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Validated Techniques and Scoring Models for PDD Test Data Analysis – Conclusions from the 2011 APA Report

Key Words: APA Report, standard of polygraph examination, polygraph techniques, recommended techniques

Standards concerning polygraph examinations for common application can be found in by-laws as well as in recommendations issued by the American Polygraph Association (APA) and in standards adopted by ASTM International (American Society for Testing and Materials International). The first of these organizations was founded in 1966 and has a membership of over three thousand polygraphists, whereas the second is a normalization organization which can trace its roots back to 1898. Both have the adjective "American" in their names, but in fact these are international organizations open to representatives from all over the world.[1]

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[1] The international character of the ASTM was underlined by augmenting the name with the element *international.* in 2001. A similar idea was an issue during the 45th annual APA seminar in

On 1 January 2012, the new **APA standards of practice** came into force**,** which introduced among other things:

- mandatory usage of a motion sensor for all examinations;
- obligatory polygraph instrument functionality test recorded semi-annually;
- general requirement for using only validated techniques (testing techniques shall be considered valid if supported by research conducted in accordance with the APA's research standards. For a minimum of five years after publication, upon request, researchers of polygraph techniques shall provide reasonable access to validation data for critical review. Where examinations deviate from the protocols of a validated testing technique, the deviations should be noted and justified in writing);
- criteria for the admissibility of particular techniques in specific types of examinations: evidentiary, paired-testing, investigative and screening.

As Pamela Shaw (APA President 2011-2012) rightly noted: "The requirement to use validated testing methods is not a new idea, of course. Other fields such as medicine and psychology eventually came to the same conclusion, albeit many years after the fields were established. It has turned out to be a great thing for them. Try to imagine, if you can, what the fields of medicine and psychology would be like if there were no requirement to validate their methods. Validation serves a number of important functions, not the least of which is protecting the public from misuse, incompetence and quackery" (APA, 2011).

It is worth specifying that the term *validus* in Latin means: strong, vigorous. By definition, method validation is the process of establishing the performance characteristics and limitations of a method. In polygraph testing **criterion validity refers to the ability of the test to correctly determine the truthful or deceptive criterion category to which an examination belongs**. It is important to determine whether the data analysis process according to a given method is **reliable** (a test will give the same result when the test is repeated or when the data are re-evaluated by another professional) and **generalizable** (a test that works on sample data will also work on other cases in the field). Validity is merely estimated from the published scientific reports.

Generalization of validity is not warranted when the structure or intended use of the test variant differs from a validated model to the extent that the

Myrtle Beach (2010). However, at that time the conservative approach prevailed – the argument concerning the recognizability of the previous brand that had been built up over many years.

distributions of scores can be expected to differ. For example: validation evidence for event-specific diagnostic techniques (interpreted with the assumption of non-independent criterion variance of the relevant questions) cannot be generalized to multi-issue screening variants of these techniques that are scored and interpreted with the assumption of independent criterion variance. Another example is when differences in the number of RQs affect the mean total score (APA, 2012).

It must be remembered that a **polygraph technique** is not just a test question sequence, but also a set of structured rules regarding: pre-test interview, target selection and question formulation, in-test stimuli presentation and test data analysis method. According to APA recommendations – in order to consider a given technique valid, it must be a combination of the following characteristics:

- test format that conforms to valid principles relating to: target selection, question formulation and in-test presentation of the stimulus questions,
- validated method for test data analysis (TDA),
- at least two studies (original and replication) published in: "Polygraph" or other peer reviewed journals, government publications or edited academic texts.

The APA also defined the **criteria that a technique authorized for different sorts of examinations should meet**:

- in **evidentiary testing** (commissioned by judicial bodies, prosecution, defence etc.): ≥90% accuracy and ≤20% inconclusive results,
- in **paired testing** (2 independent polygraphists examine at least 2 persons who testify in this way that one of them must surely be lying): ≥86% accuracy and ≤20% inconclusives rate,
- in **investigative testing**: ≥80% accuracy and ≤20% inconclusives,
- for **screening purposes**: an accuracy rate that is significantly greater than chance + successive hurdles approach which requires conducting additional validated and more precise tests if a screening test ends unfavourably (there are doubts regarding the examinee's truthfulness).

Who is affected by these standards? Since 1 January 2012 – APA members. In case of standards violations (unless otherwise provided by state or national law), sanctions, including loss of membership, might be imposed. Another important organization – the AAPP (American Association of Police Polygraphists) – intends to adopt the same standards as of 2013. It is expected that other polygraph associations (in the U.S. and all over the world) may follow suit.

More rigorous standards that became effective recently had already been elaborated in 2007 as a response to the – essentially critical – 2002 **report on the polygraph by the National Research Council** of the USA. The findings and conclusions in this report were both positive and negative for the polygraph profession. However, the former predominated:

- the scientific basis for polygraph testing is far from desirable for a test that carries considerable weight in national security decision making;
- the bulk of polygraph research can accurately be characterized as atheoretical;
- basic psychophysiology gives cause for concern that effective countermeasures to the polygraph may be possible;
- available knowledge about the physiological responses measured by the polygraph suggests that there are serious upper limits in principle to the diagnostic accuracy of polygraph testing, even with advances in measurement and scoring techniques.

Fortunately, there were also findings justifying moderate optimism for the future. The NRC admitted that *although the basic science indicates that polygraph testing has inherent limits regarding its potential accuracy, it is possible for a test with such limits to attain sufficient accuracy to be useful in practical situations* (NRC, 2003). In the NRC meta-analysis, the range of accuracy rates for single issue tests was between 0.81 and 0.91 for the middle 26 values from 52 datasets. This means that – despite general severe criticism – the relatively high effectiveness of such examinations was confirmed. That was 10 years ago. Now we know enough to say a lot more.

