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Polygraph examination in analysis of evidence

I assume that a polygraph examination may be part of mass of evidence in a specific case, and I also assume that the result of a polygraph examination belongs to forensic evidence, and within it has its place in expert evidence. Therefore, as item of evidence, it can be subjected to an analysis covering the assessment of its credibility, reliability, weigh, probative force, etc., and can also be analysed as evidential argument. Such an argument may be evaluated from two points of view: "internal" developed by its creator (in this case: by the expert), and "external" whose author is the analyst, or, more generally speaking, the addressee of the argument. The "internal" analysis is presented in (Ibek 2011). This article, in turn, aims at presenting the characteristic features of a polygraph examination result as argument in analysis of evidence.

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Let me begin from applying the concept of a substance-blind approach to evidence. It means that "we can make general statements about the relevance, credibility, authenticity, and probative force without reference to any particular kind of data" (Twining 2006: 441). Therefore, the content of these statements is the particular "hallmark" of a specific method that is sometimes defined as its diagnostic value. One of the first works on the subject was an article whose authors (Widacki, Horvath 1978) proved that the precision of a polygraph examination is not inferior, as it rather exceeds the accuracy of other, generally applied techniques of forensic identification (handwriting, fingerprint, and eyewitness identification). The same comment was maintained also much later: "polygraphy, when considered in relation to other commonly used forensic techniques, yields comparable and, in some cases, superior accuracy" (Horvath 2000: 1108). In turn, in reference to the numerical method applied in the interpretation of the CQT tests, it was established that "numerical scoring by adequately trained and experienced interpreters produced extremely high reliability that compares favorably with any psychological test interpreted by humans" (Raskin, Honts 2002: 21). In a substance-blind approach, these comments define the high position of polygraph examinations.

It must, however, be considered in what way the above brings specific consequences for the analysis of evidence. A general representation of an evidence argument in the case we find interesting is as follows:

Evidence "in hand": the expert claims that A,

then

Conclusion: A.

Oversimplifying, yet without harm to the essence of the case, the conclusions of a polygraph examination may have the following form: the subject of polygraph examination belongs to DI or NDI group. Therefore, the argument used as evidence above has the following form:

Evidence: Expert claims that the subject of a polygraph examination belongs to group DI (or NDI),

Conclusion: the subject of a polygraph examination belongs to group DI (or NDI).

In this argument, like in nearly every argument used as evidence, the conclusion does not result from the premise, therefore, it is a logically invalid argument. The element that connects the premise and the conclusion in this case is a generalisation that justifies conducting an inference towards a specified

goal. In the case of expert evidence, generalisation usually assumes the form of "if an expert asserts that A, then A". Thus, the argument is hereby developed into the following form:

Evidence: Expert claims that the subject of a polygraph examination belongs to DI (or NDI) group,

Generalisation: if the expert asserts that subject of a polygraph examination belongs to DI (or NDI) group, then the subject of a polygraph examination belongs to DI (or NDI) group,

Conclusion: the subject of the polygraph examination belongs to DI (or NDI) group.

The generalisation made above ("if expert asserts that A, then A") seems difficult if not impossible to question in the case of expert evidence.

In our case, however, the main problem is not the accuracy of the generalisation applied, the more so as the direction of the train of thought defines is natural (Are experts not used to present the observations to be accounted for in evidential reasoning?), but justification that the application of the generalisation is correct in a specific case. In other words, what needs answering is the question why we can/should assume in a given case that if the expert asserts that A, then A? The question is the more significant as the subject performing the analysis, that is the analyst as well as the lawyer making the decision in the litigation, is not an expert in the field of the given expertise.

The problem of justifying generalisations may also be interpreted as a tendency to avoid risk related to forensic evidence. Three types of such risks are identified: (1) defectiveness of the theory that the expert used as the grounds for the statements, (2) a competently conducted examination, (3) defects in the interpretation of the results acquired, and even – in extreme cases – making them up (Spencer 2000: 549–550).

The essence of justification of the generalisation, known also as generalisation support is to indicate relevant ancillary evidence. Forensic evidence is worthless without ancillary evidence (Schum 2001: 112). As far as has already been mentioned, a generalisation justifies the specific cause of reasoning and ancillary evidence allows assessment of the scope and probability of the conclusion. There may be various approaches to indicating ancillary evidence. One of them – presented in (Walton 2008: 42) – means obtaining an answer to the following questions: "How credible is E as an expert source? (…) Is E an expert in the field that A is in? (…) What did E asserts that implies A ? (…)

Is E personally reliable as an source? (…) Is A consistent with other experts asserts? (…) Is A's assertion based on evidence?". Positive answers to these questions provide a justification for the generalisation applied, and in this case the argument – developed even further – would assume the following form (let's assume that A = subject of polygraph examination belongs to group DI (or NDI)

Evidence: the expert asserts that A,

Generalisation: if the expert asserts that A, then A,

Ancillary evidence: E is credible as an expert source, E is personally reliable as a source, E confirmed the presence of facts $f_1, f_2, f_3, …, f_n$ that imply A, A is coherent with assertions of other experts, facts $f_1, f_2, f_3, …, f_n$ actually occurred,

Conclusion: then A.

In this case, the conclusion from evidence is certainly well justified. It must, however, be noted that from the analytical point of view, the questions proposed by D. Walton may be difficult to apply. The reasons for such difficulties may be following: first, it is not easy what criteria to use for the estimation of the expert's credibility and personal reliability. Secondly, the assertion of facts $f_1, f_2, f_3, …, f_n$ occurring belongs to the scope of expert knowledge, and therefore, in principle, is not available to the analyst. It is basically an interpretation of the charts acquired from the tests performed as part of polygraph examination. Thirdly, it is not known whether the answer to the question "is A consistent with other experts assertions?" concerns the polygraph examination in question, or also other expert opinions, or whether it can be interpreted extensively and then the coherence of A should be analysed with other items of evidence, for example, with witness testimonies. That is why it seems better to seek ancillary evidence in a different manner.

There are three starting points for the assessment of the "external" correctness of a polygraph examination. The first concerns the technique applied, the second – qualifications of the expert conducting the examination, and the third – the laboratory in which the examination was conducted. Let's notice that the first question also eliminates J. R. Spencer's emphasised doubts (mentioned above) concerning the correctness of the theory providing the foundation of the examination, the second doubt embraces the expert's competencies, and the third is related to the doubts around the quality of the examination.

Therefore, the first ancillary evidence is the confirmation that one of the validated techniques of polygraph examination was used in the given examination. A list of such techniques can be found in literature (Krapohl 2006, Meta-analytic survey 2011). It needs emphasising that, according to APA standards (broadly accepted also beyond the US), it is possible to use a polygraph examination in the body of evidential arguments only if the accuracy of the technique applied reaches at least 90%, with the exclusion of inconclusive results (more on the subject: Gołaszewski 2013).

