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Andrzej Frycz Modrzewski Krakow University

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Professor Gediminas Petras Žukauskas, MD
(15th May 1947–11th May 2014)

On 11th May 2014 Professor Gediminas Žukauskas, a Lithuanian forensic psychiatrist and member of the Editorial Board of European Polygraph passed away.

Professor Žukauskas graduated from the Kaunas Medical Institute (Lithuania) in 1970. For over twenty years he worked a clinical psychiatrist, receiv-

ing his doctoral degree in 1979 and the higher doctorate (habilitation) in 1987. In 1991–1998, he was a professor at the Department of Criminology of the Police Academy in Vilnius (now: Mykolas Romeris University), followed by professorships at the Department (Institute) of Forensic Medicine in 1998–2006.

Beginning with 2002, Professor Žukauskas was a member of WHO/EURO Group for research and prevention of suicide, and since 2006 he was the head of the Methodical Research Department at the Forensic Psychiatry Service of Lithuania.

The Professor was a member of the Editorial Board of our journal.

It is with great sorrow that the editors of European Polygraph inform about the passing away of our colleague, a respected scholar and great scientist.

Editor-in-Chief
Prof. Jan Widacki

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Jan Widacki*
Andrzej Frycz Modrzewski Krakow University.
Krakow
Poland

Results of Polygraph Examinations: Direct or Circumstantial Evidence?

Key Words: polygraph in court, evidence, polygraph as evidence

The division of evidence into *bezpośrednie* (direct) and *pośrednie* (circumstantial) is commonly used in the Polish doctrine (Cieślak 1955, Gaberle 2007, J. Nelken 1970). In both languages, "circumstantial evidence" stands in opposition to "direct evidence" (Ingram 2012, Inman, Rudin: 2001, Roberts, Redmayne 2001, Kiely 2001).

Let's imagine a following case: X has admitted to murdering A. Witness Y testified that he saw X killing A. Trace of A's DNA was discovered on the clothing of X.

The case is relatively simple. The court has three pieces of evidence to evaluate:

* jan.widacki@gmail.com

1) admission of suspect X (true or false)
2) testimony of witness Y (true or false)
3) result of laboratory analysis (practically certain, if certain conditions have been met).

The first two pieces of evidence refer directly to the main fact. They are direct evidence. The third piece does not refer directly to the main fact; it belongs among circumstantial evidence.

The logical analysis of the first two pieces of evidence is as follows:

if X tells the truth, A killed X
if Y tells the truth, A killed X.

The same analysis conducted for the third piece is as follows: if the DNA examination was conducted correctly, then traces of victim A's DNA are found on the clothing of X.

Let's assume for a while that the court has at its disposal not only a method of assessing the veracity of testimony and explanation but also a method for evaluating the correctness of performing DNA tests.

The recognition of the statements made by suspect X (admission) and witness Y as true implies that suspect X actually killed victim A.

Recognising the sentence "there is DNA trace coming from the victim A on the clothing of suspect X" as true does not in turn result in the implication that the suspect X killed victim A. The only implication is that victim A had contact with the clothing of X. What is therefore known is the consequence of a fact. What could that fact be? Possibly, X actually killed A, and therefore X (his clothing) had contact with A, yet theoretically X could also have contact with A in circumstances other than murder. Even more, it might have been not X himself but his clothing that had contact with A (somebody might have put on X's clothing, or make it touch A's body in any other manner).

Whichever is true, what we're dealing here with is a situation in which we infer the reason (cause) from consequences, which is reductive inference, i.e. uncertain by its very assumption, and follows the pattern of "if p then q and q, and therefore p" (Ziembiński 1984).

The main fact of interest for the court could have been the precedent of the known consequence, determined through the DNA test. But it did not have

to. In the case of direct evidence, the court must limit itself to the evaluation of veracity of the admission or testimony. Once it recognises truthfulness, the main fact has been proved.

When dealing with circumstantial evidence, besides the assessment of veracity (validity) of the outcome (in this case: DNA test results), the court has to assume the following way of reasoning: first answer if the determined fact is a result (consequence) of the main fact, and then evaluate whether the hypothesis that it is such a consequence is actually the most convincing one.

Let's now assume that in the case of the murder of A, the court has the following evidence at its disposal:
1) witness Z testified that he saw suspect X killing A
2) suspect X does not admit to the killing
3) trace of victim A's DNA was discovered on the clothing of suspect X
4) a polygraph examination of suspect X, performed in CQ technique, showed that X reacted to the critical questions in the tests in the way that is usual for people who answer such questions deceptively, which means that they lie or withhold the fact of having certain information related to the killing.

Now, the court has the following evidence to evaluate:
1) testimony of witnesses Z (false or true)
2) non-admission of suspect X (true or false)
3) result of DNA test results (practically certain, if certain conditions have been met)
4) result of polygraph examination (to what degree certain?).

The first two belong to direct evidence, and in their case it is enough to evaluate their validity. The third piece belongs to circumstantial evidence, which means that not only its validity must be verified, but it also needs reductive inference whether the proved fact is a result of the main fact. How to treat the result of polygraph examination? Does it belong to direct or circumstantial evidence?

If the results of polygraph examination were as certain as DNA test results, the result of the expertise (which a polygraph examination performed by an expert witness is) would have to be considered direct evidence, in the same way as testimony of an eyewitness is, additionally meeting the criterion of certainty of circumstantial evidence. If this were the case, practically all other evidence would have been redundant. The entire evaluation of evidence could be limited to conducting a polygraph examination, and making it the foundation of the sentence.

One could expect that the resistance of trialist lawyers against admitting a proof from polygraph examinations resulted mostly from this reason: the fear that a polygraph examination will dominate the evidential process in criminal trials.

In its sentence of 8th July 1980 (II KR 211/80, OSPiKA 1981, 1, item 15) the Supreme Court recognised polygraph examination, although admissible, "not at all necessary, especially for evidential purposes, and therefore for the ascertainment of a specific fact, i.e. a part of the so-called factual circumstances, as it serves only the disclosure of emotional reactions of the organism of the subject in the course of the examination itself". This shows that the Supreme Court recognised polygraph examinations admissible in the trial, yet as circumstantial evidence. It is not, however, admissible as direct evidence, serving the ascertainment of "a specific fact".