The fundamental question is: **which of the PDD techniques that are well-known to date satisfy the new APA requirements?** An answer was given by a **meta-analysis** – an independent scientific study which relies on a secondary exploration of knowledge by means of a systematic review of the information contained in publications and original sources using: data connections, statistical analyses, generalization of results and inferences. The meta-analysis carried out by The APA Ad-Hoc Committee on Validated Techniques encompassed: 37 studies (52 experiments and surveys), 289 scorers, 12665 scored results of 4283 confirmed exams (6597 scored results of 2300 confirmed deceptive exams and 6068 scored results of 1983 confirmed truthful exams). Studies were weighted by sample size and number of participant scorers. As a result researchers evaluated:

- unweighted **accuracy of all recognizable PDD techniques** (without outliers) that produce generalizable results = 87.1%, with inconclusives rate: 12.7%,

- unweighted accuracy of **single-issue** techniques[2] (without outliers) = 92.1%, with INC: 8.8%,
- unweighted accuracy of **screening** techniques = 85%, with INC: 12.5%.

Moreover, the APA approved the **list of PDD validated techniques** suitable for use in specific types of examinations (see table 1). It has been effective since 1 January 2012.

Evidentiary techniques[3] / Test data analysis method	**Paired testing techniques[4]/ TDA method**	**Investigative techniques / TDA method**
Federal You-Phase / ESS[5]	**AFMGQT[9] / ESS**	**AFMGQT / 7-position scale**
• accuracy[6]: 90.4%	• accuracy: 87.5%	• accuracy: 81.7%
• inconclusives (INC): 19.2%	• inconclusives (INC): 17%	• inconclusives (INC): 19.7%
• sensitivity[7]: 84.5%	• sensitivity: 72.9%	• sensitivity: 78.3%
• specificity[8]: 75.7%	• specificity: 70%	• specificity: 53.8%

[2] In single-issue techniques the variance of response to individual questions is non-independent (affected by and/or affects the variance of response to other questions). In multi-faceted and multiple-issue techniques the criterion variance of the test questions is independent.

[3] techniques used in exams to be admitted in court.

[4] paired testing – a method of utilizing polygraph testing in situations in which two or more subjects give contradictory accounts of a particular incident in such a way that at least one of the subjects must certainly be lying. The method utilizes two independent examiners with established accuracy and error rates to assess the veracity of at least two subjects in such circumstances in which opposing parties assert diametrically opposed information as factual. See: *Model Policy for Paired Testing* [online], American Polygraph Association. Available from: http://www.polygraph.org/files/Model_Policy_for_Paired_Testing.doc [Accessed 13 November 2012].

[5] Empirical Scoring System (ESS) – an evidence-based normative system for manual test data analysis of PDD examination data from comparison question test formats. For more details, see Nelson et al., 2011.

[6] Accuracy – proportion of correct decisions, excluding inconclusives.

[7] sensitivity – ability of a test to detect specific features at all levels of magnitude or prevalence. In PDD testing this term is used to describe how well a test identifies a person engaging in deception concerning the issue under investigation (Krapohl, Handler, Sturm, 2012). The proportion of true positives a test can produce.

[8] specificity – the proportion of true negatives a test can produce. This term is used to describe how well a test identifies a person being truthful concerning the issue under investigation.

[9] Two versions exist for the AFMGQT (1 and 2), with minor structural differences between them. Selected studies include a mixture of both AFMGQT versions, so these results are provided as generalizable to both versions. The two techniques are nearly identical to the **LEPET** and the **Utah MGQT**. That is why the validity of the AFMGQT can be generalized to these techniques if scored with the same TDA methods. Any hypothesis that the validity or criterion accuracy of AF MGQT and LEPET exams differs will require research evidence.

ZCT (Federal. Utah) / ESS • accuracy: 92.1% • INC: 9.8% • sensitivity: 81.7% • specificity: 84.6%	**Federal You-Phase / 7-pos. scale** • accuracy: 88.3% • INC: 16.8% • sensitivity: 84.5% • specificity: 75.7%	**CIT (GKT) / Lykken system** • accuracy: 82.3% • INC: 0.1% • sensitivity: 81.5% • specificity: 83.2%
Utah ZCT (combined versions) / **Utah** • accuracy: 93% • INC: 10.7% • sensitivity: 85.3% • specificity: 80.9%	**Federal ZCT / 7-pos.** • accuracy: 86% • INC: 17.1% • sensitivity: 85.8% • specificity: 58.1%	**DLST (TES) / 7-pos.** • accuracy: 84.4% • INC: 8.8% • sensitivity: 74.8% • specificity: 79.2%
Utah ZCT DLC / Utah • accuracy: 90.2% • INC: 7.3% • sensitivity: 81.5% • specificity: 85.7%	**Federal ZCT / 7-pos. evidentiary**[10] • accuracy: 88% • INC: 8.5% • sensitivity: 80.4% • specificity: 80.9%	**DLST (TES) / ESS** • accuracy: 85.8% • INC: 9% • sensitivity: 80.9% • specificity: 75.1%
Utah ZCT PLC / Utah • accuracy: 93.1% • INC: 7.7% • sensitivity: 86.7% • specificity: 83.3%	**Backster You-Phase / Backster** • accuracy: 86.2% • INC: 19.6% • sensitivity: 83.6% • specificity: 55.6%	
Utah ZCT RCMP (v.1) / **Utah** • accuracy: 93.9% • INC: 18.5% • sensitivity: 83.3% • specificity: 70%		
***IZCT / HSS** • accuracy: 99.4% • INC: 3.3% • sensitivity: 97.7% • specificity: 94.6%		

[10] In the 7-position evidentiary scoring method the decision threshold for the opinion NDI is somewhat lower than in the traditional 7-pos. scale and amounts to +4. For the opinion DI it remains as previously (-6).

***MQTZCT / Matte** • accuracy: 99.4% • INC: 2.9% • sensitivity: 96.7% • specificity: 96.3%		

Table 1. The list of PDD validated techniques. Accuracy (correct decisions), inconclusive rates, sensitivity and specificity. (Content based on: *Meta-Analytic Survey of Criterion Accuracy of Validated Techniques*, American Polygraph Association, 2011)

How to read the above table? Techniques that have ≥90% accuracy and ≤20% inconclusives were placed in the first column. In the second column – techniques with 86% accuracy and producing no more than 20% inconclusive results. And in the third - techniques with at least 80% accuracy and giving at most 20% inconclusives. Techniques from the first column can also be applied in examinations specified in the second column, while in investigative examinations one can use techniques mentioned in all the columns. Looking from the left to the right side of the table, criteria of admissibility (accuracy) become progressively lower.