Another part of ancillary evidence is corroboration of the expert's qualifications. Usually they are authenticated by a valid certificate of the examiner. "The goal of certification for personnel is to provide a formal and objective guarantee that a candidate has a minimal level of knowledge, skills, and abilities (…) in a given discipline." (Stauffer, Schiffer 2009: 2548). Certificates are issued by international institutions, yet certification is frequently provided within the institution that employs the experts.

The third element of ancillary evidence is related to the quality of expertise. An appropriate level of quality can be obtained in various ways (Gołaszewski 2013: 72–74), yet it is best expressed by the accreditation of the laboratory in which the examination was conducted. Accreditation is the "formal recognition that a testing laboratory is competent to carry out specific tests or specific types of tests" (Schiffer, Stauffer 2009: 11).

Should one agree that the three elements listed above are valid for the justification of the generalisation discussed above, the argument we consider has the following form:
Evidence: Expert E asserts that A,
Generalisation: if the expert asserts that A, then A,
Ancillary evidence: a validated technique was used for conducting the examination, E has a valid certificate validating his or her competencies, and the laboratory where the examination was conducted is accredited, with the accreditation approving the policy ensuring appropriate quality of the performed expert analyses,
Conclusion: then A.

Also in this case, one can assume that the conclusion A is very well justified, yet one can also ask whether the presented list of ancillary evidence is sufficient, i.e. whether it can be treated as satisfactory in each case. The answer is unquestionably negative, because the list of ancillary evidence can – at

least theoretically – be expanded *at infinitum*. The limits are defined by the context of the analysis (e.g. when certain doubts would not be eliminated by the information provided above) and common sense. A small aside: most probably the list of ancillary evidence quoted above could be aligned with D. Walton's concept, yet there is no need to consider the subject in this place.

Another circumstance, very important for the analysis, results from the remark that a polygraph examination can be used as evidential argument only if the accuracy of the technique reaches at least 90%. Taking a substance-blind approach into account, one can assume that the result of polygraph examination supports the conclusion of evidential argument with high significance. It is generally known that there are various scales for the verbalisation of the numerical description of probability. The application is a question of convention. According to one of them, the level of (objective) conviction of the addressee of the argument in case of probability exceeding 90% is expressed in the sentence "I am positive (that *A*)", and the objective strength of support for the conclusion (in our case *A*) is overwhelming (Anderson, Schum, Twining 2005: 230).

Obviously, such a situation is valid only in the case when the fact that is to be proved by polygraph examination is defined correctly and accurately. This concerns already the use of polygraph examination as evidential argument in a chain of reasoning as part of the mass of evidence, and usually while treating the case as a whole. This was noticed by J. Widacki (2014), who remarked that a polygraph examination usually provides indirect evidence in proving fact in issue.

In this context, there is one more important problem that needs paying attention to. Namely that the analyst's tasks include also the assessment of the structure of evidence. This concerns the determination of mutual relations between the individual items of evidence. They can be corroborative or conflicting (in other words: convergent or divergent) towards one another. Most generally speaking, items of evidence are mutually corroborative (convergent) if they support the same claim. The phenomenon is also defined as redundancy. Redundancy is cumulative, if one of the items of evidence that support a claim together provides novelty into its justification (Schum 2001: 391 and ff). For example, (to keep the case simple: without generalisations and ancillary evidence):
(a) Giving a negative answer to the relevant question concerning participation in breaking into *M*'s house, person *X* was deceptive (DI indicated),

(b) Witness *S* saw person *X* breaking into *M*'s house through a window.

Certainly, these statements are mutually convergent, and one corroborates the other.

Yet a polygraph examination may provide more information than the above, namely:

(a) Giving a negative answer to the relevant question concerning participation in breaking into *M*'s house, person *X* was deceptive (DI indicated),

(a') Person *X* knows the following details of burglary in *M*'s house:

- *X* knows that the burglar entered through a window
- *X* knows that a sum of CHF 1000 was stolen from *M*'s house
- *X* knows that the money was in a locker behind a copy of Mona Lisa, although *X* denies it.

(b) Witness *S* saw person *X* breaking into *M*'s house through a window.

The statement (a'), obtained as a result of conducting a polygraph examination, significantly increases the support for the claim to be proved by evidence, therefore, what we deal with is a cumulative redundancy. This is worth remembering: analysts should not limit their involvement to testing the status of the general conclusion from polygraph examination, but also consider the relevant questions of the tests applied if the expert does not emphasise its significance. On the other hand, it is a well-known fact that one issue tests are more precise than multi issue tests, and the admissibility of POT tests as a proof may sometimes be questioned.

In the case of divergence within the mass of evidence, for example:

(a) Giving a negative answer to the relevant question concerning participation in breaking into *M*'s house, person *X* was deceptive (DI indicated),

(b) Witness *S* saw person *X* in a bar in Boston at the time when *M*'s house was burgled in Kraków.

Seeking for new pieces of evidence will be decisive, but so will be a very detailed analysis of ancillary evidence in (a) and (b).

Conclusions

1. The result of a correctly conducted polygraph examination, assessed through a substance-blind approach, is a highly valuable element of evidential argumentation.
2. Pointing to accurate pieces of ancillary evidence is of key importance in analytical assessment of correctness of examination. Such validation must

at least prove that the examination technique applied was correct, the expert was appropriately certified, and the laboratory where the examination was conducted was accredited, or equally powerful proofs analogous to the above are provided.

3. Analysis of the result of a polygraph examination should encompass the precise definition of the fact that the result is to prove.

4. Analysis of this result should cover also its position in the mass of evidence while considering the case as a whole. Special attention should be paid to the determination of convergence or divergence of the result of polygraph examination with other elements of evidence.

5. A polygraph examination may be used, quite naturally, to acquire cumulative convergence (redundancy). This circumstance deserves attention both in the analysis and in the preparation of the examination for each case.

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Content analysis algorithms: an innovative and accurate approach to statement veracity assessment

Key words: psychological content analysis, veracity assessment, statement validity assessment, decision algorithm

Introduction

There are four main areas of psychological research on the detection of deception: a) deceiver's personality traits; b) extralinguistic and nonverbal cues of deception; c) physiological cues; d) and the analysis of the qualitative aspects of the account (Sporer 1997). German forensic psychologists have developed qualitative criteria to analyse the content of statements and to assess their validity. Veracity assessment is based on an assumption called the Undeutsch hypothesis, maintaining that statements derived from a memory

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of a self-experienced event will differ qualitatively from statements that are based on a fantasy or suggestion (Undeutsch, 1967). On the basis of the work of Udo Undeustch, Guenter Koehnken and Max Steller compiled a list of 19 criteria and described a procedure for evaluating the veracity of a statement, which led to development of a comprehensive method for evaluating witness statements – Statement Validity Assessment (SVA, Koehnken 2004). SVA focuses on specific content characteristics supporting the hypothesis that the account is based on genuine personal experience. SVA consists of three major elements: a structured interview, a criteria-based content analysis (CBCA) and the integration of all obtained case information into a final judgment as whether the account is based on genuine personal experience with the support of Validity Checklist (Koehnken 2004; Koehnken et al. 1995).

