A Focused Polygraph Technique for PCSOT and Law Enforcement Screening Programs

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The real voyage of discovery consists not in seeking new lands, but in seeing with new eyes. - Marcel Proust, French novelist

Abstract

Testing techniques most commonly used in polygraph screening programs were adapted from protocols originally developed for event-specific investigative polygraph testing, including the examination structures and decision rules. Screening examinations are being increasingly recognized for providing a unique and powerful tool for decision-makers and with the widening demand for polygraph screening services there is a commensurate obligation for polygraph professionals to give attention to oft-neglected questions regarding the validity and reliability of the methods they employ. In that vein, the authors propose a focused approach for polygraph screening, derived from a validated polygraph screening technique developed at the Department of Defense Polygraph Institute (now the Defense Academy for Credibility Assessment). In addition, we suggest selecting investigation targets that are informed by risk prediction and risk management research, and are consistent with our present understanding of the psychological and physiological mechanisms upon which the polygraph technique depends. An example of this approach is provided.

Background

Screening polygraph examinations are those conducted where there is an absence of a known event or known allegation. Polygraph screening has been used since as early as the 1930's when Leonarde Keeler signed an agreement with the insurance firm Lloyds of London to periodically test bank employees for embezzlement (Alder 2007). Krapohl and Stern (2003), however, provided an overview of the challenges inherent in screening polygraph programs in their discussion of the "successive hurdles" approach (Meehl & Rosen, 1955). Research by Barland, Honts, and Barger (1989) and Honts (1992) revealed potential inadequacies existed in polygraph screening methods employed at the time.

One early screening test, the Counterintelligence Screening Test (CIST) was developed around 1971 by US Army military intelligence examiners using directed-lie comparison (DLC) questions (Barland, 1981). DLC questions are those which the examiner instructs the examinee to answer falsely (Honts & Raskin, 1988; Raskin & Honts, 2002). Studies using DLC techniques (DoDPI Research Division Staff, 1997; Research Division Staff, 1998) suggested that a DLC approach and other improvements in test administration structure and decision policies contributed significantly to polygraph testing program objectives of sensitivity to deception and specificity to truthfulness.

There are undoubtedly fewer field and laboratory studies that address validity of the DLC

than the PLC. However, the results of existing laboratory studies (Barland, 1981; Barland *et al.*, 1989; DoDPI Research Division Staff ,1997; DoDPI Research Division Staff, 1998; Honts & Raskin, 1988; Horowitz, Kircher, Honts & Raskin, 1997; Kircher, Packard, Bell & Bernhardt, 2001; Reed, 1994) have shown the DLC to perform as well or better than the probable lie comparison (PLC) questions. DLCs require less complex administration practices than those associated with the PLC approach and offer greater potential for standardization.

The Research Staff at DoDPI undertook an effort to address the perceived inadequacies of the currently used screening tests and eventually created the Test for Espionage and Sabotage (TES). The design specifications of their improved screening technique included the standardization of the pretest portion of the examination, as well as standardization and reduction of investigation targets to two primary issues. The two target issues are usually presented three times each in a single examination chart. Test protocols allow for the inclusion of additional investigative targets in a separate series of questions, again conducted within a single examination. Variability in test administration is reduced through the presentation of each test question in a standardized sequence. The testing protocol includes a standardized acquaintance test, a standard rationale and explanation of the DLC questions, a standard explanation of instrumentation and psychophysiological responses and a standardized in-test chart presentation. Decision policies require that the examinee is regarded as responding significantly to the examination as a whole, rather than to individual questions, if the observed responses are significant or consistent with those expected from deceptive persons. The National

Research Council (2003) reported the accuracy index (A) of the improved screening test to be 0.90.

One relevant study (DoDPI Research Division Staff ,1997) compared the TES to the CSP using PLCs and the CSP using DLCs. There was no significant difference in the overall accuracies in identifying programmed innocent participants; 89%, 95% and 95% for the TES, CSP-PLC and CSP-DLC, respectively. However, for *programmed guilty* participants, the TES format outperformed both versions of the CSP; 83% for the TES versus 56% for CSP-PLC and 59% for CSP-DLC. These accuracy estimates are given excluding inconclusive rates which were 21%, 23% and 20% for the TES, CSP-PLC and CSP-DLC, respectively.

