

RESEARCHES REGARDING OPTIMAL SOLUTIONS IN THE POLYGRAPH TESTING SYSTEM

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Abstract: On September 13th, 1997, through the civil sentence no. 651, the County Court of Bucharest Municipality, Department of Contentious Administrative – Civil Business, has decided the admittance of the petition through which the establishment and granting of the legal personality to the 'Romanian Polygraph Association (ARP)', with the headquarters in Bucharest, is requested.

The polygraph or the 'lie detector' is also one of the technical and legal means of detecting the emotional tension. It is currently used for civil purposes, to measure the loyalty of officers from some renowned companies, or in the information services. In the management of conflicts from different companies, specialized institutions are called in for the testing with the polygraph instrument. These devices are very expensive, and the tests have high costs. The article presents the experimental researches for measuring the reaction of the eyes, as a new method of examining simulated behavior. The new system will be a new product, based on the ones that already exist, but in a new concept, at a lower cost and being easy to use.

Keywords: biodetection, polygraph test, simulated behavior, physiological parameter, judicial statistic.

Introduction – Techniques for highlighting simulated behavior

The free-association method

It represents the recording of latency time. Latency time is the period that passes from the issue of a stimuli until the reproduction of the reaction. The signs that are being followed are: the repetition of the stimuli word (necessary in order to have time to elaborate an answer); the latency of the answer (which is higher for abstract words than for the concrete ones); the superficial association (which tries to substitute a less incriminating association); repetition of the words offered as an answer (indicating the existence of a signification); modifying the sense of the initial work (explained from another perspective)[1].

The physical experience method

It involves the recording of physiologic reactions of a subject that was investigated, using the free-association technique. As the emotional charge of an investigated subject was getting higher and higher, the oscillograph recorded more ample vegetative reactions (respiration, EEG).

The experiment was that the subject must double his verbal response with a physical reaction (pushing a key), thus the subject concentrate his attention on the hand that will fulfil the task, as the changes that took place on the other hand are off the conscious control, as they are recorded.

This method was used in the first part of the XXth century, and it was replaced with other techniques with a more increased accuracy.

The method for suppressing the conscious censorship

This technique consists in the suppression of the conscious control of statements, in such a manner that the answers become mechanic.

After studying the effects of hypnosis or the state of consciousness, it was resorted to using it for detecting simulated behavior. In 1905, Sanchey Herrera used for the first time

hypnosis in legal practice, but that cannot be generalized. Now, hypnosis is used, as a detection technique, in the forensic field, along polygraph investigations.

Another method is using psychotherapeutic substances like ether, morphine, barbituric chemicals etc., which carry the subject that is administered the said substances, into a semi-conscious state named ‘oniric automatism’.

An American physician (House) launched in 1918 a chemical named ‘Truth Serum[2]’, that leads to very honest statements regarding the felony committed by each subject, prior to its administration. Today, this technique is forbidden, because it doesn’t abide the right for defence in front of legal authorities.

The method of detecting emotional stress in writing

The adjustments appeared in the writing of person who is in a psychic tension are recorder in a graphic form. There are three recorded characteristics of the writing – the type of latency, the duration for writing the answer, the pressure of the writing.

The room where the test takes place must be phonically insulated and it must ensure the necessary comfort for this kind of test, because any kind of noise will negatively influence the development.

In general, it is recommended to use this technique along with the polygraph test, thus getting to a complete result[3].

The method of detecting the stress from the voice

The changes made on the fundamental tone’s frequency are usually installed in the inaudible specter of the voice. The detector of the psychological stress from the voice (psychological Stress Evaluator- PSE), allows the highlight of the emotional stress from the voice, the inaudible and involuntary waves, of a 8-12 Hz low frequency. During the stress period of the speaker, the modulations are controlled by the central nervous system; the independent nervous system becomes dominant once the stress appears, which inhibits the phonatory muscles at the level of the medium frequency register.

In order to obtain superior results in the analysis of the voice emotion, one must use a pair of devices: a professional megaphone, which records the answer given by the subject on the polygraph, a 7029 A sonograph and voice stress detection device, which helps transcribe on voicegrams the sonic representation given by the subject during the polygraph test.

The vocal characteristics that highlight the emotion are – the values of the fundamental voice tone, the duration of the voice emission[4], the intensity of the explosive consonants, the speed of articulation, the latency time.