With regard to cognitive and motivational factors, it is assumed that the presence of several criteria indicates genuine experiences. Statements that are coherent and consistent (logical structure), with information that is not provided chronologically (unstructured production) and contains a significant amount of detail (quantity of detail), are more likely to be true. Statements are considered more likely to be truthful if they include references to time and space (contextual embeddings), descriptions of interactions (action – response – action...), reproduction of conversations (quotes of original speech), unexpected complications (unplanned changes in the course of events), unusual details (unusual or extraordinary detail), and superfluous details (peripheral contemporaneous events). Accurately reported and misunderstood details will also indicate truthfulness. Another possible indicators of truthfulness are reports of details that are not part of the allegation but are related to it (related external associations, accounts of a subjective mental state, attribution of perpetrator's mental state). Since truthful persons are not as concerned with impression management as deceivers, the following may occur in their statements: spontaneous corrections, admitting lack of memory, raising doubts about one's own testimony, self-deprecation, and pardoning the perpetrator. The last CBCA criterion is related to the characteristic features of the offence. It will be considered present, if key aspects and features of a given type of offence are presented. Description should be however counter-intuitive or discrepant to everyday knowledge (Koehnken 2004; Koehnken et al. 1995).

The Validity Checklist is used for CBCA. Validity Checklist refers to general categories of information to be evaluated: psychological traits, features of the interview, motivation, investigative questions and offence-specific ele-

ments. SVA evaluators consider the following issues: (a) appropriateness of language and knowledge (mental capability of the child) (b) appropriateness of affect shown by the interviewee, (c) interviewee's susceptibility to suggestion, (d) evidence of suggestive, leading, or coercive questioning, (e) overall adequacy of the interview, (f) motives to report, (g) context of the original disclosure or report, e.g. whether there are questionable elements in the context of the original disclosure, (h) pressures to report falsely, such as indications that others suggested, coached, pressured, or coerced the interviewee to make a false report, (i) consistency with the law of nature, i.e. whether the described events are unrealistic, (j) consistency with other statements, i.e. whether there are major elements of the statement that are inconsistent or contradicted by another statement made by the same interviewee, and (k) consistency with other evidence, e.g. presence of major elements in the statement that are contradicted by reliable physical evidence or other concrete evidence (Koehnken G. 2004; Koehnken G. et al. 1995).

There have been over 40 research papers testing the accuracy of statement analysis published in English or presented at conferences (Vrij 2005; Pezdek et al. 2004; Ruby, Brigham 1997; Buck, Warren, Betman, and Brigham 2002; Granhag, Stroemwall, Landstroem 2006; Vrij, Mann 2006). The average error rate of SVA judgments is estimated at 30%, both in experimental and laboratory studies (Vrij 2005; Vrij 2008). Research has demonstrated that content analysis scores are affected not only by the veracity of the statement but also by other factors, such as age, verbal proficiency and social skills of the interviewee, and the interview style of the interviewer (Vrij, Akehurst, Soukara, Bull 2004; Akehurst, Bull, Vrij, Koehnken 2004; Goedert, Gamer, Rill, Vossel 2005; Kapardis 2003). Some criteria were present more frequently in truthful statements, some SVA ratings were higher for false accounts, and none of the CBCA or Validity Checklist criteria proved its reliability in all the studies (Vrij 2008; Kapardis 2003). Moreover, several researchers have found that trained judges were better at distinguishing between truths and lies than nonprofessional evaluators, some found no training effect, and other found that training made judges worse at distinguishing between truths and lies (Vrij 2005, Akehurst, Bull, Vrij, Koehnken 2004; Blandon-Gitli, Pezdek, Lindsay, Hagen 2009; Rassin 2001). Aldert Vrij (2008) has pointed to another important limitation of SVA: the method is not a standardised instrument, there are no clear rules to determine the number of criteria that need to occur for a statement to be assessed as truthful, and there are no rules regarding the weight of the individual criteria. In consequence, SVA assessments are subjective.

The study

The major purpose of our study was to investigate whether SVA content criteria reliably and accurately discriminate between truthful and fabricated accounts, if there are different SVA content characteristics of true and false accounts, and to describe qualitative and quantitative features of the statements (Wojciechowski 2012).

Over 130 criminal cases were randomly selected from the register of four district and two regional courts, and thoroughly analysed with the use of files taxonomic scale. Information about crime, evidence material and witness(es) was collected. Testimonies were considered true if the courts of both first and second instance recognised them as reliable and there was additional evidence supporting the witnesses' accounts (such as physical traits of expert evidence). The testimonies were considered deceptive if the courts of the first and second instance found them unconvincing, the witness admitted to giving false evidence and was sentenced for perjury. The most important documents, such as interrogation protocols and expert evidence were photocopied. Witnesses were interviewed from one to seven times (M = 2.51, sd = 1.19), and the overall number of words ranged from 141 to 3146 (M = 1,072, sd = 787.89). False statements were longer than truthful accounts (F (1.612) = 50.6493, p<0.001), but only in the case of 8.64% accounts, the variance of their length may be explained by the reliability of the statement (eta² = 0.08643). There were no statistically significant effects for crime category, and the witness's gender, age, education level and status.

Forty-three forensic psychology graduates participated in the project on the voluntary basis as competent judges (raters). Content analysis was preceded by a 30-hour-long training. Participants read relevant books, research papers and detailed description of SVAs, and participated in lectures on rating methods and common rating errors. Extended criteria descriptions were presented, and each criterion was discussed. Raters rehearsed content analysis and identification of criteria in test transcribed statements. Rating scale for the Statement Validity Assessment was introduced, and raters had an opportunity to discuss cases of analysis and to compare their ratings with experts' ratings, and were given feedback. Each account was rated by two independent competent judges. Coding was carried out individually, and raters remained blind to the outcome of legal proceedings. 79 transcripts – 47 true and 32 false statements were rated with the SVA content criteria. Each criterion

was rated on a 6-point scale, where 1 indicated "absent" and 6 – "explicitly present". Finishing the rating task, raters could judge the overall credibility of the account according to their subjective impression, irrespective of the SVA criteria ratings. Ratings were compared with the objective truth status, and correctness of classification decisions was assessed.