In turn, 13 years later, the Appellate Court in Poznań included the following in its sentence of 2nd December 1993 (II Akr 268/93, OSA 1994/5/31): "without entering theoretical considerations concerning the power of evidence of the results of a variograph [i.e. polygraph] examination in a criminal trial, the court believes that it must be stated that subjection of the accused to a variograph examination (as it was formulated in the defender's motion – "for the verification of his explanation" – is inadmissible, if – following the content of art. 4 § 1 of [the Polish] Criminal Procedure Code, which guarantees free evaluation of evidence to the court – judges rule on the grounds of the evidence proving the existence of specific facts that at the same time allow the inference of the court's internal opinion about the guilt or innocence of the defendant. Being an act of intellect and will, this opinion of the judges inferred from evidence in the course of their free evaluation, cannot be constrained or restricted with results of specific examinations that would limit the free evaluation of evidence."

The position of the court is unambiguous here. A situation where a polygraph examination would be there to verify the explanations of the defendant, being direct evidence by its very nature, is inadmissible. For in this way, it would not only become direct evidence, but such a form of direct evidence whose value is a priori defined, and on the one hand is not a subject of evaluation of the court, and release the court from the evaluation of another piece of evidence on the other.

It is worth noting that most Polish course books in criminal and forensic studies place polygraph (usually referred to as variograph) examinations, as

if disrespectful for this position, in the chapters devoted to interrogation, and present such examinations as methods for verification of statements and explanations.

For understandable reasons, the more the partisans of polygraph examinations will continue to prove their infallibility, the stronger the resistance of lawyers against the admission of such a proof will grow. It will be so as it will be perceived as direct evidence, with a priori defined value, that does not yield to the evaluation of the court, as it releases the court from the evaluation of the testimony or explanation.

It is a lucky paradox that the diagnostic value of a polygraph examination, although far from 100%, is comparable with the diagnostic value of other methods of identification used in criminal procedures (Widacki 1977, Widacki, Horvath 1978).

The diagnostic value of a polygraph study, calculated or estimated for various examination techniques, is set by various authors in the range of 80%–95% of correct results (Abrams 1973, APA Report 2011).

The conclusion of the opinion from polygraph examination made in the control questions technique contains the following expression: "**the examinee reacted to the question in the test in the way that is usual for people who answer these questions deceptively, that is they either consciously lie or withhold the fact of having information they are asked to provide in the examination**". How, then, should one understand the word "usual"? A reference must be made here to the diagnostic value of polygraph examination. In this case, "usual" means that any number in the range from 80% to 95% of liars undergoing the examination would react in the same way as the subject of the test. Or in other words, only from 5% to 20% of truthful subjects would react to test questions in the way the subject did. This means that what the court receives from the expert is following information: "**some subjects react like liars even when they provide true answers to test questions. There are from 5 to 20 of such people in each one hundred subjects.**"

Whether this individual subject belongs to the majority reacting in a typical manner or to the minority whose reactions are not typical remains unknown. Which is the case only a court can decide, evaluating the result of the polygraph examination in the context of other evidence, already evaluated.

The evaluation of evidence from polygraph examination is performed precisely like the evaluation of any circumstantial evidence. The court must

evaluate whether the result of the examination stems from the fact that the subject actually and consciously lied or withheld information he was asked about, or whether he reacted in this way for other reasons. Thus, what we are dealing here with also here, much like in the case of evaluation of all indirect evidence, is reductive inference, which means using a known consequence (reaction to critical questions) to draw conclusions that refer to an uncertain (as it is one of the possible) reason (cause).

Thus, what a polygraph examination, in its capacity of an examination performed by an expert witness as part of his expertise, provides is circumstantial and not direct evidence.

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Marcin Gołaszewski*
Andrzej Frycz Modrzewski Krakow University.
Krakow
Poland

Polygraph Examination of Pregnant Women: Dilemmas and Recommendations

Key Words: polygraph, pregnancy, examination

Introduction

Practice of polygraph examinations may require that experts subject a pregnant woman to such an examination, with e.g. state security in mind or due to a burning need of verifying information that is significant for the health and life of others. Sometimes expecting women themselves insist on being examined, for example, when they apply for a job, want to be enrolled in uniformed services, or try to acquire exculpatory evidence in a criminal procedure. Can a pregnant woman be subjected to a polygraph examination? Every such procedure requires informed consent of the examinee, pregnant women included. No other questions related to this highly special group of examinees are defined by law. Neither the standards of the American Polygraph Association, being

* marcin.golaszewski@wp.pl

the world's largest professional organisation, nor of the ASTM International (American Society for Testing and Materials), being a worldwide standardisation organisation, envisage any detailed regulation in the area.[1] Similarly, literature on the subject holds no proofs on the psychophysiology of a pregnant woman posing a significant obstacle in conducting such an examination. Although according to a custom prevalent e.g. in Poland the time of pregnancy is not suitable for such a procedure, the problem has not been analysed in detail. It seems that every case requires an individual approach, while generally there are no ethical or legal obstacles that would unconditionally rule out the possibility of subjecting pregnant women to polygraph examinations. What remains are technical questions, especially those related to the need of sitting motionlessly throughout the examination, and placement of the pneumograph pipes on the body of the examinee. Another additional encumbrance in advance pregnancies can be the movements of the foetus that are independent of the examinee's will. An experiment was conducted, especially with a view to technical circumstances, to decide whether a woman in advanced pregnancy can be successfully examined on a polygraph.

Description of the experiment

In July 2013, two Polish certified experts, including the author of the article, conducted experimental tests on a woman in the eighth month of pregnancy (figure 1). Technologies Inc. (Paragon) and Lafayette Instrument Co. (LX 4000) computer polygraph systems, were used for the study.

Fig. 1. A pregnant woman with Paragon (Limestone Tech) polygraph sensors.

[1] See: American Polygraph Association, *Model Policy for the Evaluation of Examinee Suitability for Polygraph Testing*, [online], http://www.polygraph.org/files/5_pg__model_policy_for_the_evaluation_of_examinee_suitability_for_polygraph_testing.pdf [accessed on 29.07.2013]. More on APA standards: M. Gołaszewski, *Współczesne standardy badań poligraficznych*, Agencja Bezpieczeństwa Wewnętrznego, Warszawa 2013.

The examinee's pressure before and during testing did not diverge from the norm. Nor did the examinee complain about the arm sleeve pumped up to 60 mmHg for the duration of successive tests lasting from 3 to 5 min. Alternatively, the sleeve was also placed on the thumb. As the examination forced sitting on the chair, and pregnant women need to pass urine more often, a 10-minute break was ordered after every 30 min of the experiment. The P1 pneumograph (lower) was first placed between the chest and the abdomen (Fig. 2), and in the second phase of the experiment – directly on the abdomen (Fig. 3). The experiment primarily made use of the classical peak of tension (POT) tests with a number.

Fig. 2. Pneumograph between the chest and abdomen.

Fig. 3. Pneumograph on the abdomen (Lafayette).