In two techniques – the Integrated Zone Comparison Technique (IZCT) and the Matte Quadri-Track Zone Comparison Technique (MQTZCT) – comments were made on the references. These techniques have been listed in the table; however, it was indicated that statistical data are inconsistent with the distribution of results from all other techniques and are called **outliers**. Therefore one ought to look at these data with great caution. All the more so because the IZCT and the MQTZCT have not been verified by independent researchers. Furthermore, the APA drew attention to some shortcomings in the validation process of these techniques.

For example, the generalizability of results relating to IZCT is limited by the fact that no measures of test reliability have been published for this technique. There were also significant differences between sampling distributions from different studies.

Moreover, the developer of MQTZCT reported a near-perfect correlation coefficient of 0.99 for the numerical scores. He suggested an unprecedented high rate of inter-scorer agreement, which is unexpected bearing in mind the complexity of the method. In addition to this, scores were not provided for those cases that were not scored correctly.

Some popular techniques were omitted from the list. Among them one can mention: the US Army MGQT, Reid technique (GQT), searching POT, Marcy and R/I. The Army MGQT failed to satisfy criterion accuracy. Most studies regarding the Reid technique could not be included in the meta-analysis. The reasons for their exclusion include serious sampling confounds, insufficient information to calculate all of the statistics of interest to the meta-analysis, use of test-data-analysis models that differ substantially from the Reid method, and the use of instrumentation and testing procedures that differ substantially from actual field practices (APA, 2012). In turn, anyone using the R/I or Marcy techniques was permitted to do so throughout 2012 to allow time for further validation studies. However, there is no indication of Marcy's probable success. A few unpublished studies regarding the R/I technique exist, but they show only around a 75% accuracy level.

Examiners who want to use techniques researched by themselves should label such techniques as "experimental". Nothing precludes the use of supplementary techniques to support a decision based on a validated technique. However, such techniques shall not be used as the sole basis for a final opinion after a polygraph examination. The list of permissible polygraph techniques remains open. It can be extended provided that a technique fulfils criteria of scientific validation, minimum accuracy levels and maximum levels of inconclusive results.

The list of validated techniques includes **4 major standardized test data analysis methods**: 7-position US Federal, University of Utah, Empirical Scoring System and Lykken scoring.

Lykken scoring is the TDA method for the CIT/GKT. It entails the ranking of the electrodermal response amplitudes from 2 to 0. If the largest EDR takes place on the key item, the score for that test is a 2. If the second largest EDR takes place on the key item, the score is a 1. All others are scored 0. Reactions to the first buffer are ignored (Krapohl, McCloughan, Senter, 2006). The cutoff for a call of "RI – recognition indicated" is equal to the number of CIT subtests.

Other TDA methods are used for comparison question tests (see table 2 and 3). The oldest is the **US Federal Government scoring system** (a modification of the Backster scoring system developed in 1963). It was based on 22 diagnostic features taught by the United States Army Military Police School (Weaver, 1980). In 2006 the Department of Defense Polygraph Institute (DoDPI) made changes in physiological criteria (it kept 8 main features and introduced 3 auxiliary ones). Cutoff scores and decision rules were not modified at that

time. Since 2010, the National Center for Credibility Assessment (NCCA) has been responsible for the polygraph examinations program in the United States. Three variants of the Federal TDA model exist: "7-position", "7-position evidentiary" and "3-positon". The first two are valid and satisfy APA 2012 standards. Decision accuracy for 3-position techniques was not significantly different from 7-position, but inconclusive rates were excessive and beyond the boundaries permitted by the APA 2012 standards. Nevertheless, the three-position scoring model is valid in a scientific sense and can be used in field settings when field practices require that the results of inconclusive tests are re-evaluated using another validated TDA model.

The next system was developed as a result of studies that had been carried out by researchers from the **University of Utah** (Salt Lake City) since the 1970s. The main researcher was David Raskin. They generally concluded that the numerical scoring of polygraph charts produces higher rates of accuracy and reliability than any sort of chart interpretation. However, they deemed systems known so far to be imperfect. Some elements of both existing models: the Backster and the US Army (in the version before the fundamental modification) did not have satisfactory scientific grounds. Researchers decided to modify the Backster system, which – in their opinion – contained too complicated rules and was disadvantageous for truthful persons. As a consequence, the complete Utah approach to comparison questions testing (including Utah ZCT, Utah MGQT) together with the numerical evaluation system were developed. These methods were confirmed by many research studies and peer reviewed publications in the following 30-40 years.

The newest, least complicated and also very well scientifically documented system is the so-called **Empirical Scoring System**. It was first described in 2008 by R. Nelson, M. Handler and D. Krapohl. Only main patterns of reactions from a wide group of diagnostic features described in the literature are subject to test data analysis in the ESS. Results of this analysis are compared to cutscores dependent on the adopted tolerance of error, the required level of statistical significance and the probability of error on the basis of representative data. Tolerance of error for deceptive scores was established at the 5% level (α = 0.05), and for truthful results – at 10% (α = 0.1). This concerns grand total scores. However, when decisions are made on the basis of subtotal scores, the Bonferroni correction is applied. This is a procedure to correct for the potential for increased false-positive errors. As a consequence, in ZCT formats with three relevant questions, alpha must be divided by 3 – that gives us corrected α = 0.017.

Experiments have confirmed that ESS produces similar results when it is used both by qualified experts and inexperienced examiners. Therefore, it has a chance to become a main polygraph TDA model with universal application.

