині найпоширенішими формами протидії проведенню психофізіологічних досліджень із застосуванням поліграфа є фізичні (механічні) способи, які мають зовнішні фізичні вияви через спрямовану механічну дію досліджуваної особи та виконують відволікаючу функцію від процедури інструментальної перевірки. Розглянуто фізіологічні способи, які передбачають зміну досліджуваною особою свого психофізіологічного стану, що спричинено надмірним фізичним навантаженням на організм, виконуваним чи застосовуваним напередодні проведення поліграфологічного дослідження, що викликає втому або ж демонструє виснаженість сил людини. Зауважено, що на підставі виявлених таких ознак і способів протидії поліграфолог приймає рішення щодо часу перенесення процедури дослідження особи або подальшої відмови в її проведенні. Практична значущість роботи полягає в тому, що обґрунтовані в ній способи протидії процедурі проведення дослідження, ознаки психофізіологічних реакцій, до яких вдаються нещирі індивіди, сприятимуть уникненню помилок у роботі поліграфолога, одержанню високого рівня достовірності результатів проведення досліджень із застосуванням поліграфа

■ **Ключові слова**: детекція брехні; поліграфолог; поліграфологічне дослідження; психофізіологічні реакції; приховування інформації; обман; експертиза