The polygraph technique

Is one of most advances techniques used in the field of simulated behavior detection; it is a mechanic or electric recorder, which absorbs in a pneumatic manner the changes in blood pressure, respiration and in muscle micro-movements.

The psychophysical changes are caused by the emotional reactions of the tested person, as in 70-80% of the cases, one can establish if the subject is telling the truth.

Investigating the simulated behavior through the polygraph technique Simulation detection through the polygraph technique

The polygraph records the physiological changes of the organism during various emotional states that accompany simulation. The consciousness of the guilt, which mobilized an emotional state which can be masked with difficulty, determines the subject to emotionally react every time it is presented with an object or it is addressed a question regarding the felony committed.

The polygraph simultaneously records on a diagram the changes of five psychophysiological parameters (thoracic respiration, abdominal respiration, electrodermal response, blood pressure and micro-neuromuscular movements), then the examiner analyses and interprets them, formulating conclusions regarding the subject's sincerity or lack of sincerity, the conclusions recorded in a psychological report of technical and scientific finding.

The testing with the polygraph technique is made based on motivated resolutions or the orders of the authorities making the criminal investigation, and upon the express request of the defense. As it is a mean of investigation, it must be requested and it usually represents an initial moment of the investigation, and not a last activity. A few days before, the examiner will closely study the file of the cause, in order to formulate together the most efficient questions[5].

The testing will only be made in a phonically insulated room, specially furnished and set up, so that it is sober, without any ornaments or pictures that might distract the attention of the examined person; the room temperature must be normal, and the lighting must be appropriate.

If the subject does not agree with making the test, the examiner will conclude a report for recording the refusal and the reason invoked.

The persons not accepted at the polygraph testing are: minor children, pregnant women, persons of unsound mind, people with severe cardiac and respiratory illnesses, the ones that have severe neurological illnesses, alcoholics, people with physical ailments and other persons that are not accepted by the examiner.

The mandatory condition for testing with the polygraph technique is the psychophysiological normality of the subject. Thus, the tested person must not be submitted to a tiring inquiry, he must have a normal feeding, he must not be under the influence of alcoholic beverages, he must not be under the influence of medication that acts on the central nervous system, he must not participate on confrontations etc.

The testing procedure

If possible, it is better that the polygraph test takes place early in the morning, after the subject has had an entire night of sleep. The investigator must not interrogate the subject on the day of the testing. From the time when the person agrees to get tested with the polygraph, the investigators must cease any interrogation until the date of the testing. Usually, the examiner is the one that has the last word in making the decision regarding the person that can take the test, when the testing starts and if it will continue. The polygraph must never be used just as a threat. The subject must be asked if he agrees to take the test only when the investigator really intends to test him.

The tester is responsible for the things that are about to be discovered during the test. The exact phrasing of all the questions must be decided following the consultations between the tester and the investigator regarding the data from the case. A test will only discover a crime. If the subject is the suspect of more than one crime, than further tests must be made on subsequent dates.

Preparing the testing

Before the test[6] the investigator must supply the tester with correct and adequate information about the case and he must not conceal anything. One must not forget that the investigation of a crime implies team work. In order to achieve good results, the tester and the investigator must work together harmoniously. The tester must be informed about the subject's past.

The investigator must give the following information:

- If the subject has a criminal record, especially if he has been arrested or investigated in similar crime cases;
- The prospect motive for committing the crime;
- His religion and his degree of faith;
- The financial state;
- Any other information that the investigator considers valuable, so that the teste can realize the essence of the subject.

The subject must be well prepared for the test. As like in any other physical test, this one must be treated with care so that the testing can take place in appropriate conditions. Firstly, the investigator must find out the reason why this person wanted to take the test and his attitude towards it. One must never presume that the subject tells the truth, just from the fact that he has accepted to take the test. Any tester that works in the police can give examples of people that have willingly submitted themselves to the testing, when it was subsequently proven that they lied.

It isn't necessary to recall the fact that before the test starts, certain information must be kept hidden from third parties, including the media. The investigator must trust the tester and give him information only known by the person that committed the crime – for example, how the victim was murdered, where is the entry wound, what type of weapon was used, what objects were stolen or moved from the scene of the crime or special information related to the crime, such as sexual mutilation of the binding of the victim. This information will be secret, because at a prospect recognition after the test, one must prove the credibility and validity of the confessions.