Significant changes of physiological reactions of the subject were observed during the examination whenever she felt the child moving. These were primarily reactions that were more closely connected to the emotional reactions that a future mother displays in such moments than ones resulting from the movements themselves. The respondent informed about them with an agreed gesture both during the test and after the completion of registering examination data. Changes in the reactions are best seen in the sudden increase of the GSR amplitude, and also in the breathing cycle (Fig. 4).

Small, downright insignificant, changes in the recording from the moment sensor (Fig. 5) may occur, but this is not a rule. Clearer changes related to foetal activity may be noticed usually in the P1 pneumograph curve (Fig. 6 and 7) independent of sensor placement (on or above the abdomen). This is worth comparing with the P2 pneumograph curve. Special care must be paid while assessing the breathing parameter.

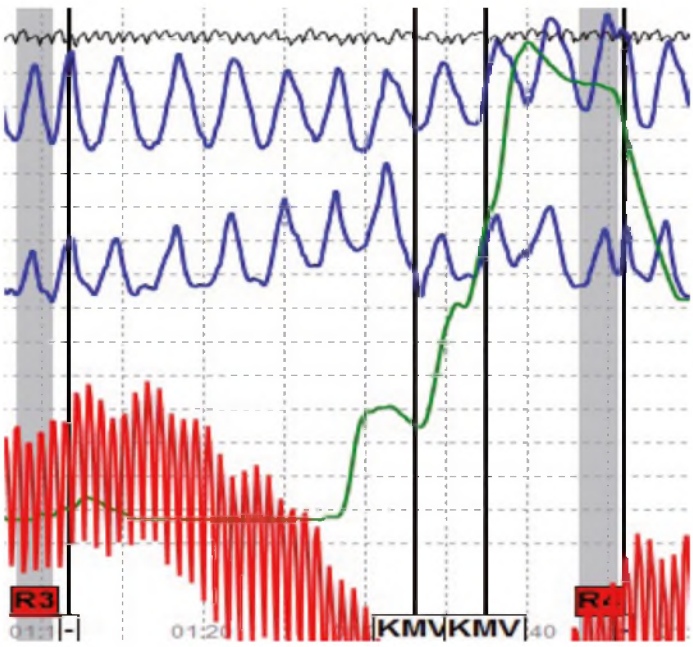

Fig. 4. Changes in a electrodermal activity and breathing curves in reaction to foetus movements.

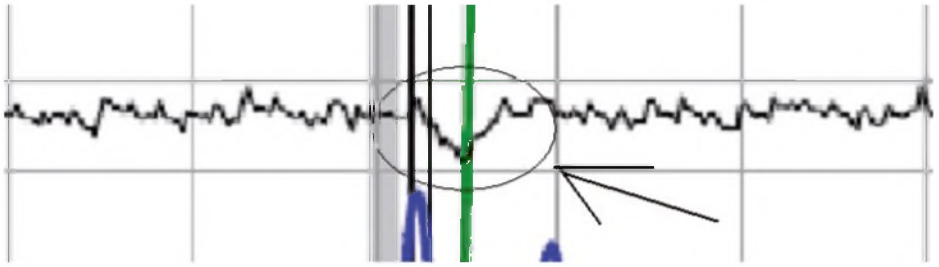

Fig. 5. Minimal changes in the recording from the movement sensor during child movements sensed by the examinee.

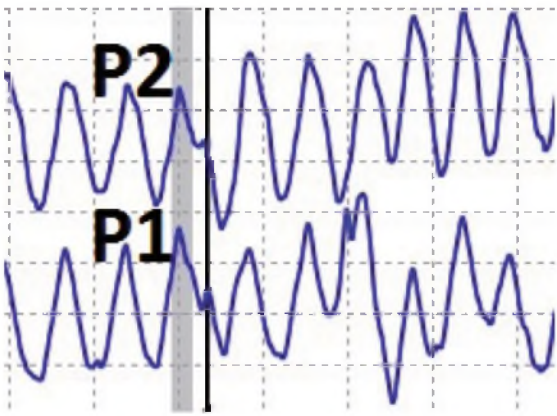

Fig. 6. Changes in the P1 pneumograph curve resulting from the child kicking in the womb.

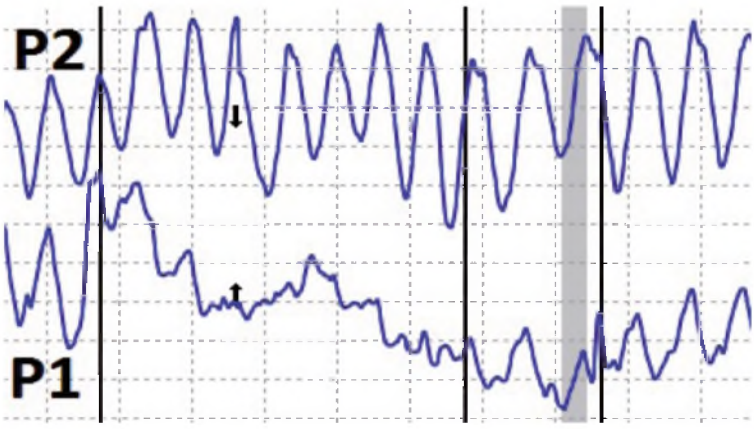

Fig. 7. Highly visible deformities of the curve from the P1 breathing sensor in pregnant women caused by child movements.

Despite the non-standard polygram recordings resulting from the child moving in the womb discussed above, the charts of physiological reactions registered allowed fully meaningful assessment of answers to the questions, and identification of the most significant test stimulus. It was also possible to collect charts without any disturbance from movements. Polygrams of an 8-months-pregnant woman were similar to that of a regular examinee (see: Fig. 8 and 9).

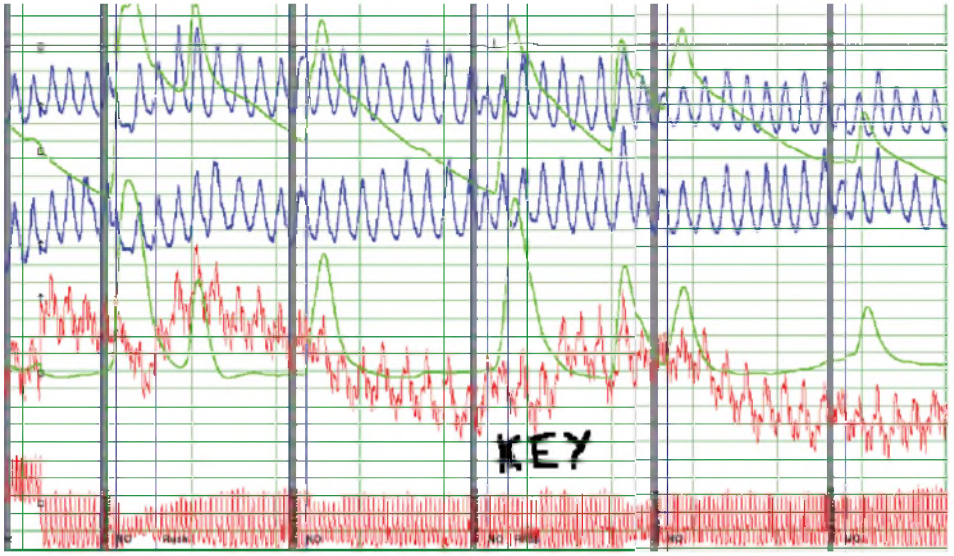

Fig. 8. A fragment of the number test conducted on a pregnant woman with a Paragon polygraph manufactured by Limestone (the key stimulus is question No. 3, and peak tension is clearly visible).