Channel	TDA Method		
	US Federal	Utah	Empirical Scoring System (ESS)
Pneumo (respiration)	Start of reaction: from the stimulus onset to 1 full cycle after the answer. Range of reaction: ≥ 3 cycles. • suppression (decrease in amplitude), • apnea, • change in inhalation and exhalation ratio, • progressive decrease in amplitude, • slowing of rate, • temporary change in baseline (secondary feature – as contrasted with above – non-RLL feature).	Start of reaction: from the stimulus onset to 5 seconds after the answer. Range of reaction: ≥ 3 cycles, up to 20 seconds if response began at appropriate time. • decrease in amplitude, • baseline arousal, • apnea, • slowing of rate.	Start of reaction: no rigid rules; generally from the stimulus onset to 5 sec. after the answer. Range of reaction: ≥ 3 cycles, up to 15-20 seconds. • decrease in amplitude, • slowing of rate, • baseline arousal.
EDA (electrodermal activity)	Start of reaction: from the stimulus onset to the answer. Range of reaction: from start of reaction to return to the baseline preceding stimulus onset. • amplitude (main feature measured from the baseline to the peak of reaction), • complexity (the curve does not return to the baseline but another physiological arousal occurs), • duration (period of time between the start of reaction and return to the baseline). The last two features are taken into account only when both compared EDA amplitudes are similar.	Start of reaction: 0.5 sec. from the stimulus onset to 5 sec. after the answer. Range of reaction: from start of reaction to return to the baseline. • amplitude, • auxiliarly: duration and complexity.	Start of reaction: no rigid rules; generally from the stimulus onset to 5 sec. after the answer. Range of reaction: up to 15-20 sec. • amplitude.

Cardio (relative blood pressure and pulse rate)	Start of reaction: from the stimulus onset to the end of the answer. Range of reaction: from start of reaction to return to the baseline (on diastolic side). • increase of baseline (main feature), • decrease in pulse rate (if the main feature does not occur), • duration (auxiliarly – when compared changes of baseline are equal).	Start of reaction: from the stimulus onset to 5 seconds after the answer. Range of reaction: from start of reaction to the return to the baseline. • baseline arousal (curve increase – more clear on diastolic side), • duration.	Start of reaction: from the stimulus onset to 5 seconds after the answer. Range of reaction: up to 15-20 seconds. • amplitude (curve increase).
PPG (changes in blood volume in blood vessels of the finger-tip of the hand)	• no recommendations	Start of reaction: from the stimulus onset to 5 seconds after the answer. Range of reaction: up to 20 seconds. • amplitude reduction and duration of that change.	Start of reaction: 2 seconds from the stimulus onset to 5 sec. after the answer. Range of reaction: up to 15-20 seconds. • amplitude reduction.

Table 2. Diagnostic criteria used in validated polygraph test data analysis systems.

	TDA Method		
	US Federal	**Utah**	**Empirical Scoring System (ESS)**
General Guidelines	• 7-position scale: 0 – equal or no responses to compare, +1/-1 – subtle difference, +2/-2 – definite difference, +3/-3 – dramatic difference.	• 7-pos. scale: 0 – equal or no responses to compare +1/-1 – noticeable difference, +2/-2 – strong and clear difference, +3/-3 – dramatic difference, stable curve and the most significant response on the chart. • 3 or 5 charts (if inconclusive after 3 charts).	• "bigger is better" rule – we score any noticeable difference between responses; • only 3-pos. scale [+1, 0, -1], ▪ exclusion for EDA: ▪ 3-pos. scale but scores are doubled: [+2, 0, -2].

Pneumo	• usually scores: +1/-1, very rarely +2/-2, never +3/-3. • in case of two equivalent diagnostic features we measure the time window of longer reaction and then we compare length lines (RLL) in the same time windows of reactions.	• usually scores: +1/-1, very rarely +2/-2, never +3/-3. • in case of two equivalent diagnostic features we take into account the duration of reactions (the segment of curve for comparison must be in the reaction window from stimulus onset to 10 subsequent seconds).	• reaction vs. reaction = 0 • apnea is taken into consideration only at relevant questions (it's easy to create artificially), • it is recommended to give 0 in the tests with directed lie questions.
EDA	• 1 = amplitudes ratio not greater than 3:1, • 2 = ratio > 3:1 < 4:1, • 3 = ratio ≥ 4:1. • if there is no reaction to one of the compared questions, we apply the rule regarding quantity of chart divisions: 1 = up to 2 divisions, 2 = from 2 to 3 divisions, 3 = more than 3 divisions.	• 1 = double difference in amplitude, or 1.5:1 ratio + duration and complexity, • 2 = triple difference in amplitude, or 2.5:1 ratio + duration and complexity, • 3 = quadruple difference in amplitude, and the most significant response on the chart.	• +2, 0, -2
Cardio	• 1 = up to 2 times greater increase in baseline, • 2 = from 2 to 3 times greater reaction, • 3 = at least 3 times greater reaction. • if there is no reaction to one of the compared questions, we apply the rule regarding quantity of chart divisions: 1 = up to 2 divisions, 2 = from 2 to 3divisions, 3 = more than 3divisions.	• 1 = magnitudes of reactions ratio 1.5:1, • 2 = ratio 2:1, • 3 = ratio 3:1 and the most significant response on the chart.	• +1, 0, -1
PPG	• no recommendations.	• scores 1 or 2, never 3.	• +1, 0, -1.