The results

The use of SVA content criteria let raters classify properly 65,19% (103) of the cases, 64% of the false testimonies and 65.67% of truthful accounts. When judgments were based on the subjective impressions of the judges irrespective of the SVA ratings, 84.18% (133) of cases were properly classified, yet a truth bias was explicit (89.96% of truthful and 55.21% of false accounts).

To assess the effect of truth value on the SVA assessment, Kruskal-Wallis ANOVA was conducted. The mean overall score for all testimonies was 115.35 points (sd = 16.65), there was a statistically significant difference between two categories of accounts (83.13 and 63.20 respectively, H = 3.9516, p = 0.0468), true accounts received 116.05 points (sd = 15.67) and false ones – 111.56 points (sd = 21.13). However, only 15 out of 30 SVA criteria differentiate true and false accounts according to the methodological assumptions. The CBCA criteria 2, 3, 4, 8, 9, 12–18, and Validity Checklist items 1, 4 and 5 were evaluated higher for dishonest statements. Consistent with previous researches outcomes (Vrij 2008; Kapardis 2003; Rassin 2001), the presented results suggest that the false and true accounts could not be differentiated on the basis of the CBCA and Validity Checklist criteria, and the use of SVA reduces accuracy of veracity assessment.

In order to select SVA criteria reliably discriminating truthful and fabricated accounts and to narrow the list of predictor variables, a feature selection and variable screening tool was used. The analysis revealed that seven of the SVA content criteria are significantly related to the veracity of a statement at the value of p<0.05; they are: reproduction of conversations (Chi^2 = 20.4381, p = 0.0004), quantity of detail (Chi^2 = 16.1770, p = 0.0063); inconsistency with other evidence (Chi^2 = 14.5281, p = 0.0126); spontaneous correction (Chi^2 = 10.9737, p = 0.0269); appropriateness of language and knowledge (Chi^2 = 10.9036, p = 0.0277); admitting lack of memory (Chi^2 = 11.6637, p = 0.0397) and pardoning the perpetrator (Chi^2 = 11.4940, p = 0.0424). Surprisingly, validity predictor variables did not correspond with rater decisions

predictor variables. As presented in Figure 1, only two of account truthfulness predictors (spontaneous correction, and inconsistency with other evidence) influenced decisions made by the competent judges in the process of validity assessment.

Fig. 1. SVA veracity predictors and raters' decisions determinants
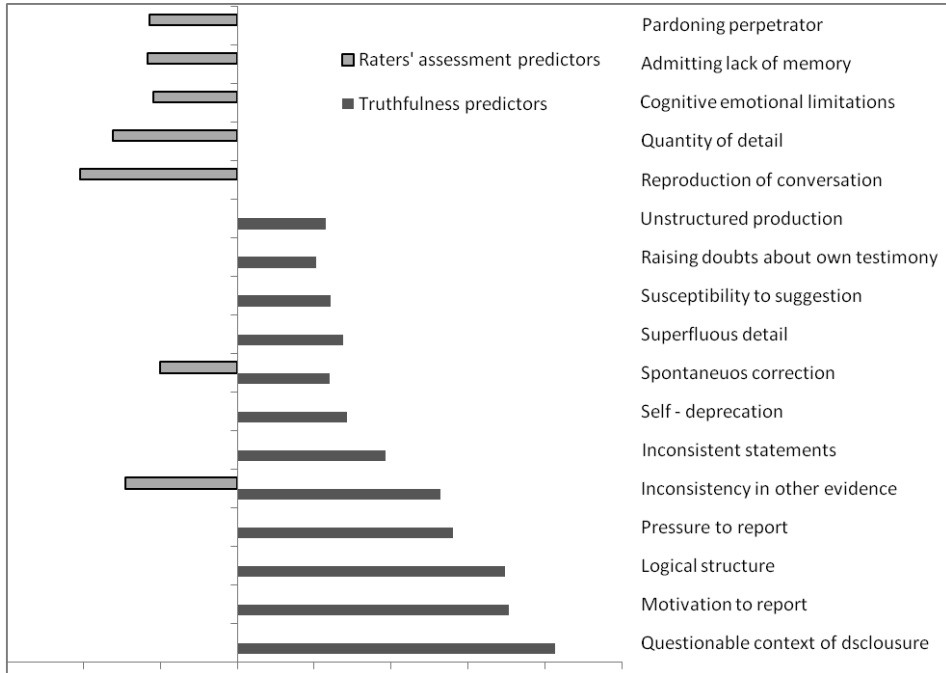
Preselected categorical variables, which are the best determinants of statement veracity, were used for recursive partitioning analysis, a non-parametric data mining algorithm for generating decision trees. Recursive partitioning creates a decision tree where observations are sorted into nodes, but compared to generalised linear models, no distribution assumptions are made about the data. Variables that best differentiate between the categories of account divide data into leaves of the tree or nodes, ordering the target variable. Decision tree is a high performance algorithm that groups accounts into two classes: true and false.

Fig. 2. Classification and decision tree for true and false statements
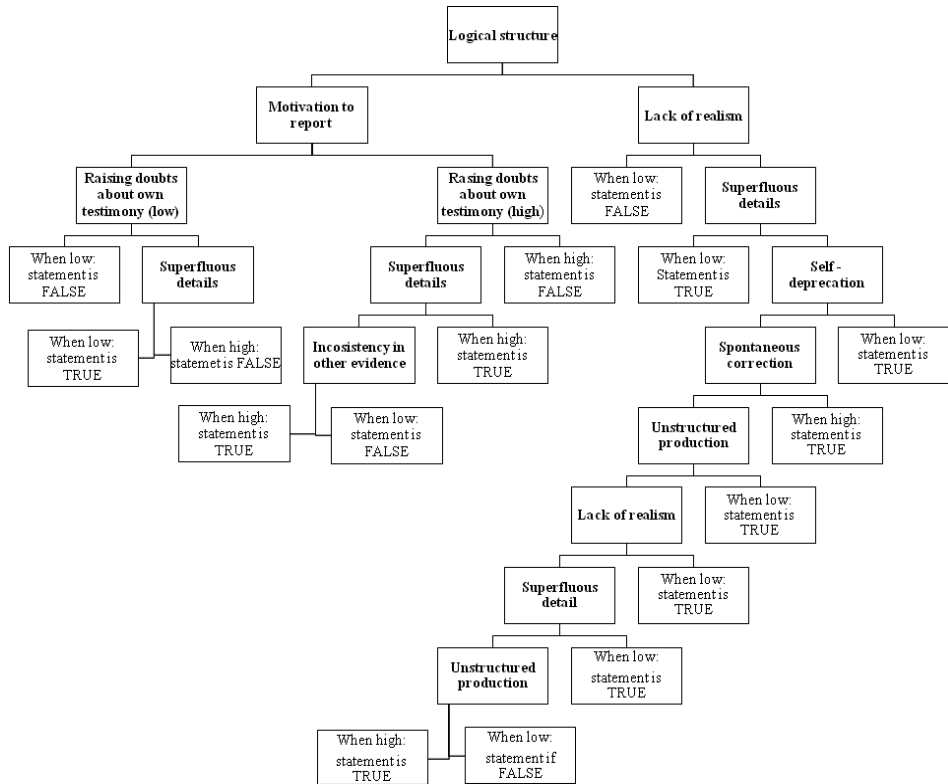
The screening of variables and focus on the most significant categorical statement value predictor – SVA content criteria organised into a classification tree – allow proper classification of all (100%) truthful accounts and 84% of false statements made by witnesses. Presented model not only improves accuracy of the ratings but may be deployed to make reliable and objective decisions on statement veracity. Classification tree offers rules regarding the weight of different criteria and the number of criteria that need to occur for assessing the statement as truthful. There are two steps of the veracity assessment with the use of the content analysis algorithm. First, the rater grades each of the content criteria. Second, the results of the individual criteria analysis are confronted with the decision tree. For example if the first CBCA criterion ("logical structure") is rated 4 or lower on the 6-point scale used, "motivation to report" is rated between 1 and 4, and the criterion "rais-