The DoDPI Research Division Staff (1998) conducted a second study as a formal replication of the first study using data from the first TES study to evaluate new scoring criteria in an effort to improve upon the technique. In this second study innocent examinees were identified with 98% accuracy and guilty examinees with 83% accuracy. The researchers reported an initial average inconclusive rate of about 15% but this was later reduced to an inconclusive rate of 2% for the innocent and 0% for the guilty after continued testing to resolve inconclusive tests.

Reed described a third TES study (Reed, 1994) addressed examiner subjective opinion bias, an expanded comparison question list, question formatting and wording, and a "team approach" to the administration of the TES. The "team approach" portion of the

study explored an approach where one examiner administered half of the examinations including the pre-test, in-test, and data analysis phases. The remaining half of the examinations was performed by two examiners; one conducted the pre-test and one conducted the in-test. Both examiner-members of the team evaluated the test data individually. The overall combined accuracies (excluding inconclusive results) were 85% for the innocent, 78 % for the guilty with an average initial inconclusive rate of about 13%. In summary the three studies indicated that the TES could produce accuracy rates that were significantly above chance levels.

Standardization of any technique can serve to increase inter-rater and test-retest reliability and both measures constrain the potential validity of a technique. Excessive variability in test administration or interpretation will necessarily compromise the reliability and validity of any test method. Inter-rater reliability is a concern that will remain of paramount importance to questions about polygraph validity. When standardized practices are based on principles that are consistent with validated constructs and data obtained through the objective study of data, we can more reasonably anticipate that improvements will contribute meaningfully to the test design goal of criterion validity.

Test Description

Following existing practices we defined a screening technique we call the Directed-Lie Screening Test (DLST) that contains two neutral questions (N1, N2), a sacrifice relevant question (SR), two separate relevant questions (R1, R2) and two comparison questions

(C1, C2).

The sequence is as follows;

N1- Neutral or Irrelevant question

N2- Neutral or Irrelevant question

SR- Sacrifice Relevant question

1C1- First presentation of DLC#1

1R1-First presentation of R1

1R2-First presentation of R2

1C2-First presentation of DLC#2

2R1-Second presentation of R1

2R2-Second presentation of R2

2C1- Second presentation of DLC#1

3R1-Third presentation of R1

3R2-Third presentation of R2

2C2-Second presentation of DLC#2

Presentation of the question sequence is intended to be standardized except when it is necessary to present an additional neutral question before proceeding with the next test question. Additional presentations are allowed when three artifact-free presentations of each have not been obtained. In the latter case, examiners are permitted to present the question sequence a fourth time. This can take place as a fourth presentation of the test

stimuli within the single examination chart or through the completion of a second shorter chart, consisting of the following sequence (N1, N2, SR, 3C1, 4R1, 4R2, 3C2).

Test Data Analysis and Decision Criteria

The test data are hand-scored with validated scoring criteria by comparing the relevant question response to the stronger response of an adjacent comparison question per each component sensor. In consideration of the cautions expressed by Bell, Raskin, Honts, and Kircher (1999) regarding artifacted or uninterpretable data, examiners should be careful to assign scores only to pneumograph data of arguable authentic quality and interpretive value. One cautionary issue exists in scoring DLC exams. Kircher and Raskin (2002) and Kircher et al.(2001) have reported that the data collected from pneumographs in DLC examinations do not appear to have diagnostic value.

Test data analysis can be automated by dividing the single examination chart of three presentations of each test stimulus into three virtual charts, using the following sequences:

Chart 1: (1C1, 1R1, 1R2, 1C2)

Chart 2: (1C2, 2R1, 2R2, 2C1)

Chart 3: (2C1, 3R1, 3R2, 2C2)

If a fourth presentation of the test stimulus is completed, the sequence will be (2C2, 4R1,

4R2, 3C1) or (3C1, 4R1, 4R2, 3C2) depending on whether the fourth presentation of the stimuli was completed as part of the single examination chart sequence or as separate short examination chart respectively.

Hand-scored results for each relevant question are totaled along with the grand total for the examination as a whole. A spot total of -3 or lower at either spot, or a grand total of -4 or less results in an opinion of Significant Response (SR). No Significant Response (NSR) opinions are the result of a grand total of +4 across the two relevant targets, as long as there is a positive numerical subtotal for each target. If the result is neither SR nor NSR it is Inconclusive or No Opinion (NO) can be rendered. Many examiners will recognize these cutting scores as identical to those for the "You-Phase" two-question Zone Comparison Technique (Department of Defense, 2006).