The pre-test interview

The pre-test interview anticipates any polygraph test which is then concluded with a post-test interview. The tester obtains more information from the direct observation of the person, since the moment when he enters the laboratory, until the finish of the testing.

The pre-test interview consists of the presentation of the tested person, the purpose of the test, the device's mean of functioning and the results that can be obtained; these aspects loosen up the person. The lack of being accustomed to being tested with such an equipment or involving him in the criminal cause that is investigated, creates a state of tension with actions characteristic to simulated behavior – hyperemia and facial whiteness, glottic spasm, lips contraction, voice tremor, accelerated blinking of the eyes, forced laughter, palm or facial sweating, hands kneading, latency periods during answers, avoiding the eyes of the speaker, picking up imaginary lint etc.

The failure to make a safety and reciprocal trust environment influences in a negative manner the psycho-emotional activity of the subject and of the test result. During this interview, one can observe the natural and detached behaviors of the subject. The subject that isn't sincere, does not cooperate, he gives monosyllabic answers and when a sincere problem is reached, one can observe responses like: 'I don't know', 'I can't explain it', 'Who, me?', 'I don't remember', along with exterior manifestations specific to the simulated behavior[7].

The test-questionnaire used in polygraph examination

A test-questionnaire contains 10 questions numbered from 1 to 10, an order that can also be found on the polygraph's diagram. The questions formulated will solely refer to one criminal cause. The tester notes the number of the question, adding, depending on the affirmative or negative response of the subject, the '+' or the '-' sign. The following categories of questions are included in the questionnaire – **relevant questions** (incriminatory, critical, accusing, that point to the accomplishment or the involvement of the subject in the felony that is the object of the investigation, they are addressed for the identification of the

existence of some co-participants, receivers, material evidence, instruments used for making the crime, as well as other aspects of this kind); **neutral questions** (they are simple questions that have no relation with the incrimination and that allow the psychic re-equilibration of the subject; the purpose is obtaining a standard segment on the polygraph diagram for the common psycho-emotional activity of the subject); **check-up questions** (they are questions to which it is known that the subject will not answer truthfully, as their purpose is to obtain a certain level of the psycho-emotional reactivity, necessary for making comparisons with the level of psycho-emotional reactivity obtained on the relevant questions).

The polygraph testing

The 5 pens of the polygraph record simultaneously the changes of the physiological parameters that accompany the subject's responses and which unreel with a constant speed. The entire body of the tested subject is in state of alert, as the psycho-emotional reactivity is clearer. The tester will establish the number and the type of the questions that will be given to a subject. The formulation of conclusions consists in analysis, comparison and synthesis, activities of perceiving the most sensitive changes in the tracks of the polygraph diagram, following the responses obtained on relevant neutral and check-up questions.

The psychological report for the technical and scientific observation of the simulated behavior is given to the criminal investigation authorities that have ordered the examination of the subject with the polygraph.

Post-test interview

The post-test interview concludes any testing made with the polygraph technique, as the tester asks the subject to describe the emotional states that he has felt during the answers given to the questions addressed; this interview will continue in the investigation office.

Re-examination

If following the administration of the established tests the elaboration of an exact diagnosis regarding sincerity and lack of sincerity was not achieved, in order to clarify the situation of the subject, a re-examination at the polygraph will be made. The data and time for the re-examination will be established in agreement.

The polygraph re-examination will always start with a simulation test, 'The cards test', then 'The regular questions test' and the 'Interlaid questions test'. If the tests indicate sincerity, the examination must be considered as concluded.

If there are indicators of intentional noncooperation, it is recommended to give the 'YES' Test or the 'Mental test'. Finally, the 'Interlaid questions test' can be repeated.

Factors that can influence the accuracy of the polygraph testing

The examiner must be an intelligent person, with superior education, he must manifest an interest towards his activity.

From their researches made in 1971 regarding the capacity of the examiner and the results of the polygraph testing, Horvath & Reid have demonstrated that the testers with a limited experience have a greater rate of errors.