ing doubts about own testimony" is rated 1, 2 or 3 points, this indicates that the statement is false. If, on the other hand, the first criterion ("logical structure") were rated 4 or higher, "lack of realism" – 3 or higher, and "superfluous details" from 1 to 3 points, the analysed statement would be truthful.

Summary and discussion

There are three key findings in this study. First, that the results support the Undeutsch hypothesis claiming content differences between accounts of events that are based on true experience and accounts of events that are based on fantasy or invention. The results revealed that SVA content criteria, and reproduction of conversations, quantity of detail, inconsistency in other evidence, spontaneous corrections, appropriateness of language and knowledge, admitting lack of memory and pardoning perpetrator in particular reliably discriminate truthful and fabricated accounts.

The second key finding of this study is that the poor accuracy rates of the SVA may be explained by the lack of correspondence between the best validity predictors and the decisions predictors used by the raters. Feature selection and variable screening results showed that decisions made by the raters are not based on the results of content analysis including the best truthfulness predictors for the accounts. Only two SVA criteria of the 15 best veracity predictors (spontaneous correction and inconsistency with other evidence) are used by competent judges, and specific contents characteristics with poor discriminative power are the grounds for veracity assessment.

The third key finding of this study is that Statement Validity Assessment can enable accurate discrimination of truthful and false testimonies but decision algorithms in the form of classification trees should be applied. Assessment of the content criteria of particular SVAs must be followed by a formalised analysis employing rules that involve the weight of different criteria and number of criteria that need to occur for assessing the statement as true or false.

There is a considerable empirical support for the assumption that there are qualitative and quantitative differences between experience-based and fabricated statements. To improve the diagnostic strategy in specific cases, it is desirable to assess decision algorithms in further studies and to use of clas-

sification and decision trees to gather more information on how individual traits related to the quality of the statements can affect the accuracy of veracity assessment.

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Book review

Credibility Assessment: Scientific Research and Applications, eds. D. Raskin, C. Honts, J. Kircher, Elsevier, New York 2014, 374 pp.

What is Credibility Assessment? It's not an academic discipline – yet? It's not a recognized field of study or even a well-defined area of scholarly interest. Irrespective of those and whatever other limitations one could list, the term seems to have caught on as though we all understand what it means. In some settings in the United States organizational entities that were formerly identified as polygraph programs are now officially referred to as Credibility Assessment Programs, even though the work that is done is not different from what it was previously. The U.S. federal polygraph examiner training program, known originally as the U.S. Army Polygraph School, has gone through several official name changes since its first year of operation in 1951. That program is now known as the National Center for Credibility

Assessment in spite of the fact that the curriculum is largely the same as it was before the name was changed. Is this because Credibility Assessment and polygraph testing are, in the minds of most, actually synonymous. Or, is something else at work here? I think it's the latter. The field has not yet caught up with the changing terminology and the changing thought process that underlies it.

To my knowledge there are now only three authoritative monographs dealing with Credibility Assessment. The first two of these are likely not known by many persons, even those who have kept abreast of the literature. The first volume was an edited publication by a well-respected psychologist, John Yuille. With support from NATO he organized a conference of interested persons, mostly psychologists, that resulted in a published volume, *Credibility Assessment*[1]. While this work was of moderate interest it did not bring much attention to bear on Credibility Assessment.

In 2005, the Research Branch of the Department of Defense Polygraph Institute (DoDPI) desired to update its research program and to develop an agenda that was grounded in available science. I was asked to carry out this task and, because the DoDPI research at that time included a number of projects that did not involve either polygraph instrumentation or methodologies, a rethinking of what needed to be done was in order. Credibility Assessment was the grounding term for how a research agenda was to be produced. To accomplish this the parent agency for DoDPI, the Counterintelligence Field Agency (CIFA), provided funding over several years to support the project.

The starting point for the project was the assemblage of a small group of well-known and widely respected researchers in various areas of Credibility Assessment. The work of this organizing body led to an invitational list of leading researchers and governmental practitioners, primarily but not exclusively polygraph examiners, as well as a defined agenda for a multi-day conference referred to as the Credibility Assessment Research Summit (CARS). The original CARS meeting of the invited participants was, over the following year, supplemented with a number of smaller meetings of scientists and practitioners who focused their efforts on research needs in well-defined areas of credibility assessment. Generally, each group, led by a researcher working under commission for the CARS, was responsible for the preparation of a separate report documenting its work. Each of the sections' reports was then edited and organized as appropriate and ultimately included in a final

written report describing the outcome of the work of the various groups. In this report the state-of-the-art in various areas of Credibility Assessment, as well as the research needs in each area, were addressed. Because this was a federal effort it was necessary that the report be submitted to CIFA for clearance review. That review required processing over several years during which, unfortunately, CIFA was officially dissolved. Most of its personnel were absorbed into the Defense Intelligence Agency (DIA). The DIA also absorbed the CIFA clearance processing; its review of the CARS report was not completed until December, 2013.

The CARS report, though not publicly distributed, is relevant here because some of the chapters included in this reviewed book are slightly revised versions of the work commissioned for the CARS report. (See, for example, page 52 in Chapter one of this reviewed book for a reference to the CARS work.) This wider distribution of such material bodes well for it offers reason to believe that Credibility Assessment may become more widely accepted as a term encompassing research and practice than the misnomer of "lie detection."

