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#### A COMPARISON OF SIGNALS MEASURED FROM

#### **OCCLUSIVE ARM AND FINGER CUFFS**

#### By

#### Victor L. Cestaro, Ph.D. and Andrew B. Dollins, Ph.D.

#### Abstract

This study was designed to investigate the correlation between cardiovascular signals measured during a psychophysiological detection of deception (PDD) examination using the occlusive arm cuff and the Lafayette Model 76520 finger cuff. Because the finger cuff is more comfortable than the arm cuff, its use could allow examiners to ask more questions per test and facilitate development of new, longer, test question formats. Twenty subjects participated in this study. They were asked to complete a number search task (circle a specific set of two-digit numbers within a block of two-digit numbers) and participate in a PDD examination conducted by a Federal Forensic Psychophysiologist. The PDD examination questions addressed the number circled during the number search task. Half of the subjects circled numbers outside of the range. Each subject completed one examination (three tests per examination). Testing conditions and question order were constant across all subjects. Dependent measures included the amplitudes of electrophysiologic signals measured from the occlusive arm and finger cuffs (*i.e.*, amplitudes were time-locked, relative to question offset). The Pearson correlations between the right finger cuff and the left arm cuff amplitudes were 0.9 or higher for 379 of 529 (72%) data pairs. The correlations between the left finger cuff and the left arm cuff were equal to or greater than 0.9 for 219 of 523 (42%) data pairs. These results, and practical considerations, suggest that the occlusive finger cuff tested is not a viable alternative to the traditional arm cuff. A finger cuff may, however, be more sensitive to peripheral blood volume changes than the arm cuff and a less problematic design should be investigated.

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#### A Comparison of Signals Measured from Occlusive Arm and Finger Cuffs

The psychophysiological detection of deception (PDD) is a technique used by the United States Government, various state and local law enforcement agencies, and officers of state and local courts, to determine an individual's truthfulness concerning topics of interest (Office of Technology Assessment 1983, pp. 108; Lykken 1981, pp. 1-4). In theory, the subject's physiologic reactivity varies with the personal relevance of presented stimuli and, more so, with attempts to conceal that relevance from the PDD examiner. In practice, the variability in Skin Resistance Response (GSR), respiratory rate and/or volume, and heart rate/blood pressure are typically assessed (Abrams, 1989). Increased reactivity, defined as an increase or decrease in rate and/or amplitude of responding, depending on the measure in question, to some stimuli but not others is assumed to reflect the personal relevance of the stimuli presented to the subject. The typical PDD examination is designed to elicit physiologic responses to specific questions from the subject regarding topic(s) of interest. Those physiologic responses are subsequently scored by one or more methods and interpreted as indicative of the subject's response truthfulness.

Currently the number of questions asked during a single test is limited by the degree of discomfort the subject experiences due to inflation of the occlusive cardio arm cuff. Yankee (1965) reports that discomfort is first experienced by male and female subjects an average of 2.0 minutes after cuff inflation (90, 100, and 110 mmHg) and severe discomfort an average of 5.5 minutes after cuff inflation. Additionally, there are dangers associated with the occluded venous return of blood to the heart when the arm cuff is left in place for prolonged periods of time, and the side effect of production of reactions in other autonomic measures (Davis, 1961). Use of a more comfortable cardiovascular measurement technique would allow examiners to conduct longer, possibly more accurate, PDD examinations.

The current investigation was designed to compare the signals acquired using occlusive finger cuffs to those acquired using an occlusive arm cuff during a PDD examination. Although alternative measures have been examined by other investigators (Ansley, 1975; Davidson, 1979; Decker, Stein, & Ansley, 1975), some require additional instrumentation or substantial modification of existing polygraph equipment. Additionally, some sensors, such as the photoelectric plethysmograph, have not been subjected to sufficient research defining the use and interpretation of responses for PDD (Ansley, 1975). The Lafayette finger cuff was examined because it required no instrument modification, and it is readily available to field examiners. If signals acquired using the finger cuffs correlate highly (*i.e.*, r = > 0.90) with those acquired using the arm cuff, then the finger cuff should be tested for consideration as the standard instrument for measuring cardiovascular activity.