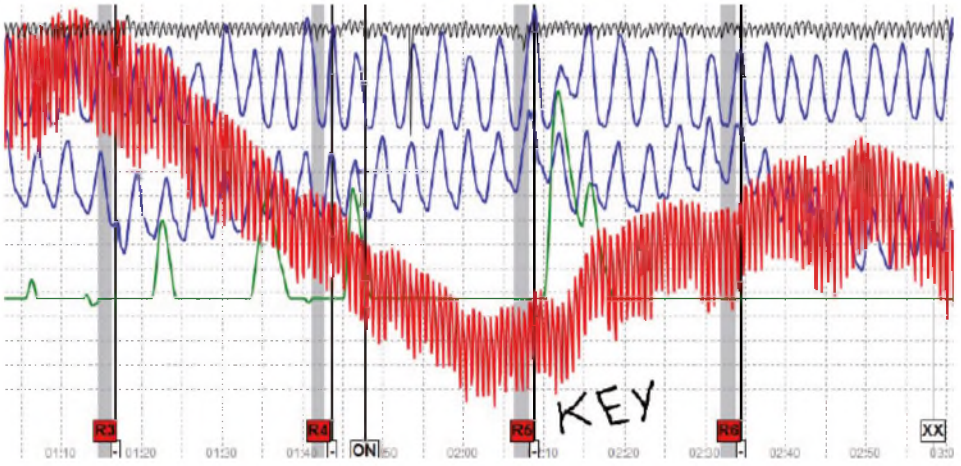

Fig. 9. A fragment of the number test conducted on a pregnant woman by another expert with an LX4000 polygraph from Lafayette Instruments.

It is worth quoting here an interesting experiment that was conducted on 9th May 2014, when Raymond Nelson, current President Elect of the American Polygraph Association presented polygrams of 10 examinees, whose number included pregnant and non-pregnant women, and men, during a meeting with Polish polygraph experts in Warsaw. None of the participants was capable of discriminating correctly which charts concerned which categories of examinees. This is another proof corroborating that there are generally no significant differences in the course of the registered physiological reactions between pregnant women and other people. Still, even if such differences were present, one should not reject the possibility of conducting the study in advance, as the discovery of problematic behaviours based on polygrams is not the only goal of polygraph examinations. Equally important is the opportunity of acquiring more information from the examinee than with the use of other previously applied methods. This takes place during the interview preceding the tests, the conversation between the tests series, and in the phase of discussing the results of the examination.

With the above in mind, it can be assumed that if a pregnant woman expresses her informed consent to undergo a polygraph examination, there are no obstacles in performing such a procedure (especially in the relatively safest and least cumbersome second trimester of pregnancy). It is, however, worth to take into account the comments and recommendations presented further in this article.

Comments and recommendations

I. When should a pregnant woman *not* be subjected to a polygraph examination?
   1. When the pregnancy is compromised, and/or when there are any counter indications from the physician.
   2. If the interview corroborates intense emotions of the potential examinee, and/or significant physical ailments (strong aches, weakness, etc.).
   3. With too high or too low values of arterial blood pressure and heart rate (correct blood pressure ranges from 110/60 to 140/90mmHg, yet small short lasting variations related to emotional stimulation are allowed. On the other hand, a heart rate increased by 15-20 beats must be considered normal due to the volume of blood constantly growing in the woman's organism.

II. Limitations and phenomena that must be taken into consideration while subjecting pregnant women to polygraph examinations

1. Avoiding strong stress.

- A pregnant woman is generally more sensitive to emotions because of the hormones.
- Coming first in a difficult situation is a short term reaction – vegetative stimulation of the organism in reaction to a stressor. Triggered later are conscious and unconscious mechanisms of coping with the situation. In Lazarus' stress-coping model,[2] an event is not stressful in itself, and the sense of burden related to it is determined by the consequence assigned to the situation during the original cognitive assessment (being an answer to the question "What does it mean to me?").[3] An individual may assess the situation as harm, threat (anxiety reactions), loss (regret, sorrow), or challenge (mobilisation). The condition of a pregnant woman must be paid special attention to when the observed and declared fear is too great, or when the examinee endeavours so badly to have something explained or to have a favourable result of the examination that her emotional stimulation exceeds levels considered safe by common sense.
- Under the impact of stress, the concentration of cortisol and adrenaline, organic compounds commonly known as "stress hormones" is growing. Too high concentration of cortisol contributes to child malformations (including heart and the nervous system). In extreme conditions, there is a risk of miscarriage in the first trimester or, in a later period of the pregnancy, of a premature labour activity caused by too high level of adrenaline.
- A sudden and significant increase of blood pressure may lead to placental detachment.[4]

2. An increased exertion of the organism, tiredness, and sleepiness (especially in the first trimester), increased heart rate.
3. Consequences of distended matrix and abdomen:

- shifted centre of mass of the woman
- a greater burden on the muscles and joints; possible pain in the spine (also because of the loosening of the joints caused by the hormones).

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[2] R.S. Lazarus, *Psychological Stress and the Coping Process*, McGraw-Hill, New York 1966.

[3] J. Krzyżanowska-Zbucka, *Problemy emocjonalne kobiet w okresie okołoporodowym*, Fundacja Rodzić po Ludzku, Warszawa 2008, pp. 7–8.

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- Need for more frequent urination, because of the pressure of the body of the uterus on the bladder.

4. Movements of the foetus:
- first sensed by the woman between the 16th and 22nd week of pregnancy
- uncoordinated, arhythmical movements including straightening up, stretching, sucking, catching, and kicking
- they may result in distortions of polygram curves, and in emotional reactions of the examinee.