It is common to find in anthologies that the different contributions include overlap in coverage, duplication of material and styles and approaches to topical areas that differ dramatically. This book is no exception. For that reason in this review I will provide a description of the content of each of the chapters as if each stood alone, something which, as the astute reader will note, could actually be the case.

In the first chapter the authors describe a process known as the Strategic Use of Evidence (SUE), a framework for constructing an interview protocol to be applied in cases when suspects are questioned regarding involvement in criminal events. SUE is said to improve a questioner's ability to distinguish between persons who are telling the truth and those who are not. The authors clearly set out the theoretical basis for the SUE approach and argue that it is based on cognitive as opposed to emotional principles. Liars and truth-tellers differ, it is said, because they possess different information and, for that reason, they are motivated differently. When questioned they adopt different strategies of response. The SUE approach attempts to capitalize on those differences.

In this chapter an excellent overview of the theoretical discussion is followed, importantly, by a review of the relevant empirical research. This includes

a meta-analysis of the major studies, and a number of pointers to help a questioner move from an understanding of SUE to its actual application.

In the second chapter the need for Credibility Assessment (screening) at portals, such as airports, border sites, and so forth is discussed. In this material the authors make clear that many of the current practices at portals have been and are still being used at a great cost but with little or no scientific support. In addition, in spite of the large investment (by the U.S. government) in a research program designed to detect "malintent" (A newly coined term meant to capture the intent to commit a transgressive act in the future.) amongst travelers, there has been little payoff. This program, Future Attribute Screening Technology (FAST), employed in its research plan the use of sophisticated technologies and carefully constructed, somewhat realistic research scenarios; yet, it failed, partly because, as pointed out in this chapter, it was not actually grounded in good science.

Credibility assessment at portals is, as well documented in this chapter, an extraordinarily complex and difficult task. Trying to predict future actions is not something that has been the mainstay of deception research. Also it is assumed that the base rate of, for instance, terrorists or others with malintent passing through portals, is likely to be extremely low. In addition, the pressure of time restrictions at portals complicates whatever might be done to detect those with malintent. The authors thus are not positive regarding what has been and is being done to deal with credibility assessment at portals. They, appropriately, call for much closer attention to sound theoretical advances and better empirical data than is now available to deal with this problem.

The third chapter, dealing with polygraph testing, is largely based on material available in other published sources. Much of the focus here is on what is referred to as the Utah probable-lie test (Utah PLT), a variant of the Comparison Question Technique (CQT) that the authors are most familiar with. Although they point out that there are two forms of the Utah PLT only one of these, the one used when there is a single allegation to be assessed, has empirical support; this is not noted in the chapter.

In this chapter the authors cover a number of topics of importance in polygraph testing: numerical scoring, computer algorithms for data analysis, directed lies and probable lies and their view of what the scientific literature shows with respect to the accuracy of the CQT. A portion of this material is devoted to a presentation and discussion of very interesting data pertinent to

screening examination results derived from an analysis of law enforcement applicants' tests. This is one of the few appearances in the literature of relatively detailed information regarding polygraph screening examinations. It should prompt better research and more interest in polygraph testing in screening environments; that alone would be a very positive contribution of this section of the book.

Chapter 4 is devoted to a discussion of countermeasures, heavily focused on polygraph testing methods. Much of this material has appeared in a number of journal articles and other publications. The possible effects of different types of countermeasures on both CQT and concealed information testing (CIT) are considered here and there is limited discussion of some of the proposed as well as currently applied solutions. Of importance to field polygraph examiners, many of whom in recent years have adopted the use of motion sensors dedicated to detecting covert movements, is that, according to the author, there are no "published scientific data exploring the efficacy of those devices in detecting the types of countermeasures that have been shown to be effective." This, if the author is right, is or should be a concern given the amount of information now available to all with internet access. In his conclusion the author decries the (apparent) policy of the U.S. government to classify all countermeasures research; he encourages researchers in other countries to continue work in this area and to publish it in publicly accessible literature.

In the following chapter, a multi-author contribution, a new and excitingly different approach to detecting deception is presented. Here, the authors present the theoretical basis for and the extant empirical research that supports the use of pupil size changes in "lie detection." But, they do not propose a methodology – or technique – that most are familiar with. Rather, their method involves measurements of pupil changes and other oculomotor events during reading activity when specially prepared material is viewed. This approach may have value in a number of situations and may be particularly well-suited for use in certain screening environments.

The authors devote considerable time to a discussion of the physiological and psychological bases for their method and pay particular attention to why reading behaviors are useful for detecting deception. The results of their method, when used in two separate laboratory studies and two field studies, are presented in detail and ought to be of great interest to others who are willing to explore alternatives to traditional approaches to "lie detection." To

their credit, the authors provide the reader with their insight regarding both the strengths and weaknesses in their testing protocol and, while their findings are promising, there is reason to be cautious without further research.

Although some of the other chapters include considerable discussion of the underlying theory for the material presented, this chapter, the sixth in the volume, is devoted exclusively to a cognitive, neuroscience understanding of deception (and Credibility Assessment). In doing this the author borrows from different disciplines, experimental psychology, neuropsychology, neurobiology and computational neuroscience. He reviews the theory and the empirical findings in these different, but related, disciplines as they relate to deception. Importantly, he considers in his overview a variety of different types of deception and the newer technologies for the investigation of brain functioning including electrophysical techniques, e.g., event-related potentials (ERP) and hemodynamic techniques (e.g., fMRI) and he shows how each of these have contributed to our understanding of brain functioning.

In his discussion of the extant neuroscience-based research the author dichotomizes his material as that pertaining to either "instructed" lies or "intention-based" lies. The former might be seen as those relevant to how many might see simple, laboratory-based deception studies; the latter may be closer to how real-life (goal-directed, purposeful) lies are viewed. The distinction between these two categories of lies and the relevant evidence to each are considered in some detail, providing an excellent overview of the current scientific knowledge.

Although real-life, forensic application of neurocognitive research has been limited, most of what is available, some considerably controversial, is reviewed in this chapter. The author points out clearly that the research to date is not well formed in the direction it is going; it is impeded in an important way by a simple concern: countermeasures. Notwithstanding that, this chapter is, I think, a very important contribution, especially for those who now advocate that technology such as fMRI represents the future of "lie detection." The author makes a most instructive point: "the specific processes engendered during deception vary in a flexible and dynamic manner in response to the circumstances and goals of the deception."…"[an] understanding of how deception-related processing is instantiated in the brain,…will be accomplished only by combining the temporal and spatial information provided by these two techniques [ERP and fMRI]." (p. 288–289).

We are a considerable distance from any practical application of brain-based technologies in credibility assessment.