These rules differ from the common spot scoring rules for MGQT examinations (Ansley, 1998; Department of Defense, 2006), which require a +3 or greater at every relevant question. Existing practices are based on the belief that each question is related to a separate issue and therefore should be treated separately. However, none of the existing cut scores for spot scoring decisions has been subject to statistical analysis and examiners cannot presently calculate a p-value for the significance of hand-scored results. Empirical studies of spot scoring practices suggest that present values may not be optimal (Capps & Ansley, 1992). Research suggests when an SR decision is rendered, the strongest physiological responses are not always to the question to which the examinee is being deceptive (Barland, 1981; Barland *et al.*, 1989; Correa & Adams, 1981; Kircher,

Raskin, Honts & Horowitz, 1988; DoDPI Research Division Staff, 1998). In general, accuracy tends to decrease when examiner opinions are made on a per-question basis. An examinee may be practicing deception to one relevant question on the test and have more arousal to another relevant question on the test. It is clear the existing polygraph methods can alert an examiner when an examinee is practicing deception. Data do not yet support the notion that existing polygraph screening methods can advise an examiner regarding an exact test question to which an examinee is practicing deception.

Several studies of polygraph scoring (Krapohl, 2005; Krapohl and Cushman, 2006; Senter, 2003) have shown that two-stage scoring rules maximize decision accuracy by using spot scores to resolve inconclusive results. Mathematical expectations that spot scoring rules may inflate false positive and inconclusive results are supported by Nelson, Handler and Krapohl (2007), who found that alternative decision policies, based on statistical theory, can help to optimize the specificity and sensitivity of screening examinations. The "test as a whole" decision rule applies when assessing for NSR results. Nelson *et al.*, (2007) used a Kruskal-Wallis equation, as a one-way analysis of variance to evaluate differences between different investigation targets before rendering an NSR result. This process procedurally approximates the requirement for a positive sign value for all spots when hand-scoring the DLC screening exams according to procedures described by Department of Defense (2006). Another consideration for empirical inquiry involves the potential advantages of sequencing decision rules in various ways. Senter (2003) found no significant differences in sequencing of decision rules in hand-scoring experiments. Nelson *et al.*, (2007) achieved optimal balance of

sensitivity and specificity by sequencing decision rules that parse NSR results ahead of decision rules for SR results with event specific investigative polygraphs involving ZCT and MGQT techniques. They were able to maximize sensitivity to deception in screening exams by executing rules for SR classifications before those for NSR results.

Target selection

While reviewing exact details for each investigation question will always remain a task for the examiner and examinee at the time of the examination, the selection of investigation targets is an important consideration prior to the examination. It would be a simplistic and naive assumption to suggest that polygraph examiners themselves know what questions or targets to investigate on behavior of an investigation or risk assessment process. In investigative polygraph programs, examination targets are specified by the details of a crime or investigation. Investigation targets in polygraph screening programs are properly informed by data from risk prediction and risk management research.

Post Convicted Sex Offender Testing (PCSOT) polygraph monitoring programs should emphasize behaviors that provide supervision and treatment professionals with early warning of an escalating risk level, and allow for corrective intervention prior to a new assault. Possible behavioral indicators include the unauthorized use of pornography, unauthorized physical contacts with children or being alone or unsupervised with minors, masturbation behaviors involving fantasies of children or violence, and secretive or undisclosed sexual partners. Other investigation targets may address concerns about use

of alcohol or illegal drugs while under supervision. By emphasizing investigation targets pertaining to safety and compliance behavior that is a precursor to re-offense activities, supervision and treatment professionals will avert the costs to individuals, families, and communities associated with new sexual assaults. Polygraph questions regarding noncompliance with supervision and treatment will also not create secondary problems involving offenders' rights against self-incrimination regarding new crimes. Additionally, noncompliance behaviors might be expected to occur at higher base-rates than re-offense activities, which serves to simplify any error estimation methods based on Bayesian models.