Cut-off scores	• the same cutscores for 7-pos. and 3-position scales. • **ZCT** **DI** – when grand total ≤ -6 or any subtotal ≤ -3 **NDI** – if every subtotal (spot total) ≥ +1 and grand total ≥ +6 **INC** – other results. • **You-Phase** (Bi-Zone) **DI** – when grand total ≤ -4 or any subtotal ≤ -3 **NDI** – if all subtotals ≥ +1 and grand total ≥ +4 **INC** – other results. • **DLST** **SR** – if grand total ≤ -4 or when any subtotal ≤ -3 **NSR** – when all spots ≥ +1 and grand total ≥ +4 **INC** – other results.	• single issue test (Utah ZCT): **DI** – if grand total ≤ -6 **NDI** – grand total ≥ +6 **INC** – other results. • multi-faceted (Utah ZCT, Utah MGQT) and multiple issue (Utah MGQT): **SR** – if grand total ≤ -6 and all subtotals are negative; or any sub-total ≤ -3 **NSR** – when grand total ≥ +6 and all subtotals are positive **INC** – other results.	• **ZCT** **DI** – when grand total ≤ -4 or if any subtotal ≤ -7 **NDI** – if grand total ≥ +2. Exception: consider as inconclusive if within test point difference of more than 7 points (e.g. R1:-2, R2:+6) **INC** – other results. • **You-Phase** (Bi-Zone): **DI** – if grand total ≤ -4 or sub-total ≤ -6 **NDI** – if grand total ≥ +4. Exception: consider as inconclusive if within test point difference of 7 points or more (e.g. R1:-3, R2:+6) **INC** – other results. • **MGQT** and **DLST** **SR** – if any subtotal ≤ -3 **NSR** – when all subtotals ≥ +1. **INC** – other results.

Table 3. Numerical polygraph charts evaluation and decision rules according to major TDA models: US Federal Government, University of Utah and Empirical Scoring System.

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Search for New Tests

Key Words: polygraph techniques, polygraph test, Event Knowledge Test

Widely known sources (Mangan, Armitage, Adams, 2008; Matte, 2012; Raskin & Honts, 2002; Shurany & Chaves, 2010) state that minimum 90% criterion accuracy may be achieved when using Control Question Tests (CQT) in polygraph examinations. Such results can probably only be achieved by polygraphist-superstars. However, we will not perform an analysis of the reasons thereof in this article. As we did not achieve results that were satisfactory for both us and our customers by using CQT in criminal investigations in the past, we have been using the significantly more informative Event Knowledge

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Test (EKT) since 2004 (Saldžiūnas & Kovalenka, 2012a;2012b). The Latvian police have problems when they provide CQT examination results in court (Ivancika, 2012). The polygraphists of the Serbian police achieve only approx. 66% reliability by using CQT (Djurovic & Mijovic, 2011); the polygraphists of the Croatian police detect lies in 45% of cases (Grgurić & Pavlović, 2011). Some examiners experience other CQT-related problems in their practice. (Shurany, 2011;2012). Such results satisfy neither the polygraphists nor the courts. Therefore, polygraphists are continuing to look for ways to ensure more reliable results. The polygraphists of the Serbian police use psychological tests in addition to polygraph tests (Djurovic & Mijovic, 2011). The polygraphists of Russian (Oglobin & Moltchanov, 2004) police use CQT and Concealed Information Tests (CIT) together in order to obtain more reliable results. Matte (1997) also included Fear of Error control and Hope of Error relevant questions in CQT.

Another way to obtain more reliable results of the polygraph examination is to improve the methodologies of the polygraph examination. In our opinion, an original solution was chosen by Korovin (Fedorenko, 2009). This solution is based on the idea that *the criminal knows themself.* Korovin suggested including the following relevant questions in CQT:

– Do you know the name of the mother of the person who participated in the theft of money from the strongbox of the bookkeeping office at all? (We translated this and other questions from Russian and did not edit them.)
– Do you really know the home address of at least one person who participated in the recent theft of money from the company "K"?

In our opinion, such wording of the questions should be analyzed in a matter-of-fact manner. We will not delve deeply into the issue of the wording of these questions here. Fedorenko (2009), a colleague of Korovin, notes that the person (the criminal) may have been brought up in a family without a mother or a father. He also believes that the examinee may know the home address of the person whom he suspects of a crime. In such a case, Fedorenko (2009) suggests the following relevant questions:

– Do you know how one of the people who participated in the theft of money from the strongbox of the bookkeeping office spent yesterday evening?
– Do you really know where the person who really participated in the theft of money from company "K" is at the moment?

Naturally, the question of whether the examinee will personalize these questions arises. This means that, as one is examined by a polygraph – i.e. one is

a suspect already (Ekman, 1992), one will feel fear for these reasons alone and responses may be recorded after these questions. Fedorenko (2009) asserts that he has not recorded such responses during ten years of examinations. We believe that a good lawyer may successfully use this weakness of the questions in court.

As we have already mentioned at the beginning of the article, most examiners do not trust CQT results very much. That is why Fedorenko (2009) recommends additionally using CIT drawn up based on the principle *the criminal knows them self* after application of the CQT. If it is found out during the criminal investigation that the suspect resides in a block of flats, Fedorenko (2009) recommends constructing the question roughly as follows:
Do you know what type of house or flat the criminal resides in?
0. Does the criminal reside in a masonry house?
1. Does the criminal reside in a yellow brick house?
2. Does the criminal reside in a wooden house?
3. Does the criminal reside in a block of flats?
4. Does the criminal reside in a red brick house?
5. Does the criminal reside in a white brick house?

We believe that an examinee who resides in a block of flats may think of their home first of all and a higher or lower response should be recorded after "Does the criminal reside in a block of flats?" regardless of whether they are "guilty" or "innocent". We want to inform readers that a great number of blocks of flats were built in the former Soviet Union. Therefore, the question of whether this item is informative enough, i.e. whether it is useful for the examination, arises.

When we familiarized ourselves with this idea for the first time, we became interested in it. We were thinking of ways to use it when formulating EKT tactics. An idea occurred to us: if the examinee is blond, approx. 180 cm height, owns a dachshund, etc., the following EKT questions/answers may be constructed (Saldžiūnas & Kovalenka, 2008a;2008b;2008c;2009a;2009b;2011):
Can you describe the hair of the murderer of person K?
0. Brown
1. Black
2. Grey
3. Blond
4. Of different colour
5. You do not know the colour of the murderer's hair

Do you know the height of the murderer of person K?
0. Approx. 200 cm
1. Approx. 150 cm
2. Approx. 190 cm
3. Approx. 180 cm
4. The murderer's height is different
5. You do not know the murderer's height

Do you know what breed of dog the murderer of person K owns?
0. Boxer
51. Bulldog
2. Dachshund
3. Wolfhound
4. Other dog
5. You do not know the breed of dog that the murderer owns

Very many questions may be constructed in an analogous manner.