## Method

#### Subjects

Twenty healthy, native English speaking, male and female subjects between the ages of 19 and 30 years participated in the study. All subjects completed an informed consent affidavit, approved by the Department of Defense Polygraph Institute Human Use Committee, prior to participation.

# Examiner

One examiner conducted all of the PDD examinations. The examiner completed training at the Department of Defense (DoD) Polygraph Institute (Ft. McClellan, AL) and was certified as competent to administer PDD examinations by the Department of the Army. He had administered approximately 300 examinations during the 7 years prior to the study.

## Apparatus

Data were collected using a Lafayette Factfinder (model 76740/76741) polygraph equipped with three Cardio/Aux/Pneumo/GSR modules (Model 76477-G) set in Cardio 1 mode. Lafayette sensors were used to collect cardiovascular data at the arm (Model 76530) and both thumbs (Model 76520). A custom built interface was used to amplify the analog signals, which were ported to a computer containing an analog-to-digital converter. Amplifier gains for digitized data were fixed to provide 10:1 amplification for the finger cuff channels, and 5:1 gain for the arm cuff channel. The analog data were digitized and stored on the computer disk for off-line analysis.

The PDD test questions were recorded to eliminate volume and inflection variance. Each PDD test question was digitized and recorded to computer hard disk using a Sound Blaster board (Model 16ASP, Creative Labs Inc., Milpitas, CA). A parallel port interface (Speech Thing, Covox, Inc., Eugene, OR), connected to a Radio Shack (Fort Worth, TX) integrated stereo amplifier (Model SA-15.5) and two speakers (Model Minimus-77), was used to present the questions. An IBM compatible 286 computer was used to replay questions during testing.

# Procedure

Subjects were randomly assigned, a priori, to the treatment or control groups with the constraint that no more than three subjects from each group were tested consecutively. Prior to testing, the subjects were asked to read a short description of the project which explained the investigation purpose and procedures, as well as participant requirements, rights, and risks. Any questions the subject had were answered at that time.

Subjects were then required to accurately locate, on pre-printed forms, six sequences of five adjacent repetitions of a two-digit value in a block of two-digit values. Treatment group subjects completed the task by circling repetitions of the number 64 embedded in a block of numbers ranging from 60 to 69. Control group subjects circled repetitions of the number 84 embedded in a block of numbers ranging from 80 to 89. After completing the task, subjects wrote their name and the value they circled on two 3" x 5" index cards. One card was concealed on the subject's person throughout the PDD examination and the second was retained for verification purposes. In an attempt to motivate subjects to be successful in their deception, they were told that it is extremely difficult to lie successfully during a PDD examination, and that only individuals with great emotional control and superior intelligence can do so successfully

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(Gustafson & Orne, 1963). Subjects were then escorted to an examination room and introduced to the examiner.

The examiner conducted a brief pretest interview to gather biographical information; explain the purpose of the polygraph sensors and theory supporting PDD examinations; and review the test questions and sequence. Next, the arm cuff was placed over the brachial artery of the left arm, and the finger cuffs were placed on the subject's left and right thumbs. The arm cuff was then inflated to 90 mmHg, massaged to remove wrinkles, and deflated to 48 mmHg. The pressure was then adjusted, as necessary, to achieve a 2 mmHg sphygmomanometer deflection. Each of the finger cuffs was inflated to 50 mmHg, then deflated to 40 mmHg. These pressures were maintained throughout testing. The amplifier DC offsets were then adjusted to zero, and polygraph sensitivity adjustments were made.