The factors that can influence the results of the polygraph testing [8] are:

- Not being aware of the awareness possibilities (subjects with a very low schooling and I.Q. level);
- The emotional tension and nervousness of an honest subject (doubts regarding the accuracy of the device, the tester's competency, etc.);
- Hyper-anxiety (the subject's personal problems, the fear of not being involved in the act investigated, etc.);

- Physical and psychic discomfort during the testing (fear of a possible physical pain made by the device, etc.);
- Excessive inquiry of the subject, prior to the testing (prolonged and tiring investigations, threatening with the polygraph, etc.);
- The large number of addressed questions (leads to lack of reactivity);
- Inappropriate check-up questions (relating to the problem from which the subject is investigated);
- State of ‘subshock’ or ‘adrenalin exhaustion’ (a lying subject cannot react if he is immediately tested after committing the crime);
- Physiological and mental anomalies (high blood pressure, hyperthyroidism, etc);
- Various factors (inappropriate room temperature, inappropriate lighting, sound pollution, etc.)

The accuracy of the polygraph

If the simple participation on the polygraph test makes the subject nervous, then establishing a physiological state of control becomes almost impossible. The subsequent results, during the relevant questions, become useless and lead to inconclusive results. But an inconclusive result, even though it should be ignored, can be interpreted as a sign of guilt – in theory, honest and innocent persons are not afraid of the polygraph. The polygraph test is an intimidating experience, if not scary, for everybody. Moreover, an honest person that knows the limits of the polygraph, can become even more nervous, because she is afraid of a false positive. If a question increases the nervousness of the subject, even if her answer is sincere or correct, the polygraph will give a false result. So, keep in mind that the majority of factors influencing the results of the polygraph do not depend on the fact that a person is innocent or not, the fact that she tells the truth or she is lying, but of the fact that she is intentionally trying to mislead the polygraph or not.

The validity of the polygraph results

The device measures the changes in blood pressure, pulse and respiration. When a person lies, it is considered that these physiological characteristics change, and this change can be correctly interpreted by an expert. Is there a formula or a scientific law that can establish a regulated correlation between these physiological changes and lie? **No.** Are there scientific evidences which can indicate the fact that the polygraph experts can detect a lie, through the device, in a larger percentage than the non-experts that use other methods? **No.** There is no device and no expert that can detect, with a great accuracy, the moment when the subjects, who are randomly selected, are telling the truth or are lying. Even though it is obvious that a good liar or a person with mental problems (who believes that what he says is the truth) can fool the device; this is not the problem, nor the reason why the device cannot detect the lie with accuracy, in comparison with other methods.

Case study – ‘Transilvania’ University from Braşov

MyGaze Eye Tracker is based on a SensoMotoric Instruments (SMI) technology from Germany, which has been a leader for more than 20 years in developing solutions for tracking the eye movement depending in its emotional state. With a system latency of less than 50ms, having a powerful stamina and trustworthy performance, myGaze peripheral is a leader on his class’s cost and technology. The low latency of the intelligent eye movement tracking system shows emotional changes and physiological states, otherwise impossible to detect. Low latency is crucial for all the interaction with ocular movement applications. Having a latency system with less than 50ms, myGaze ® Eye tracking is one of the leaders from its class. MyGaze is specially designed for a wide range of participants and applications, where

stamina is important, and for different conditions like eye color, age, glasses, contact lenses or environmental lighting, for instance, when an optimal performance is needed. The intelligent mean of tracking the binocular vision compensates when an eye cannot be tracked temporarily, by continuing the tracking of the other eye. Interpretation of the given answers in the case of a test based on the tracking through this system can have direct or additional solutions for another system, in order to determine the truthfulness of the human behavior and differentiating it from a simulated behavior. The system can compensate the faults appeared in the accuracy of the polygraph system through subsidiarity and compensation case analysis, in the review of some physiological characteristics which are hard to control through emotional analysis practice.

CONCLUSIONS

The reason why the polygraph **is not a lie detector**, is the fact that the physiological characteristics measured by it – the respiration rhythm, the number of heart beats etc. – can be caused by various factors. Nervousness, anger, sadness, embarrassment and fear can alter these physiological characteristics measured with the polygraph. Another cause may be the need to go use the bathroom. Various medical conditions – cold, migraines, constipation or neurological and muscular problems, can have the same effect.

The statement that an expert can realize when a change is caused by a lie or by other factors has not been proven yet. Even if the device would measure the nervousness, we have no guarantee that the said nervousness is caused by the act of lying. Some people are afraid that the device might indicate the fact that they are lying when they are telling the truth and that they will be falsely accused for lying.

The first application developed at “Transilvania” University of Braşov wishes to prove that the majority of uncontrolled eye movements can be used as individual indicators, but also as additions in determining the simulated behavior.

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