Nevertheless, we declined this idea and did not include it in EKT tactics. We believe that:

– The examinee should personalize (identify with them self) the questions to a greater or lesser extent. We have already written that defence lawyers will neutralize these questions in court as unreliable. The rest of the questions may be insufficient for a(definitive) court ruling in such a case or the court may rule that the polygraph examination was performed incorrectly and the conclusions thereof are unacceptable in the court as they are unreliable.
– Although very many questions may be constructed in such a way, they all repeat in terms of their content and do not reveal any new information. We believe that this option may be used in CIT tests. CIT tests (Konieczny, 2009; Krapohl, McCloughan & Senter, 2006; Osugi, 2011) are repeated 3-5 times during the examination. By using the principle described herein, another question from this series may be included instead of repeating a question. We believe that the adaptation process of the examinee may take place more slowly in such a case.
– The objective of EKT is to check the versions of a criminal event (Saldžiūnas V., Kovalenka A.;2012c). These questions do not provide any information for checking the versions. On the other hand, a lot of questions asked during the examination prolong the examination. We agree with the Japanese polygraphists' (Osugi, 2011) statement that only the most significant and necessary questions must be selected for the examination.

We hope that some practising polygraphists will find something rational in these ideas. Generalizing, we want to say that it is great that some polygraphists are putting forward new, daring ideas. By checking them in practice, the best ideas may be selected and polygraph examinations may be made more reliable in this way. We are planning to review other interesting ideas as well in the near future.

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Polygraph Examination in Criminal Cases. Current Polish Practice. A Critical Study

Key Words: polygraph examination, evidence, polygraph in Poland, legal admissibility of polygraph

In total, according to data reported for our research by Police, Military Police, Border Guard and General Public Prosecutor Office in 2005–2012 they performed 570 examinations in criminal cases (the fewest in 2005 – 8, and the most in 2011 – 158).

In the same period approximately one million criminal cases were initiated in Poland each year (with the most in 2005 – 1,235,239, and the fewest in 2010 – 964,616).

This shows that the polygraph is hardly ever employed in criminal cases. In 2011, when examinations were conducted in altogether 158 instances, 981,460 cases were initiated.

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The scarce use of such examinations in criminal cases in Poland proves both the low efficiency of the examinations conducted, which seems to attest to the low competencies of polygraphers, and also the fact that the investigating authorities are not capable of making appropriate use of polygraph examinations in their cases.

In Poland, polygraph examinations are conducted primarily to examine candidates for the police and special forces, and also for screening tests in such forces. The legal grounds for such examinations are clear regulations in the acts of law concerning such services. On the contrary, subjecting other civil servants or officers of local, regional, and central governments to polygraph examinations – when such a procedure is not clearly admitted by an act of law – is assumed impermissible.

Similar examinations are also performed in private business, especially on candidates for work in private security companies protecting people and goods (i.e. in "private police forces"), and also on people already working in such firms. There is a lack of clear regulations regulating the admissibility of polygraph examination in the private sector.

It is generally assumed that such examinations are allowed if certain conditions are met. It is obvious that an examination may be performed only with the consent of the examinee, and test questions may concern only such information on the employee to which the employee is otherwise entitled. Sometimes another condition is also raised, namely, that the option to conduct such examinations should be included in the job contract (Widacki, Cempura 2012). The result of the examination itself justifies neither making an employee redundant nor starting a disciplinary procedure against one. In other words, the result of the examination does not entitle the employer to such actions against an employee to which the employer would not have been entitled without such an examination. In most cases, procedures of this type for the use of private business are performed by private companies providing the relevant services. In Poland, unfortunately, unlike in many other countries, no licence is required to perform polygraph examinations.

Polygraph examinations in Poland are also performed for the needs of criminal investigations and, more generally, criminal trials. Performance of such examinations is permitted verbatim by the Code of Criminal Procedure since its amendment in 2003 (see: Art. 192a, and Art. 199a of the Code).

Unlike in the United Kingdom, no polygraph examinations are performed on people convicted of sexual crimes in order to focus the therapy properly and later to control the effects(Wilcox 2009).

Yet even earlier, the Code of Criminal Procedure explicitly allowed polygraph examinations in trials. Such examinations were conducted both for preliminary elimination of suspects and in taking evidence. The first use of polygraph examinations as evidence in a Polish criminal trial took place in the 1960s (Widacki 2007).

From that time, until 1990, polygraph examinations were very occasionally conducted, most often in homicide cases.

At this time, polygraph examination in Poland have been performed either by academics from university departments of criminalistics, who also conducted experimental research in the area, or by military experts.

Neither the police, nor the Institute of Forensic Research (IFR)of the Ministry of Justice had a polygraph machine or their own experts in the field.

Now, for over a decade, polygraph examinations in criminal cases have been performed in five police centres (regional headquarters in Białystok, Bydgoszcz, Katowice, Łódź, and at the Central Forensic Sciences Laboratory of the Police in Warsaw), as well as in the centres of the Military Police and Border Guard.

Although performed very rarely, such examinations are among services offered by the Polish Forensic Association (Polskie Towarzystwo Kryminalistyczne), performing expertise for the needs of the Polish judiciary in various fields, and also by private experts. The last group are in most cases academics dealing with the scientific aspects of the question, and also other people, including retired officers who had a longer or shorter involvement with polygraph examinations during the service.

As far as the ascertainment of the number of examinations performed in criminal cases by polygraphers employed in governmental and academic institutions is possible and relatively easy, there is an absolute shortage of data on the number of examinations performed by private experts. However, it can be estimated that they conduct no more than anything from 5% to 10% of all the examinations performed in criminal cases.