The test questions were asked three times (via digitized voice) in the same sequence during each examination. Subjects were instructed to answer "NO" after each question. If response artifacts occurred during questioning, the question was repeated immediately, and data collected during the first presentation of the question was discarded. When a test was complete, all sensors were vented (*i.e.*, ambient pressure restored), and the subject was allowed to move around in the examination chair (for approximately three minutes) before beginning the next test. During that time the examiner asked the subjects if they wished to discuss any of the thoughts they had during the examination. Questions were answered, without indicating the results of the previous test, and the second test commenced. The same procedure was observed between the second and third tests. After the third test, the sensors were removed, the subject debriefed, and the subject released. Data collected during all three tests were retained for off-line analysis.

#### **Data Collection**

Time-locked amplitude data from the three occlusive cuffs were digitized at a rate of 256 samples per second for the 15 seconds following the offset of each question asked and recorded on computer disk. A 100-point running average was used to remove 60 Hz artifacts. The first and last 50 data points of each sample were omitted during this process.

Prior to data analysis, three research physiologists independently assessed the recorded signals to determine if movement artifacts were apparent in any of the three cuff measures. When at least two judges were in agreement regarding the presence of movement artifacts, that subject's data for the affected question were omitted from further analysis. Two data sets were analyzed. Set A consisted of left thumb and left arm data, and Set B consisted of right thumb and left arm data. Seventeen of 540 data pairs were dropped from Set A, and 11 of 540 from Set B due to artifacts.

# Results

The time-locked amplitude variations measured from the two finger cuffs and the arm cardio cuff during each 15-second response epoch were assessed by Pearson correlation ( $\underline{r}$ ). It

was necessary to time-shift the finger cuff signals to obtain a maximum correlation (*i.e.*, because the finger measure is more distal than the arm measure, the pulse signals were time shifted). A correlation, between each finger and arm cuff measure, of 0.90 or greater was accepted as indicating that equivalent physiological activity was measured from the arm and finger cuffs. This criterion was chosen, a priori, as a conservative estimate of signal congruence. It can be seen in Figure 1 that when correlations between measures are greater than 0.90, the signals are visibly similar. However, correlations less than 0.90 are indicative of dissimilarity (see Figures 2 and 3). Figures 2 and 3 illustrate a greater baseline shift in the right finger cuff tracing, relative to the left arm cuff tracing. In Figure 3, the amplitude change evident in the arm cuff tracing is not seen in the finger cuff tracing.



Figure 1. Cardio tracings depicting similar signals at three locations with  $\underline{r} = .98$  between the right thumb and the left arm, and  $\underline{r} = .90$  between the left thumb and the left arm.

Polygraph, 26 (2)(1997).





Figure 2. Cardio tracings depicting dissimilar signals at three locations with  $\underline{r} = .76$  between the right thumb and the left arm, and  $\underline{r} = .85$  between the left thumb and the left arm.



Figure 3. Cardio tracings depicting dissimilar signals at three locations with  $\underline{r} = .58$  between the right thumb and the left arm, and  $\underline{r} = .53$  between the left thumb and the left arm.

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Within Set A (left thumb vs. left arm), 219 of 523 data pairs (42%) had Pearson correlations meeting the criterion ( $\underline{r} = > 0.90$ ). Within Set B (right thumb vs. left arm), 379 or 529 data pairs (72%) satisfied the criterion, indicating a higher rate of congruency when the finger cuff and arm cuff were placed on opposite sides of the subject. The frequency of correlations equal to or greater than .9 are shown by group programming in Figure 4. Within Set A, 151 data pairs (69%) came from the programmed truthful group, and 68 pairs (41%) were from the deceptive group ( $\underline{Z} = 5.11$ ,  $\underline{p} < .001$ ). Within Set B, 205 (54%) of the 379 data pairs came from the group programmed to be truthful and 174 (46%) were from the group programmed to be truthful and 174 (46%) were from the group programmed to be truthful and 174 (46%) were from the group programmed to be deceptive. No significant differences were found in the distribution of high correlations between the two groups within this data set ( $\underline{Z} = 1.45$ ,  $\underline{p} > .10$ ). During data collection, the examiner made more baseline corrections for each of the two finger cuffs (left =129, right = 115) than for the arm cuff (79).