III. General guidelines for a polygraph expert conducting an examination of a pregnant woman

1. Make sure whether the examination is necessary at the moment. Does it make sense to wait? If this is a routine employment procedure, try to convince the woman to postpone it till after the birth. Still, the future mother will have to spend at least a few months taking care of the newborn.
2. If an examination has been decided, try to perform it close to the place where the examinee lives so as to avoid long travel and additional anxiety caused by being far from home.
3. The room where the examination is conducted should be air-conditioned.
4. The entire examination should not exceed 2 or 3 hours, and an individual test series (chart) – no more than a few minutes.
5. At the beginning, ask about the general well-being, emotional state, and possible sleep disturbances within 24 hours before the examination.
6. As always, build up an atmosphere of tranquillity and trust for the expert. Try to be even more tactful than usually.
7. Do not stretch the pneumographs excessively.
8. Pump up the cardio sleeve to the maximum of 65 mmHg.
9. Make frequent breaks (pay attention to physiological needs, and also to the fact sitting for a longer spell of time aggravates the back ache of a pregnant woman).
10. During the breaks, regularly monitor blood pressure and pulse of the examinee.

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Vitas Saldžiūnas*
VIP Protection Department
Ministry of the Interior of the Republic of Lithuania
Vilnius, LITHUANIA

Aleksandras Kovalenko**
Police Department
Ministry of the Interior of the Republic of Lithuania
Vilnius, LITHUANIA

Field Examination: Certain Phenomena Related to Electrodermal Activity

Key Words: galvanic skin response (GSR), electrodermal activity (EDA)

Introduction

The electrodermal activity (EDA) refers to all exosomatic and endosomatic changes in electrical properties of the skin (Krapohl & Sturn, 2002). There is ample empirical evidence that electrodermal phenomena are generated by sweat gland activity in conjunction with epidermal membrane processes

* vitas.saldziunas@vad.lt
** aleksandras.kovalenka@policija.lt

(Boucsein, 2012). Generally, under control of sympathetic nervous system, EDA is regarded as a valid indicator of emotional, motivational, and cognitive states. EDA is divided into tonic (EDL = electrodermal level) and phasic (EDR = electrodermal response or reaction) phenomena (Boucsein, 2012).

Phasic EDA is a response of the central nervous system to a situational stimulus which usually depends on novelty (Varlamov & Varlamov, 2000).

Tonic EDA is a certain state of the nervous system which changes slowly (within minutes or hours) and is determined by metabolic processes in biological tissues (Varlamov & Varlamov, 2000). According to Boucsein (2012), tonic electrodermal measures are obtained either as EDLs in response-free recording intervals or as the number of non-stimulus-specific EDRs in a given time window.

EDA is measured as resistance in ohms or as conductance in siemenses.

The article begins with an overview of our experience and observations concerning EDA, and continues with a description of certain phenomena of phasic and tonic EDA that have received little attention from other authors (Handler, Nelson, Krapohl & Honts, 2010; Konieczny, 2009; Matte, 1997).

Phasic EDA

We have noticed earlier that in polygraph examination changes following the stimulus (the question) hardly ever occur in phasic EDA in persons with psychopathic symptoms (Saldžiūnas & Kovalenka, 2010). According to some authors (Verschuere, Crombez, Koster & Van Baelen, 2005; Verschuere, 2011), results further demonstrate reduced electrodermal response to concealed information in antisocial inmates. The electrodermal hyper-responsiveness in antisocial individuals might therefore threaten the validity of concealed information tests. Investigations of phasic EDA parameters yielded a general decrease of electrodermal reactivity in old age (Boucsein, 2012). In older age, a decrease in skin thickness and elasticity is likely to occur. Representatives of certain professions (field workers, mechanics, etc.) have very thick and rough skin on their fingers, therefore, they are more difficult to examine by EDA (Varlamov & Varlamov, 2000).

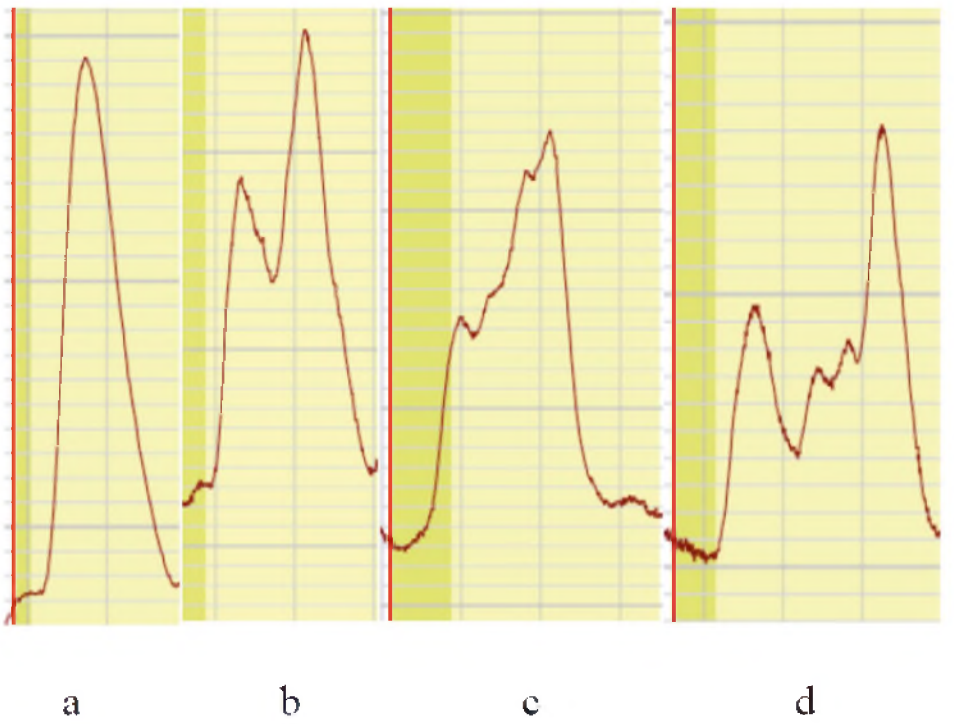

Figure 1. Shapes of EDA curves in polygraph charts

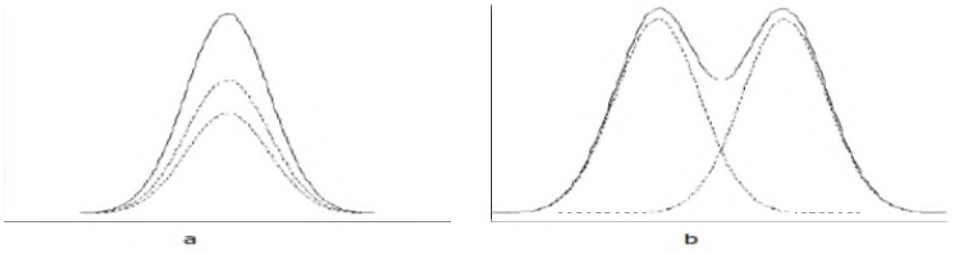

Figure 2. Examples of the way complex responses are formed from two responses

With a few individual exceptions (Saldžiūnas & Kovalenka, 2010; Varlamov & Varlamov, 2007;Verschuere, Crombez, Koster & Van Baelen 2005), EDA is very important in polygraph tests (Boucsein, 2012; Handler, Nelson, Krapohl & Honts, 2010). The contribution of EDA channel accounts for approximately 50 per cent of all data (Krapohl, 2011). Hira and Furumitsu (2002) show that

EDA response was largest to a relevant alternative in about 62 per cent of cases.