Despite the legal admissibility of polygraph examinations in criminal cases, such procedures are hardly ever employed. In Poland in recent years, the

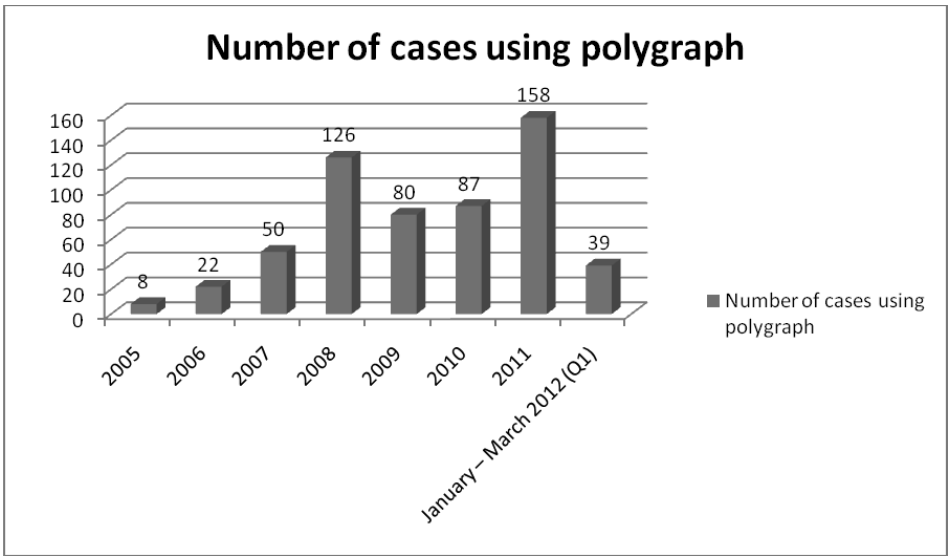
Police, the Military Police, the Border Guard, and academic institutions have performed polygraph examinations in a few hundred criminal cases altogether. Majority of them it was homicide cases. Only Military Police recently conducted polygraph examination in cases of theft (even in small thefts) commited in military barracks or camps.

A detailed list of the cases in which the polygraph was used is presented in Table 1.

Table 1.

Year	Number of cases using polygraph
2005	8
2006	22
2007	50
2008	126
2009	80
2010	87
2011	158
January – March 2012 (Q1)	39

Table 1 (Source: own research)



In this time, approximately one million criminal cases per annum were conducted in Poland (ranging from 1,235,239 in 2005 to 964,616 in 2010). This means that polygraph examinations were commissioned in an infinitesimal number of cases.

Table 2 presents the number of criminal cases initiated in individual years, and the percentage of cases in which polygraph examinations were performed.

Table 2.

Year	**Number of initiated criminal cases**	**Promilles of cases in which polygrapher examinations were commissioned**
2005	1,235,239	0.006
2006	1,156,031	0.02
2007	1,014,695	0.05
2008	968,620	0.1
2009	994,959	0.08
2010	964,616	0.09
2011	981,460	0.8
2012	No data	

Table 2 (Source: General Headquarters of Police and own data)

Obviously, not every criminal case requires polygraph use, and in some it makes no sense. One such case is when the suspect confesses, which is corroborated further by other evidence raising no doubt. As a rule, such a procedure is not applied in minor criminal cases either. If one were to consider only the gravest criminal cases, the percentage making use of the examination would probably be somewhat higher, yet still very low. To compare, it is worth noting that in 2011, the year when relatively the largest number of polygraph examinations were conducted, one such examination was on average performed in every 6705 criminal cases!

We do not have data, even estimations, concerning the percentage of criminal cases in which a polygraph examination is justified. Yet using elementary experience, it can be said that such a proportion is definitely many times higher than the current fraction of a percent.

It is therefore justifiable to conclude that polygraph examinations in Polish criminal cases are an absolute exception.

The lack of popularity of the polygraph may generally result from two fundamental reasons appearing independently or jointly:
1) low efficiency of the examinations conducted
2) lack of trust for the method.

In turn, the low efficiency of examinations may result either from the poor preparation of experts performing the studies or from commissioning such examinations too late, while it is general knowledge that polygraph examination is most efficient in the earliest possible phase of the procedure, immediately after the first contact with the suspect (e.g. upon arrest) (Widacki 2008).

Theoretically, the low efficiency of the examinations may also result from poor collaboration of the prosecution and expert polygrapher in charge of the examinations. In brief: the prosecution officers may not be ready to use polygraph examinations.

Preliminary research (M. Widacki, 2013) seems to corroborate these presumptions. Polygraph tests are very often commissioned by prosecutors or officers at advanced stages of the investigation, when the subject has already been remanded in custody for weeks if not months, and has previously been interrogated, possibly repeatedly, and participated in numerous investigative procedures (recognitions, confrontations).

Frequently, antiquated (e.g. Reid) and rather ineffective (e.g. GKT, CIT) techniques are used for conducting tests, often with unjustified deviations from the principles approved for the given technique and with the assessment of the results being performed almost exclusively with quality-based methods, control questions being incorrectly selected, and pre-test interviews lasting no more than several minutes.

Reports from the tests are often written in an enigmatic manner (e.g. "the subject of the examination reveals an emotional link … yet …" etc.) and tell the officer in charge of the investigation hardly anything, thus being of little use for the investigation.

Lack of trust of examinations acting as a deterrent from commissioning them, despite legal and organisational capacity, may also have a certain link to the traditional reluctance of European lawyers to the polygraph. In Poland, before the Code of Criminal Procedure approved legal admissibility of polygraph examinations in criminal cases and recognised the results of the examination as evidence, most legal scholars, experts in criminal procedure, strongly opposed

such examinations, and the sentences of the Supreme Court were not unanimous in the matter.

The diagnostic value of such examinations raised doubts. Although it is a paradox, the diagnostic value of a polygraph examination has been investigated far more precisely than that of many other methods of identification offered by forensic sciences (Widacki, Horvath 1978, Committee Report 2011), such as tool marks, contact traces, or even handwriting analysis.

The lawyers found it a problem to qualify the results of polygraph examinations. Are they circumstantial evidence – much like the ones provided by various forensic sciences, or direct evidence – like the admission of the suspect during an interrogation (see: Inman, Rudin 2001). The closer the diagnostic value of a polygraph examination to 100%, the more such evidence resembles direct evidence.