The final chapter of this work, following the theoretical consideration of cognitive neuroscience, is another chapter titled as a theory-based contribution. Here the authors present material pertaining to a wide range of traditional methods applied for "lie detection" purposes: physiological, such as Polygraphy, verbal, e.g., Statement Validity Analysis, and non-verbal, e.g., facial expressions, approaches. Interestingly, near the close of their chapter, the authors discuss fMRI findings and conclude with a caveat completely in-line with that stated in the previous chapter.

The presentation of the material in this chapter is more aptly categorized as merely an overview, a selected review, if you will, of the literature. It is primarily based on empirical findings and how they might relate to each other across similarly focused studies; it is not an integrated, theory-focused assessment of either "lie detection" or Credibility Assessment. There is here an over-emphasis on "accuracy" of methods as opposed to a meaningful summarization of the previous chapters. It is up to the reader to determine the fit between what is included in this section and what is said, and unsaid, in the preceding chapters.

Overall, this book advances the idea of Credibility Assessment and one way it might be limned. It is accepted, I think, that whatever Credibility Assessment is, it is by its nature, in its underpinnings and applications, multi-disciplinary and this volume makes that clear, with respect both to theory and "techniques." While I am confident that the future promises better integration and focus, this volume reinforces the direction of the limited work that has already been done.

Finally, it is fair to note that the reader ought to be highly skeptical of many of the assertions, claims and interpretations of the evidence that are offered in this volume. Some of them are without any empirical support and others are, in my view, simply wrong. It is also somewhat disappointing that in some sections the material has already appeared in the public literature in the same manner; while this won't be disconcerting to those new to the field, those already familiar with it may find the lack of new or alternative views in some areas to be a considerable shortcoming. Nevertheless, as an introduction to Credibility Assessment, this book, in its scope and content, is a significant

contribution that is recommended to those in the research and practitioner communities dealing with "lie detection" in whatever form.

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Reports

Report from the 49th Annual Seminar/
Workshop of the American Polygraph Association,
Seattle (Washington) 7th–12th September 2014

The 49th Annual Seminar of the American Polygraph Association was held at the Sheraton Seattle Hotel in Seattle from 7th to 12th of September 2014.

The seminar gathered a few hundred experts in polygraph examinations, not only from the United States but also from many countries of Latin America, Asia, Africa, and Europe.

It is worth remembering that approximately 30% of over 3000 current members of the American Polygraph Association (APA) are polygraphers from outside the US. Despite the fact that there are currently approximately 7000 polygraphers active currently in China and the countries of the former USSR, and that therefore the APA gathers only 30% of people performing polygraph examinations worldwide, it remains the largest and most influential organisational in the sector. Thus, it is the American Polygraph Association that bears the greatest responsibility for the professional and ethical level of polygraph examinations.

As usual, the seminar provided an opportunity to exchange experience, and to establish and reinforce personal contacts between polygraphers from many countries.

A decided majority of presentations were delivered by practitioners doing polygraph examinations in their daily work. A weakness of the seminar was a relatively low turnout of scientists running experimental scientific and academic research, both in actual polygraph examinations and in disciplines of fundamental importance for polygraph examinations, i.e. psychologists, psychophysiologists, and neurophysiologists. Some sessions were of plenary character.

Discussed in the plenary sessions were Hot Topics in Polygraph (panellists: G. Vaughan, M. "Skip" Webb, R. Nelson, J.P. O'Burke, F. Horvath), Ethics – by Milton "Skip" Webb, and also Extended Polygraph Testing by Charles "Chuck" Slupski, President of the APA.

The remaining sessions were delivered in three parallel sections. In one of them, the papers were interpreted simultaneously into Spanish.

There were altogether more than 30 papers, panel discussions, and presentations on highly varied subjects and at various level of expertise. From a case study presentation (The Incredible Use of Forensic Hypnosis and Polygraph) by George Baranowski, via general problems, experience syntheses, and research methodology (e.g. the presentations by Chuck Slupski and Pam Shaw), to panel discussions: the above-mentioned Hot Topics in Polygraph, and also Future of Polygraphy with participation of F. Horvath, R. Peters, S. Slowik, D. Ngoo, M. Novoa, and P. Selic.

Similarly, the subject range of the papers was highly varied. From legal issues (results of a polygraph examination as evidence) to highly specialist considerations of examination techniques and sophisticated manners of interpreting polygraph records. There were also educational presentations aimed at – as one could guess – improving the level of forensic knowledge of sex crimes (Criminal Sexual Behaviour: Patterns and Typologies by D. Orr) and foundations of psychophysiology (Applied Physiology by J. Reicherter) in polygraph examiners.

Present and speaking during the seminar were also producers of polygraph examination equipment: Lafayette Instrument Company, Stoelting Company, Limestone Technologies Inc., and Axciton Systems.

The seminar was also an opportunity to say farewell to the stepping down former President of APA, Charles "Chuck" Slupski. The following, jubilee,

50th APA Seminar in 2015 will be held in Chicago's prestigious Chicago Palmer House, and will be opened by the current President of the American Polygraph Association, Raymond I. Nelson.

<div align="right">

Jan Widacki[*]

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Report from scientific conference on Perspectives of Instrumental and Non-Instrumental Lie Detection

Perspectives of Instrumental and Non-Instrumental Lie Detection was a scientific conference organised by the Faculty of Law, Administration and International Relations of the Andrzej Frycz Modrzewski (KAAFM) Krakow University in collaboration with the Institute of Psychology of the Jagiellonian University, and Polish Polygraph Association on 26th September.

The conference gathered practitioners dealing professionally with lie detection and researchers focused on instrumental and non-instrumental methods of detection. The complex nature of the subject of conference should be emphasised, as the questions discussed concerned polygraph examination performed in investigation procedures, issues related to the interpretation of polygraph examination results, legal foundations and limitations for lie detection, and criteria-based content analysis (CBCA) also in the case of seniors (i.e. people over 60 years of age), and the application of evoked (event-related) potentials (p-300 waves in EEG examinations) in revealing concealed information.

The content part of the conference began with a presentation by Professor Jan Widacki, Dean of the Faculty of Law, Administration, and International Relations of the Andrzej Frycz Modrzewski Krakow University. The professor emphasised the importance of lie detection being a scientific issue with profound practical significance, not only in criminal procedure but also in

the operation of police and special forces, and the process of recruitment of staff to various state administration institutions.

A juxtaposition of results of empirical studies on lie detection with instrumental and non-instrumental methods, and comparison of the diagnostic value of individual detection methods became a precious forum for exchange of know-how in the area, the more significant as participating in the debate were representatives of academic chairs of forensic studies, psychologists researching non-instrumental methods of detection, and practitioners – both conducting polygraph examinations and using the interpretation of results of such examinations.