Simple amplitude response and complex response of phasic EDA are evaluated in polygraph examinations (Department of Defence of Polygraph Institute, 2006). Four variations of phasic EDA peaks are shown in Figure 1. The relative magnitude of EDA is shown vertically, whereas time is registered horizontally. The darker field is the time interval when the examiner asks the examinee a question. All EDA responses are complex ones in Figure 1, as they consist of at least two EDA peaks. US specialists (Bradley, 2009; Handler, Nelson, Krapohl & Honts, 2010) do not explain the reasons for occurrence of the second peak. Russian polygraph examiners (Varlamov & Varlamov, 2000) believe that the second response (a repeated peak) may occur because the examinee additionally remembered some information related to the question after answering it. Ekman (2003) has expressed an opinion that, in the case of a sudden threat, the emotion of fear comes (and is recorded) first, and is subsequently replaced by horror or anger. Explanation of a multi-complex response consisting of two or more peaks (Figures 1 b, c, and d) is probably even harder. Another reason (Stankus, 2004;2012) may be the fact that the processes in the examinee's brain occur in several stages. Handler (2012) thinks that this is caused by a filtering effect of the instrument (polygraph). We consider that if polygraphs alter the shape of EDA peaks in a different way due to the filtering effect, they consequently distort charts, and such instruments cannot be used for examination. As a consequence, scientific works explaining the occurrence of EDA complex response in an unambiguous manner are still lacking.

The way a complex peak is formed from two peaks is shown in Figure 2. An assumption that although EDA looks like a non-complex peak in the charts, it is a sum of two peaks which may be caused by several psycho-physiological factors may be made with regard to the conjuncture of the responses illustrated in Figure 2a. This means that the examiner does not know whether EDA peak is complex or not when identifying it. In such a case the examiner may commit the error of misassessment.

We performed several laboratory tests. We used to give the examinee a mathematical task during polygraph examinations: perform addition or multiplication of numbers (5+12=?; 13×6=?; 17×5=?; 127×9=?). Each following mathematical calculation was more complicated than the previous one. The charts typical for this experiment are shown in Figure 3. It is obvious that the examinee's EDA responses may be the result of mental activity. Thus, it can be assumed that the complexity of EDA responses may be determined not only by

the question of the examination but also by other processes of mental activities in the examinee's brain.

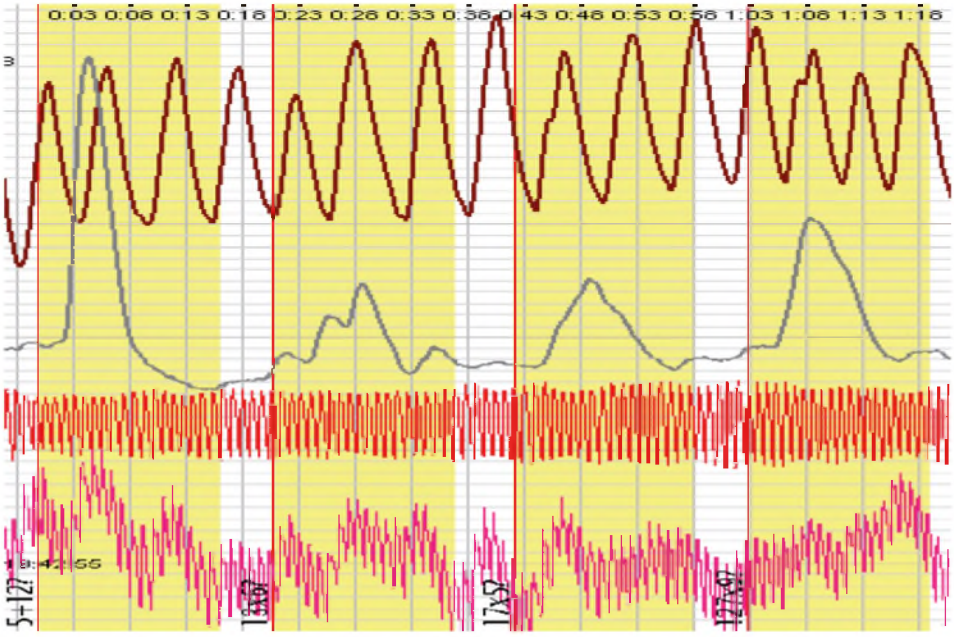

Figure 3. Mathematical calculation test charts

Tonic EDA

As tonic EDA changes slowly, it receives very little attention in polygraph examinations (Handler, Nelson, Krapohl & Honts, 2010; Hira & Furumitsu, 2002, Osugi, 2011). Varlamov & Varlamov (2007) noted that tonic EDA levels exceeding 300 kohms usually indicate that the examinee is a drug addict. We have recorded examinees' tonic EDA in polygraph examination for a number of years. Several illustrative examples from field examinations results (which have as yet received no scientific treatment) are provided below. We only want field examiners to take a note of certain potential tonic EDA effects which we recorded during field examinations.

The change of tonic EDA in examinees honest in answering the questions (a further criminal investigation established that they did not commit crime) is illustrated in Figure 4. We can see that tonic EDA hardly changes during polygraph examination for most examinees. A slightly more labile system of

the body was recorded for examinee K. Figure 4 shows that tonic EDA for examinees P, K, and C was below 300 kohms. Prior to the examination, the examinees confirmed that they were not taking any medicine. The examiners did not have any reasons to believe they were taking medicine or using drugs prior to polygraph examination.