PCSOT risk assessment polygraph programs will also be interested in investigation targets pertaining to unknown or unreported sexual offense history behaviors that have a direct role in actuarially derived risk-prediction schemes. Polygraph has been shown to increase the amount of useful disclosure (Ahlmeyer, Heil, McKee & English, 2000; Grubin *et al.*, 2004) as well as deterring unwanted or risky behavior (Kokish, Levenson & Blasingame, 2005) among sex offenders. Target behaviors for sexual history disclosure polygraphs may include an offender's history of incest activities or sexual contact with relatives, adult sexual contact with underage persons (e.g., minors under age 15 in Colorado and other states, or children four or more years younger than juvenile offenders). Risk assessment targets involving historic victim access behaviors may include questions about forced or violent sexual assault, including implied or threatened violence. Additional targets of interest may be questions about sexual contact with persons who were unconscious from alcohol or illegal drugs, or while sleeping. Risk

assessment targets involving historic sexual compulsivity behaviors, may include voyeurism (sexual peeping), exhibitionism (indecent exposure), frottage (unwanted rubbing or touching of strangers in public), theft of underwear or undergarments, or public masturbation activities.

Countermeasures

No consideration of a new approach would be complete without the discussion of countermeasures. Countermeasures have become a highly discussed topic among polygraph professionals. One can hardly attend a national conference and not expect to be afforded an opportunity to attend a lecture that includes a discussion on countermeasures. Several well designed scientific studies have assessed the vulnerability of polygraph to countermeasures (for a thorough discussion see Honts & Amato, 2002). The findings of most polygraph countermeasure studies suggest that under very specific conditions, countermeasures can reduce sensitivity to deception. These findings suggest that effective countermeasure training must include; educating examinees on testing procedures; teaching them to evoke physiological arousal through physical movements and/or mental arousal, and coaching them by attaching them to a polygraph to practice. Absent the last key element, most published research suggests countermeasures will be ineffective at producing negative polygraph outcomes. One can only hope that sex offender access to a polygraph instrument and an examiner willing to train them is very limited.

Some research suggests the use of countermeasures by examinees is actually counterproductive. Innocent and programmed guilty examinees who engage in countermeasures have been found to produce polygraph test data more indicative of lying (Honts. & Alloway, 2007). This was consistent with the finding that innocent examinees engaging in spontaneous countermeasures are more likely to fail a test and the guilty that so engage enjoy no benefit as a result of their attempts (Honts, Amato & Gordon, 2001).

Some may argue a DLC approach is an invitation to employ countermeasures. However, a review of *The Lie Behind the Lie Detector* (Maschke & Scalabrini, 2007) finds PLC testing is addressed with equal (if not greater) depth than DLC testing. DLC polygraph formats task the examinee with simply saying "no" to a personally significant question when they and the examiner both know the answer is not true. During the question review portion of the pre-test interview, the examinee is encouraged to recall a minor past transgression unrelated to the issue(s) at hand. The examinee is not instructed to recall this transgression while answering the DLC during the test data collection. They are instructed to answer all test questions in an equally timely manner. The DLC acquires salience from the task demands, not from the recall effort. We know of no research suggesting that examinees use different countermeasure strategies depending on whether they are targeting PLCs or DLCs. In other words, whatever countermeasures examinees would use against DLCs they would also use against PLCs. Perceptions that DLCs are more vulnerable to countermeasures than are PLCs are not supported in the published literature. As a practical matter, examiners unable to detect or deter countermeasures with DLCs would probably not fare better if they used PLCs.

One example of the application of the DLST

One examiner who tests subjects for a probation department agreed to conduct some tests using a DLST and graciously share those data with us. The examiner was conducting a periodic maintenance polygraph examination on an offender on probation for a sexual offense. Maintenance polygraphs target non-c
mpliance behaviors that reveal the early onset of an escalating risk level. This offender's treatment provider requested the target areas include; viewing pornographic material, being alone or unsupervised with anyone under age ten and the use of alcohol or illegal drugs. This offender's last polygraph test was a sexual history disclosure and had taken place about six months prior to this exam.

The examiner formulated and reviewed the following relevant questions for the first chart;

R1 Since your last polygraph test, did you drink any alcoholic beverages?

R2 Since your last polygraph test, did use any illegal drugs?