The latest research and analysis prove that the validity of the polygraph lies more or less in the range of 83% to 95% of correct indications, with the level of non-conclusive examinations at the level of 13% (see for example : Committee Report 2011).

Thus, in every case, the opinion of an expert drawn up after each polygraph examination must be judged by the court that performs this evaluation in the context of other evidence (by the way, of similar diagnostic value) that the court has gathered and assessed. In this scope, the result of polygraph examinations must be treated just like any other circumstantial evidence provided by forensic sciences.

Thus a polygraph examination may be of great use for the investigation, and as such should be resorted to far more often than is the case nowadays. This, however, requires better professional training of people conducting the investigations and improvement of the level of the examination itself.

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Book reviews

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Courts, Law, and Justice,
ed. W.J. Chambliss,
SAGE, Los Angeles 2011, pp. 317

Published in the Key Issues in the Crime and Punishment series, the volume consists of an Introduction and 20 relatively brief essays on highly varied subjects, primarily related to law and criminal and forensic sciences. As the editor of the volume says: "although the topics of this volume are quite varied, the authors all provide detailed overviews of the development of the justice system and give consideration to the contrasting leading opinions that support or denounce the laws and policies used during the investigative, prosecutorial, and sentencing processes" (p. XV). The persistent highlighting of segments that contain arguments for and against the concepts discussed in every chapter is an editorial practice certainly worth noting.

The chapters on "DNA Evidence", "Expert Witnesses and Hired Guns", "Eyewitness Testimony and Accuracy" and "Polygraphs" are most relevant to readers interested in forensic sciences.

"DNA Evidence" is a simple introduction to the issues of genetic identification tests. The main question discussed in the article is the existence and development of databases using genetic material samples from the entire population, i.e. all citizens of a given state. Champions of building databases in such a format point to the benefits stemming from the practice: the equal treatment of all people, a deterrent to committing crime, the possibility of running tests and

validations at any stage of the procedure, etc. Suggestions include collecting biological material from new-born children. Opponents of developing such databases suggest that their existence constitutes a major threat to privacy and individual rights, especially to the principle of presumed innocence.

The chapter entitled "Expert Witnesses and Hired Guns" is at a level below basic. Although its subtitles indicate coverage of "Psychiatric/Psychological Evaluation", "Physical Evidence Evaluation", and "Documentary and Computer Evidence Evaluation" in the chapter, there is actually not a word on the essence of the methods mentioned above or an assessment of results obtained from such procedures. In turn, we are informed that, e.g. to obtain the qualifications necessary to practise as an expert investigating material evidence, you need to complete a few-week-long course in a specialised police school. The "Hired Guns" mentioned in the title refer to experts who are ready – in return for exorbitant rewards – to challenge officially appointed experts, while the conclusion presented to the reader boils down to lamenting the very limited (for very financial reasons) availability of these hirelings to accused persons not willing to subscribe to the point of view of official experts. The chapter ends in a surprising discussion, namely as to whether to use experts at all, as "the use of expert witnesses entails certain social costs, which include delay and financial costs. However, not using expert witnesses increases the chances of innocent people being convicted of crimes they did not commit" (p. 100). Following that line of reasoning, it is easy to note that an absolute liquidation of the judiciary would solve the problem "of innocent people being convicted of crimes they did not commit" once and for all, not unlike many other problems.

Far more interesting is the following chapter, namely "Eyewitness Testimony and Accuracy". Its author, Lisa E. Hasel, describes problems related to eyewitness identification carefully and competently, for – contrary to what the title suggests – this is what the chapter is about. Within we find highly valuable comments concerning the psychological grounds for an investigation, the circumstances behind tactical actions and an analysis of the variables influencing identification effectiveness. Moreover, the author also looks at the results of new research on line-ups, and considers the sequential line-up, making the important observation: "If the ultimate goal is to have as few mistaken identifications as possible, then a sequential line-up should be used; but if the ultimate goal is to have as many correct identifications as possible, then a simultaneous line-up should be used" (p. 112). The chapter ends with a comment whose theoretical and methodological significance would be difficult to overestimate: "If legal practitioners treat eyewitness testimony as

trace evidence and take the same precautions with eyewitnesses as they do with other pieces of evidence, then it has the potential to be very accurate" (p. 112). Bravo!

As far as the last chapter discussed here is concerned, one must admit that its title alone raises eyebrows, as the term "Polygraphs" seems more appropriate for a commercial offer or a section on an exhibition of equipment used for investigation purposes.

Apart from a number of obvious inaccuracies, e.g. reducing the role of L. Keeler in the establishment and development of the method, the use of dated terminology (e.g. the article speaks of the "control" and not the "comparison" question technique), the entire text is a fairly well balanced essay on polygraph examinations. Unfortunately, the criticism of certain aspects being not up-to-date concerns not only petty terminological matters. One has the impression that the author's knowledge on polygraph examinations does not extend beyond 2003: the date of publishing of the famous Polygraph and Lie Detection report of the National Academy of Science, repeatedly referred to in the essay. It is true that the weak points of examinations emphasised in the report were (partly) justified, yet it was that very document that provided inspiration for a leap in the development of the theory and practice of examinations in successive years, which unfortunately was absolutely glossed over in the chapter. This, one could presume, is caused by the too limited bibliographical basis for the text. It would be hard to find references to authorities of the magnitude of C. R. Honts, F. Horvath, D. J. Krapohl, J. A. Matte, D. C. Raskin and many others in the literature referred to. Moreover, the bibliography fails to perceive the several decades of publication of the world's most important journal devoted to examinations, namely *Polygraph* quarterly. Possibly, this is why "Polygraphs" is not one of the book's fortes.

In general terms, *Courts, Law, and Justice* provides an introduction to selected questions related primarily to penology. However, it seems that to be fully satisfied with its content a reader needs to operate beyond these sciences, and possibly be a beginner student of law.

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

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