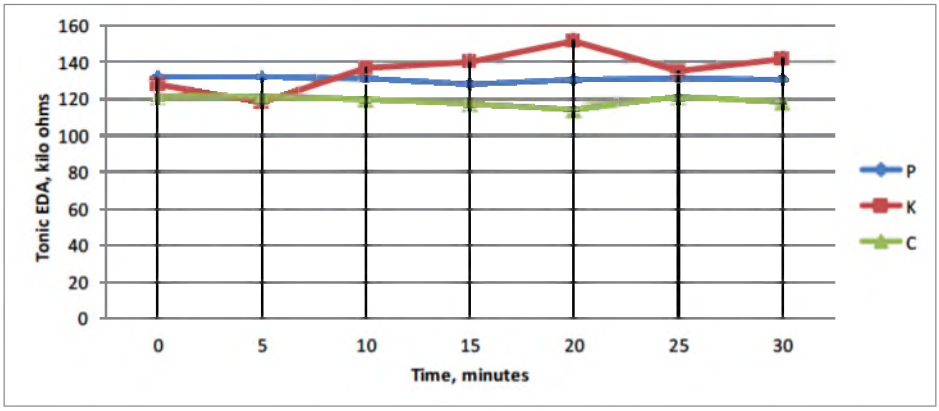

Figure 4. The change of tonic EDA during polygraph examinations (it was determined that the examinees were honest when answering the questions and had not used any psychotropic substances before examination).

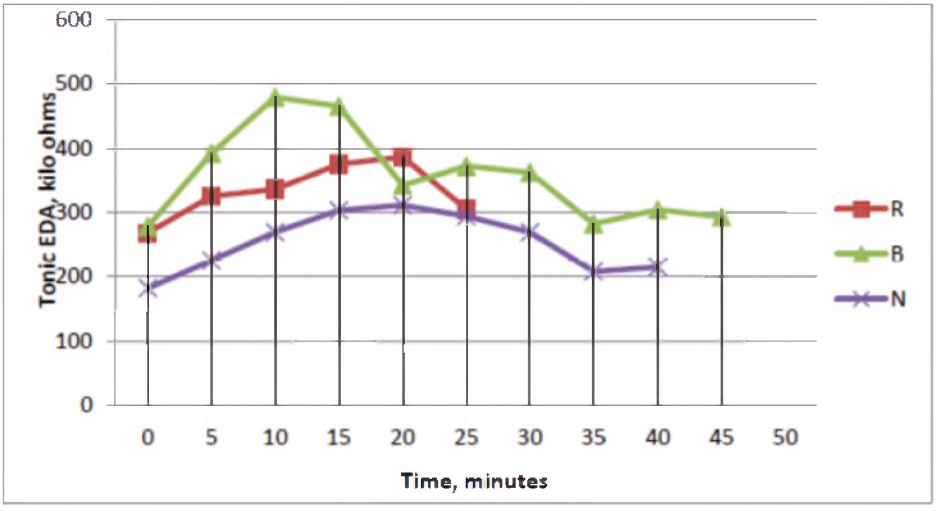

Figure 5. The change of tonic EDA during polygraph examinations (it was determined that these examinees were not honest when answering the questions and, possibly, had used psychoactive preparations before examination).

The change of tonic EDA during polygraph examinations when examinees B, D, R, and N were deceptive is illustrated in Figure 5. Such tonic EDA is not typical of all dishonest examinees. Not unlike Varlamov & Varlamov (2007), we assume that these examinees could be taking medicine prior to the examination, yet this is unknown to us. The subsequent criminal investigation established that all these examinees had committed a crime. Moreover, prior to the examination, none of the examinees admitted to having used psychoactive substances.

Since we are not able to have examinees' blood tested after polygraph examination and identify whether they used psychoactive substances, we added an additional question about the use of such substances to the Event Knowledge Test (EKT) (Saldžiūnas & Kovalenko, 2008a; 2008b; 2008c; 2009a; 2009b; 2009c; 2010; 2012a; 2012b).

Table 1. Additional EKT question for examinee N

How many medication tablets have you consumed today before the polygraph test?			
Answer options to the question presented by the examiner to the examinee		The examinee's answer to the presented answer option	The mark of the recorded psychophysiological response by the examinee
0.	6 tablets	no	
1.	5 tablets	no	
2.	4 tablets	no	Reaction responses
3.	3 tablets	no	
4.	2 tablets	no	
5.	1 tablet	no	
6.	None	yes	Reaction responses

The question and the answer options given to the examinee N are presented in Table 1. The examiner reads the question before the examination. The examinee repeatedly answers the question whether the examinee has consumed any medications (the question is asked during the pre-test interview first). Sometimes the examinee admits to consuming medications for heart (or other) dis-

eases. The examiner explains that medications for heart diseases are not very important for the examination. What is important for the examination are medications with a sedative effect. No one has ever admitted to consuming medications with a sedative effect before the examination in our practice. In one case, the examinee admitted to having smoked some "weed".

The answers of examinee N after the examiner read the answer options during the examination are presented in the third column of Table 1. The examinee's responses following his answers are recorded in the following column based on polygraph charts. This example illustrates that one can assume that examinee N possibly took 4 medication tablets before the examination. The response after answer no. 2 and after answer no. 6 (Saldžiūnas & Kovalenka 2012b) confirms that he might possibly consume medications. If we see that tonic EDA for other examinees does not exceed 300 kohms during the examination, we do not ask the question about the medications taken at the end of the examination.

Figure 5 shows that for most persons the tonic EDA varied during the polygraph examination. We assumed that these persons could have consumed medications containing psychoactive substances before the polygraph examination (Varlamov & Varlamov, 2007). The course of the curves (Figure 5) is different; therefore, it is to be considered that:

- they could have consumed different medications
- each of them consumed different amounts of medications
- it is not known how long before the polygraph examination they took the medications
- each person's body reacts to medications in an individual way.

Regardless of the fact that all the curves follow a consistent pattern: tonic EDA increases after several minutes of the polygraph test. Tonic EDA decreases for examinees B, N, and R after approximately 30 minutes of the polygraph test. Therefore, it can be assumed that they consumed medications shortly before the examination.

Polygraph examiners from Poland and Latvia (Ivančika, 2012) who are familiar with the effect of some medications and drugs on EDA sometimes ask for our assistance. Both of us have noticed that phasic EDA is absolutely uninformative when the examinee's tonic EDA is about 500 kohms.

Discussion

The ideas presented in this article are partially inconsistent with the classical perception of phasic and tonic EDA (Boucsein, 2012; Handler, 2012). Irrespective of Handler's (2012) disagreement with our observations, we believe that they will be interesting for some field examiners.

On the grounds of our observations from practical polygraph tests, it may be claimed that each response must be assessed cautiously as long as the nature of the complex peak of phasic EDA is unknown. We hereby remind that the magnitude of EDA response is assessed with regard to the height of the amplitude and the peak duration (Handler, Nelson, Krapohl, & Honts, 2010). The reasons causing complex peaks must be analysed especially in the Comparison Question Tests (CQT) where EDA responses after the comparison and relevant questions are compared. Unfortunately, when complex responses coincide completely (Figure 2a), it is virtually impossible to assess whether a peak is complex.