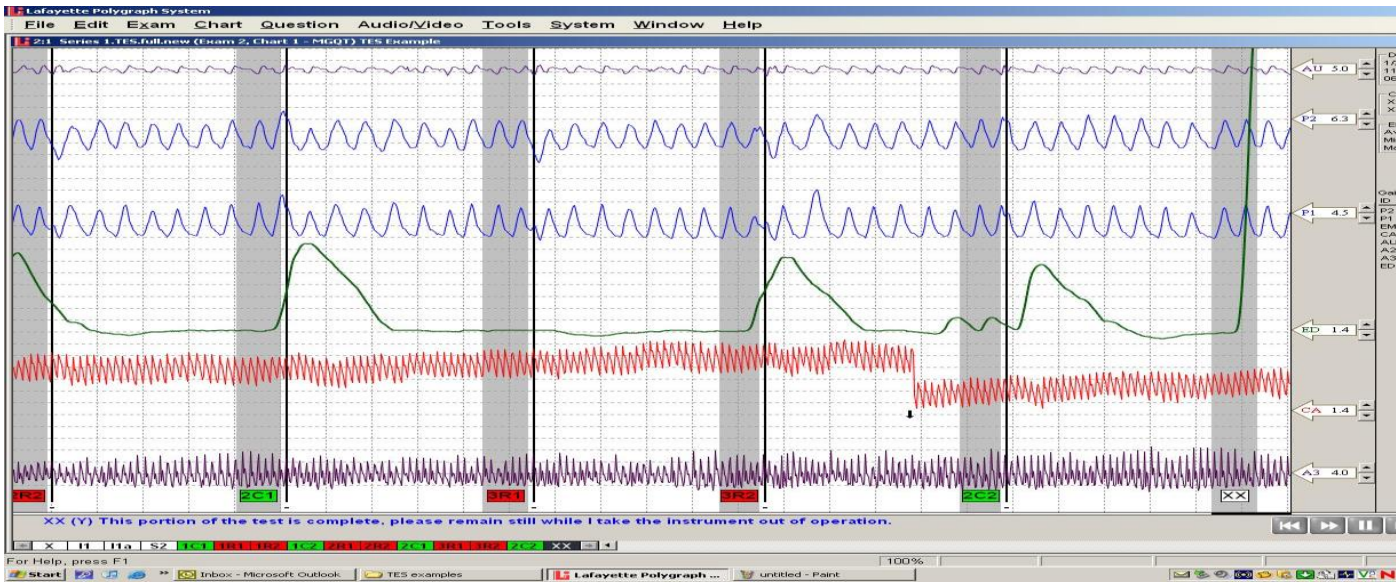
The examiner conducted the first sub-test which included three iterations of these two relevant questions. After hand-scoring the examination using the federal 7-position numerical evaluation scoring system (Department of Defense, 2006) the examiner rendered an opinion of *No Significant Response*. The test data were evaluated by the

OSS3 algorithm (Nelson et. al,, 2007), excluding the respiration channel. OSS3 reported a probability that the data were produced by a deceptive person was 0.042 or approximately 4%. (It should be noted, however, the OSS3 tool has not yet been validated with DLC testing.) The chart one is presented below in three sections.

Chart one, section one of three.

Chart one, section two of three.

Chart one, section three of three.



Next the examiner formulated and reviewed the following relevant questions for the second chart;

R1 Since your last polygraph test, other that that one time, have you viewed any pornography?

R2 Since your last polygraph test, have you been alone or unsupervised with anyone under the age of ten?

The examiner conducted the first sub-test which included three iterations of these two relevant questions. After hand-scoring the examination using the federal 7 position numerical evaluation scoring system (Department of Defense, 2006) the examiner rendered an opinion of *Significant Response*. The test data were evaluated by the OSS3 algorithm, excluding the respiration channel. OSS3 reported a probability that the data were produced by a truthful person was 0.020 or 2%. (Again we remind readers the OSS3 tool has yet to be validated with DLC testing.) The chart two is presented below in three sections.

Chart two, section one of three.

Chart two, section two of three.