During the three sessions, papers were delivered among others by academics from the University of Warsaw, University of Silesia, the Jagiellonian University, and also practitioners among others from the Internal Security Agency (ABW).

The conference opened with a presentation of results of research concerning non-instrumental methods of lie detection. The object of non-instrumental methods based on text analysis is the distinction between – on the one hand – true and – on the other – invented or learnt accounts. Professor Romuald Polczyk and Karolina Dukała from the Institute of Psychology of the Jagiellonian University presented results comparing efficiency of criteria based content assessment (CBCA) in seniors and other adults.

The results of research in lie detection in adult witness testimonies conducted in the Institute of Psychology of the University of Silesia with the application of psychological methods of content analysis were presented by Dr Bartosz W. Wojciechowski.

The last speaker in the first session was Dr Jerzy Wojciechowski from the Institute of Psychology of the University of Warsaw, who presented the question of using the analysis of evoked (event-related) potentials in revealing concealed information. The results of studies based on electroencephalographic examination of the electric activity of the brain (p-300 waves) were juxtaposed with results of polygraph examinations.

Professor Marek Leśniak from Department of Criminalistics of the University of Silesia discussed issues in interpretation of polygraph examination results. He presented the results of empirical studies concerning the volume of the

error in polygraph-assisted judgments. In their light, significant statistical differences in the interpretation of polygraph examination results were discovered. The divergences resulted from the use of OSS 2 and OSS 3 applications, and the application of the "human scorer" seven-point scale. Interpretations falling back on computer-assisted method were burdened with a greater error. Therefore, one should pay attention to the potential threats present in Polish practice, for example in cases when less experienced experts formulate conclusions solely on the grounds of indications from OSS 2 or OSS 3 algorithms.

The following speaker, Marcin Gołaszewski, a polygrapher from the Internal Security Agency proved lack of essential knowledge of polygraph examinations among representatives of process bodies, inconsistencies in legal course books, non-homogenous verdicts, and incompetence of numerous expert witness opinions.

The reasons for a small number of polygraph examinations commissioned in criminal procedures, despite plenty of practical opportunities for their use, were discussed. Practitioners focused on advancing the position of polygraph examinations among the forensic studies preferred by judges and prosecutors, and postulated permanent education in the scope, and the care for attention to detail in expert witness opinions.

Analysis of polygraph examination techniques applied in Polish practice was the subject of the paper by Michał Widacki (a graduate of the American International Institute of Polygraph), also presenting the results of document studies in procedures conducted by prosecutors general and military. In the light of studies covering the period from 2003 to 2012, the UTAH technique proved the most frequently used method of polygraph examinations in criminal procedures, although examinations performed in already obsolete Reid technique were also present. Moreover, in practical application it was often forgotten that technique goes beyond just the type of the basic test and also includes the methodology of assessing the recordings. In result, studies were frequently performed formally according to UTAH technique, yet the assessment of their recordings was only quantitative. Moreover, a variety of artefacts happened to have been considered "specific reactions".

During the first session of the conference, Aleksandra Cempura (lawyer and doctoral student) presented the legal aspects regulating lie detection in Poland, with a special focus on the verdicts of the Supreme Court and

appellate courts concerning the admissibility and conditions for the use of polygraph examinations during criminal investigation and as evidence in court.

A comparative analysis of the use of polygraph examinations in supervision and therapy of individuals sentenced for crimes against sexual freedom in UK and US practice was presented by Agnieszka Leszczyńska. The speaker presented the options for using polygraph examination in the system of managing risks related to the monitoring of the danger of return to the criminal path in the case of people convicted for sexual crimes, and also in the supervision of such people after their release from penitentiary institutions.

The paper closing the content part of the conference and concerning one of the instrumental methods presented the preliminary results of the studies conducted by doctoral students – Paweł Zając, Renata Staszel, and Małgorzata Wojtarowicz – concerning the use of infrared photodetection in the detection of emotional traces.

An event accompanying the conference was a presentation of professional infrared cameras and equipment monitoring emotional changes.

To Recapitulate, instrumental and non-instrumental methods of lie detection should be mutually complementary. The use of instrumental methods of detection to investigate brain processes is thought-provoking, although, offering a similar accuracy of the results, the procedure is more complicated and troublesome for the examinee than a classical polygraph examination.

In turn, attempts at lie detection with the use of observation of face temperature changes require overcoming plenty of minor technical problems, yet are promising as they allow observing emotional reactions remotely, which at the same time begets further ethical and legal problems.

The meeting described above emphasised the need to conduct scientific research in lie detection. The multi-aspect nature of the questions presented, results of the studies conducted by the speakers, opinions of practitioners, members of international and Polish associations pursuing constant improvement of quality of examinations in lie detection fully justify the need for exchange of know-how and experience between all parties interested in instrumental and non-instrumental lie detection.

Participating in the debate were also representatives of the Regional Police Headquarters in Kraków, university chairs of criminal studies, the Polish National School of Judiciary and Public Prosecution, courts, public prosecutors, Internal Security Agency Military Counterintelligence Service (SKW), and the Court Observation Psychological Unit (OOSP) in Kraków invited to participate in the conference.

Presented during the conference was also the infrared photodetection equipment and a system for monitoring emotional changes.

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Varia

Recommendation to our readers

Editor-in-Chief of the „European Polygraph" recommend to our readers articles in "Polygraph", an official journal of the American Polygraph Association:

In "Polygraph" 2014, Vol. 43, No 1:

Replication: Criterion Validity of the Empirical Scoring System – by Ray Nelson, Mark Handler and Stuart Senter.

Decision Accuracy for Relevant-Irrelevant Screening Test: A Partial Replication – by Donald Krapohl and Terry Rosales.

Effects of Media Portrayal on Mock Juroror's Use Deceptive Polygraph Evidence – by Chelsea Lye, Josh Karr and Ron Craig.

A Letter to the Editor Regarding Cushman's Critique of the Matte Quadri-Track Zone Comparison Technique and its Inside Track – by James A. Matte.

Rejoinder to Matte – by Barry Cushman.

In "Polygraph" 2014, Vol. 43, No 2:

American Polygraph Association – Brief of Amicus Submitted to Alaska Court of Appeals (with Introduction by Gordon Vaughan).

In "Polygraph" 2014, Vol. 43, No 3:

Initial Investigation of Selected Hypotheses Regarding the Pneumograph in Polygraph Testing – by Donald J. Krapohl and Chad Russell.

Scoring Respiration When Using Directed Lie Comparison Question – by Charles R. Honts and Mark Handler.

The Use of an Enhanced Polygraph Scoring Technique in Homeland Security: The Empirical Scoring System – Making a Difference – by Bruce P. Robertson.

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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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