Having measured the magnitude of the examinee's tonic EDA before beginning the examination, *ex ante* assumptions on whether the examinee is a drug addict or has consumed medications containing narcotic substances may be made. For the examiners, it may be the first symptom signalling that the examinee wants to distort the results of the test. Based on our experience and that of other examiners (Reid & Inbau, 1977), we may maintain that an honest (non-deceptive during the test) person who would apply no countermeasures during the test is a great rarity. We believe that further laboratory research is necessary to establish more precisely how tonic EDA changes after the examinee has taken certain medications or narcotic substances.

Our latest field examinations revealed that some food supplements can raise tonic EDA to 500 kohms. Experiments are required to explore how food supplements influence tonic EDA, and which ones actually do.

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Donald J. Krapohl*
American Polygraph Association
USA

Letter to the Editor: Calculating Polygraph Decision Accuracy

A recent article in *European Polygraph* caught my attention for the manner in which polygraph decision accuracy was calculated (Patton, 2013). In brief, from a sample of 151 cases drawn over five years, the author reported he had 143 true positives, 6 inconclusives, and two false positives. Accuracy was reported in two ways, once with inconclusives counted as errors, and with inconclusives removed. The author reported 95% accurate decisions for the former, and 98% for the latter.

In the mainstream literature, polygraph decision accuracy is reported with and without inconclusives, as Patton (2013) had done. One difference, though, is how overall accuracy is calculated. The conventional approach is to average the decision accuracy between deceptive and truthful cases. The formula is below:

$$\left(\frac{\text{True Positives}}{(\text{True Positives}} + \frac{\text{True Negatives}}{(\text{True Negatives} + \text{False Positives})} \right) / 2$$

* The author is a member of the American Polygraph Association, and the Editor of its publications. Comments welcome at APAkrapohl@gmail.com.

In plain language, this formula calculates the accuracy for truthful and deceptive cases separately, then takes the average of those two accuracies. For example, if a polygraph technique were 80% accurate with truthful cases, and 92% accurate with deceptive cases, setting aside inconclusives, the overall accuracy of that technique would be 86%, that being the average of 80% and 92%.

Returning to the Patton (2013) data, and excluding inconclusives the technique caught all of the deceptive examinees in the sample, but the two false positives show that it detected none of the truthful cases. Averaging the 100% accuracy with the deceptive cases with the 0% accuracy with the, albeit, limited number of truthful cases produces an accuracy of 50%. The difference between the 98% accuracy reported in Patton (2013) and the 50% estimate for the standard method is substantial, and worthy of comment.

By way of illustration, suppose that a researcher in the field collected a sample of 100 cases. All of them had been called DI and there had been a posttest confession to confirm it. The sample had no confirmed truthful cases. Would it be correct to conclude the polygraph technique was 100% accurate? The short answer is no, because the actual accuracy of the polygraph could not be calculated with only these data. Without determining the accuracy of the technique in detecting both deception and truthfulness, the findings would be meaningless. It might be that the technique can detect 100% or 50% or none of the truthful cases. and the final accuracy estimate will depend on which figure it is. Without knowing the number would preclude a calculation for accuracy. This is one reason the standard formula became the standard.

Another challenge to the paper can come from the exclusive use of the confession criterion for comparing against polygraph decisions. The problem is that it can produce a non-representative sample that works in favor of high accuracy. Consider this: if the polygraph results are DI, there will be an interrogation, and deceptive examinees are more likely to confess if interrogated. Conversely, when the results are NDI (right or wrong) there is no interrogation and consequently no confession. If only confession cases are selected, they will be only those where there was an interrogation. Non-confessing true positives are indistinguishable from non-confessing false negatives, both of which come with DI results and no confession. False negative and false positive errors are not easily detected using only confessions as the basis for inclusion in a sample. From the Patton sample,

one could argue that calling every case DI with whatever technology would lead to the exact same accuracy as did the polygraph: all deceptive cases were correctly identified, and none of the truthful cases.

In fairness I would like to make clear that I am not contending the technique used by Patton is 50% accurate, nor that the Patton sample was intentionally biased. Rather, the purpose is to point out two oft-encountered pitfalls in polygraph efficacy research, sampling and statistical methodology, and to counsel readers and writers to be mindful of their impact on research results. While Patton's paper is clearly instructive in what it says about the *utility* of his polygraph technique as regards securing confessions, the statistical information concerning decision accuracy oversteps what the methodology and data can support.

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Varia

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POLYGRAPH

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Conference on the Prospects for Instrumental and Non-Instrumental Lie Detection

Andrzej Frycz Modrzewski Kraków University (KAFM), Institute of Psychology of the Jagiellonian University, and the Polish Society for Polygraph Examinations (PTBP) organise a conference on the Prospects for Instrumental and Non-Instrumental Lie Detection, which will be held at the KAFM Campus, at ul. G. Herlinga-Grudzińskiego 1, on 26th September 2014.

Participants who have already confirmed their participation in the conference include scientists, practitioners, lawyers, psychiatrists, and sexologists.

Professor Romuald Polczyk, Karolina Dukała (Jagiellonian University):

- *Comparing the efficiency of the criteria based content analysis (CBCA) in assessing statements of seniors and adults*

Dr Bartosz W. Wojciechowski (University of Silesia):

- *Lie Detection In Adult Witnesses Statements With The Use Of Psychological Methods Of Content Analysis*

Dr Jerzy Wojciechowski (University of Warsaw):

- *Using the analysis of potentials for detecting withheld information*

Marcin Gołaszewski (Internal Security Agency, ABW):
- *Polygraph examinations in investigations*

Michał Widacki (University of Silesia):
- *Techniques of polygraph examinations used in Polish practice*

Aleksandra Cempura (KAFM):
- *Legal limitations of lie detection*

Agnieszka Leszczyńska (Warszawa-Płock):
- *Polygraph examinations in supervision and therapy of sentenced for sexual offenders*

Paweł Zając, Renata Staszel, Małgorzata Wojtarowicz (KAFM):
- *Thermal imaging in detection of emotional traces*

Marek Leśniak:
- *Selected issues in interpreting polygraph examination results*

Thermal imaging equipment and BIORADIO system for monitoring emotional changes will be presented during the conference.

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To publication will be accepts unpublished research papers as well as review article, case reports, book reviews and reports connected with polygraph examinations.

Submitted manuscripts must be written in English.

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The references should be after the text.

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For example (in references):

Reid J., Inbau F. (1966), *Truth and Deception: the Polygraph ("Lie-detector") Techniques*, Williams & Wilkins, Baltimore.

Abrams S. (1973), *Polygraph Validity and Reliability – a Review*, Journal of Forensic Sciences, 18, 4, 313.

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