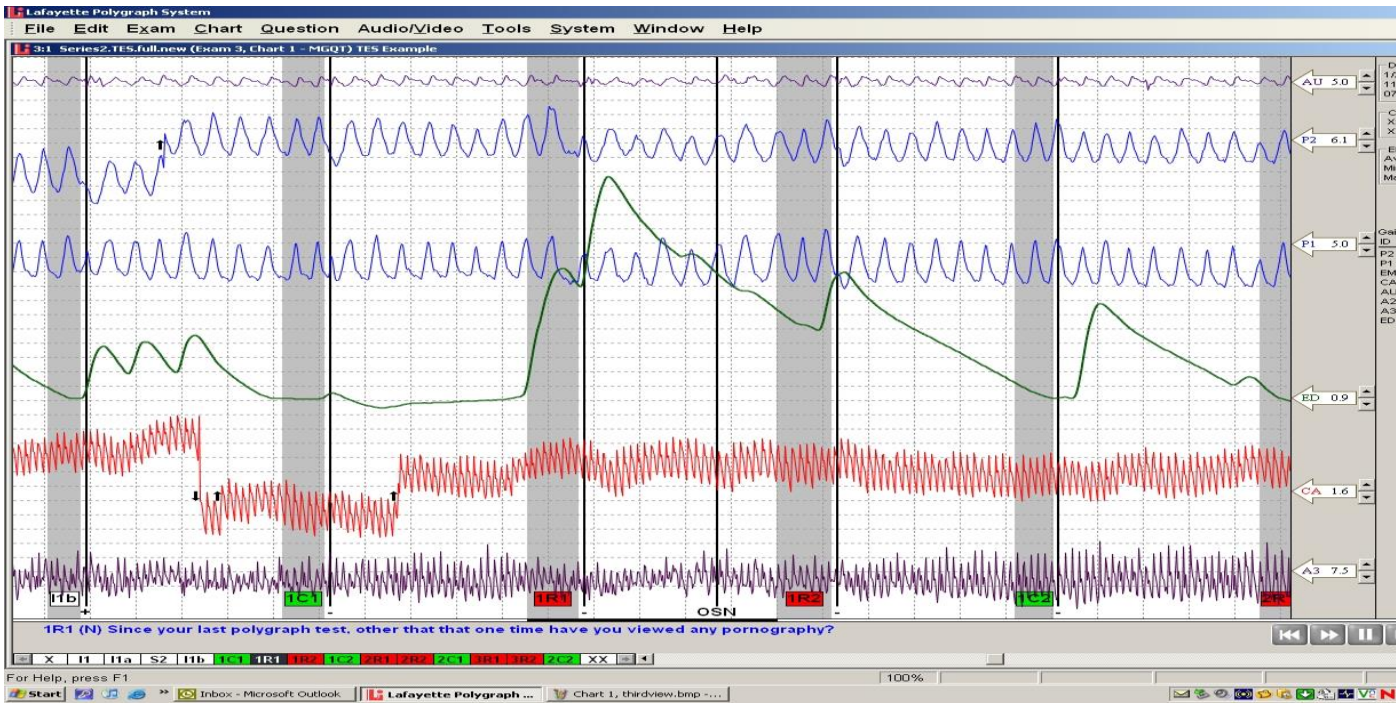
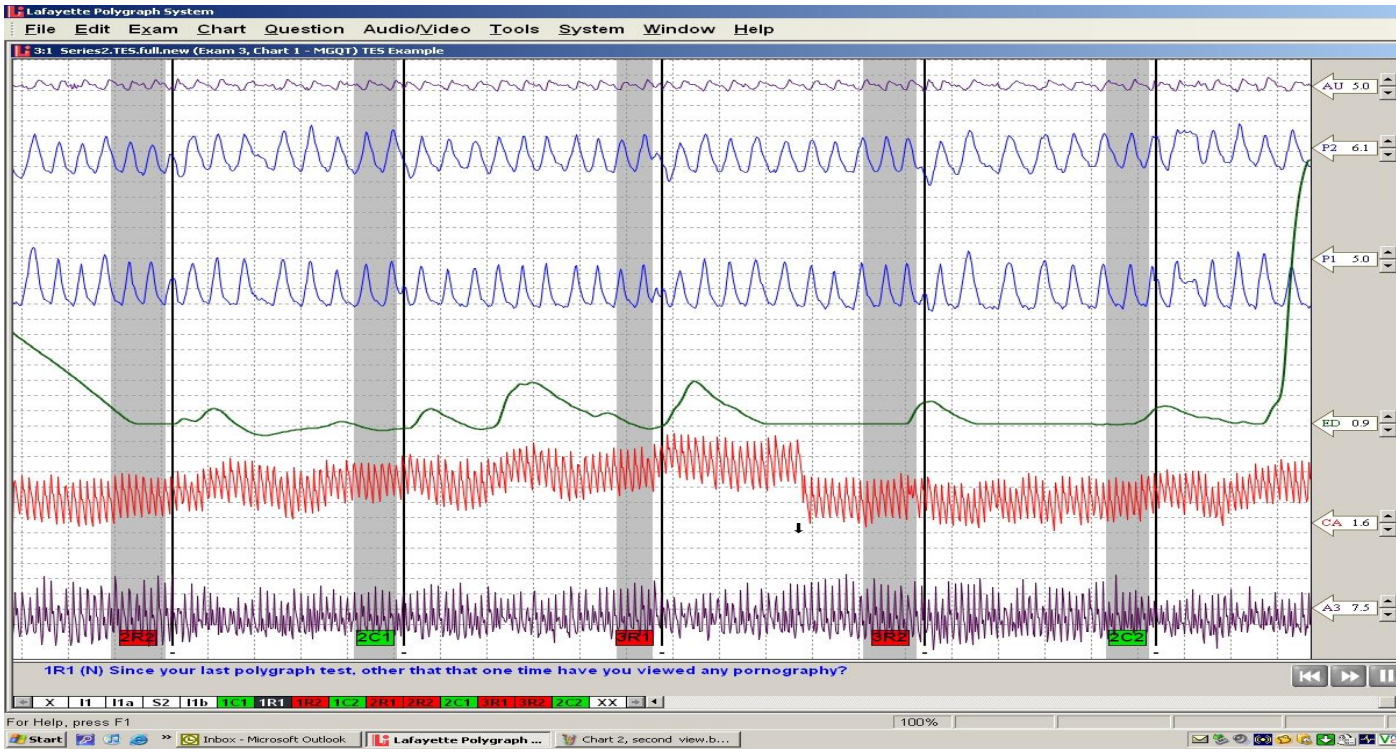