Figure 4. Frequency of cases by group with  $\underline{r} => .90$  between the left thumb and the left arm, and the right thumb and the left arm.

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# Discussion

The results suggest that the Lafayette occlusive finger cuff is not an analog of the occlusive arm cuff currently used for measuring cardiovascular activity during the PDD. Congruent tracings were observed less than 75% of the time. Additionally, the PDD examiner made more finger than arm cuff baseline corrections, suggesting that the finger cuffs may be more sensitive to blood volume changes than the arm cuff. The most obvious differences between the two types of sensors were differential baseline and amplitude variations. These variations frequently occurred in some subjects' data and rarely in others. The lower frequency of congruent signals observed when both types of sensors were placed on the subjects' left side may have been due to a rise in venous return pressure caused by the occlusive arm cuff. This increased pressure may have caused the left finger cuff amplitude changes which were not observed on the concurrently measured arm cuff tracings.

Movement artifacts were not a serious problem with either type of sensor, however, poor mechanical integrity was a problem associated with the finger cuff assembly. The latex bladder used in the finger cuff developed leaks over time and had to be replaced periodically during testing. Some of the baseline shifts encountered early during the study were directly attributable to pin-hold bladder leaks and/or insufficient pressure from the "O" rings used to secure the bladder to the metal cuff assembly. As a further practical note, during pilot testing it was observed that large pen deflections occurred in response to small transient changes in barometric pressure (i.e., on and offset of air conditioning, opening and closing of examination room and when finger cuff used external building doors) the was and the Lafavette Cardio/Aux/Pneumo/GSR module sensor selector was set in the cardio 2 position. These seemingly random pen deflections could lead to erroneous chart interpretation.

When choosing a sensor to detect physiological activity, researchers should consider what the sensor is measuring and whether that measure is appropriate for assessing the response under investigation. Increased blood flow to major muscle groups may be readily assessed by the arm cuff. However, the finger cuff may be sensitive to blood flow away from the periphery. The differential blood volume changes noted between the two types of sensors suggest that the finger cuff is a more sensitive indicator of minor changes in this measure. Other evidence indicates that the two measures reflect the behavior of different physiological mechanisms (Cook, 1974), and that they would not be expected to behave similarly. Care should be exercised when interpreting the finger cuff response in the field. However, further research is needed to determine which cuff would provide the better measure of deception during PDD.

It is our opinion that the occlusive finger cuff tested during this investigation should not be adopted for use by forensic psychophysiologists. Because visual inspection of the data suggests that the finger cuff is more sensitive to changes in peripheral blood flow, testing of a finger cuff with a less problematic design should be considered. The current finger cuff design is not analogous to that of the traditional arm cuff. The finger cuff tested is composed of a pneumatic bladder inside a rigid metal tube. The entire finger is encircled by the bladder, thus, transient volume changes (*i.e.*, those associated with blood flow through the princeps pollicis or radialis indicis artery) are distributed throughout a pneumatic area that is relatively large compared to the actual change in volume. The occlusive arm cuff consists of a bladder, which is placed over a major artery of the leg or arm, secured by a strap. A finger cuff composed of a small bladder, placed directly over the finger artery, held in place by a flexible, adjustable, but not elastic strap could prove more efficient and less problematic.

In conclusion, it was found that even though responses measured using the traditional occlusive arm cuff correlated highly ( $\underline{r} \Rightarrow 0.90$ ) with those measured using finger cuffs, the measured responses were not congruent during a relatively high percentage of trials. The Lafayette Model 76520 finger cuff has a design problem; however, it could prove more sensitive to peripheral blood volume changes than the traditional arm cuff. Although the efficacy of the occlusive cuff sensors was not evaluated, the current results clearly indicate that tracings obtained with one sensor are significantly different from those obtained with the other. While differences occurred more frequently in some subjects than others, no mediating factors were evident. It is suggested that: (1) the Model 76520 occlusive finger cuff not be used in PDD examinations; (2) design and testing of a less problematic occlusive finger cuff be pursued; and (3) results of PDD accuracy determinations, in addition to correlations between measures, be obtained prior to deciding which sensor is the most suitable for use.