Chart two, section three of three.



During a post-test interview the examinee admitted to multiple viewing of pornography. He told the examiner he had downloaded pornography from an I-pod music playing device onto his own handheld device capable of viewing video. The examinee admitted the infraction to his probation officer and was expected to be confronted with the issue during his next group therapy session.

Summary

We propose here one alternative screening polygraph method. We suggest it may prove

to work well for PCSOT for offenders who are tested regularly. It is a modification of a well-researched technique, the TES, which in the laboratory has been shown to be effective as the initial method for polygraph screening in the counterintelligence realm. Combined with the "successive hurdles" approach (Krapohl & Stern, 2003; Meehl & Rosen, 1955) it can be a powerful tool to assist treatment providers and supervisory officials in the treatment and containment of sex offenders. Though we focused our discussion primarily around PCSOT, we feel this approach may also result in increased sensitivity and specificity in other polygraph screening milieus.

It might be argued by those skeptical to this approach that DLST has never been researched in the PCSOT setting, certainly a legitimate observation. The only generalization of the validity of DLST is the replicated research on the TES, the method after which DLST is modeled. It is important to note that the only difference between DLST and TES are the test questions. To our knowledge polygraph techniques are not designed for only one type of test question (otherwise, we might have to have as many techniques as there are crimes to investigate). For this reason we are confident that DLST can be used effectively in the PCSOT setting. To those who would persist that DLST has not been validated for PCSOT, we would simply point out the obvious: such a standard would eliminate all other polygraph techniques, as well.

There are certain caveats that attend the use of DLST. First, examiners with no familiarity with DLCs should receive formal instruction in their proper development and introduction. Second, the pneumograph for any DLC technique cannot be analyzed using

the same criteria as are used for PLC testing. Consequently, scoring rules must be adjusted, and there are currently no algorithms available that have been trained on DLST data. Third, DLST is a one-chart test, and can only accommodate two relevant questions per series. In using the DLST examiners depart from the more familiar PLC techniques which can accommodate larger numbers of questions but demand larger numbers of charts. Finally, like the TES, DLST may not be a standalone technique but may be only the first step in a successive hurdles approach.

Advantages to DLST are obvious. DLCs do not require the type of manipulation seen necessary for PLCs, resulting in better time management in the examination room. DLCs have the added benefit of remaining useful over repeated examinations. This is important given that many offenders are tested every few months, a circumstance which poses a challenge to examiners to keep PLCs salient over time. Lastly, DLCs reduce the intrusiveness of polygraph testing over PLC methods, thereby eliminating one source of complaints against the examiner or the examination. The DLST may serve as a primary or secondary screening technique, in both general and unique screening cases.

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