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# A COMPARISON OF PSYCHOPHYSIOLOGICAL DETECTION OF DECEPTION ACCURACY RATES OBTAINED USING THE COUNTERINTELLIGENCE SCOPE POLYGRAPH AND THE TEST FOR ESPIONAGE AND SABOTAGE QUESTION FORMATS

#### By

# Department of Defense Polygraph Institute Research Division Staff June 1995

#### Abstract

This study was designed to compare the decision accuracy rates obtained using a new psychophysiological detection of deception test, the Test for Espionage and Sabotage (TES) to those obtained using two versions of the counterintelligence scope polygraph (CSP) format; the CSP format using probable lie control (PLC) questions (CSP-PLC), and the CSP format using directed lie control (DLC) questions (CSP-DLC). The TES format differs from the CSP formats in that: (a) the number of issues being tested in a question series is reduced; (b) a maximum of three question repetitions are used to calculate question scores; (c) between-test stimulation is eliminated; (d) the order of questions within the question sequence cannot be altered; (e) each relevant question is compared to the same control questions; (f) the pretest is brief, more standardized, and follows a logical sequence of information presentation; and (g) problems associated with PLC questions are reduced by using DLC questions. The 277 examinees included in the analyses were recruited from the communities surrounding Ft. McClellan, AL. Ninety of the examinees programmed guilty (PG) by enacting one of four possible mock espionage scenarios. Eighteen certified government examiners conducted the examinations. The decisions of the examiners who administered the TES format were significantly more accurate (83.3%) at identifying the examinees than were the decisions of the examiners who administered either the CSP-PLC (55.6%) or the CSP-DLC (58.6%) format. There were no significant differences among the accuracies of the examiner's decisions at identifying the programmed innocent (PI) examinees. The decision accuracies obtained using the three formats to identify PI examinees were 88.9%, 95.3%, and 95.2% for the TES, CSP-PLC, and CSP-DLC formats respectively. Blind scoring of the examinations yielded similar results.

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#### Deception Accuracy Rates Obtain Using the Counterintelligence Scope Polygraph and the Test for Espionage and Sabotage Question Formats

Federal agencies use three basic types of psychophysiological detection of deception (PDD) examinations: Preemployment, security screening, and specific-issue criminal examinations. Several authors have summarized the research conducted to assess the validity of specific-issue criminal examinations (Ansley, 1990; Kircher, Horowitz, & Raskin, 1988; McCauley & Forman, 1988; Raskin, 1989). Little research has been conducted with either preemployment or security screening examinations. During security screening examinations, the majority of the Department of Defense (DoD) agencies utilize the counterintelligence scope polygraph (CSP) format. Although there is widespread use of CSP security screening examinations-the DoD reported 17,970 examinations conducted during fiscal year 1993 (Department of Defense, 1993) -- the analog studies, to date, suggest that when the CSP format is utilized, 94.9% of the programmed innocent (PI) examinees are correctly identified, but only 43.2% of the programmed guilty (PG) examinees are correctly identified.

Using four different security screening formats, Barland, Honts, and Barger (1989) assessed the accuracies of decisions identifying examinees as guilty or PI of enacting a mock crime. Examiners from four government agencies conducted PDD examinations utilizing their agency's format. The formats included a CSP format in which standard probable lie control (PLC) questions were asked (CSP-PLC), a CSP format in which directed lie control (DLC) questions were asked (CSP-DLC), and two variations of relevant-irrelevant (R/I) formats. The authors reported that 97.2% of all the PI examinees were correctly identified but only 33.7% of all the PG examiners utilizing the four formats were significant. Decisions based on the results of CSP-PLC tests were the least accurate (8%) in identifying PG examinees, and decisions based on the results CSP-DLC tests were the most accurate (48%) in identifying PG examinees.

However, there were several flaws in the design and analyses of the study. The most critical flaw concerns how the authors reported correct decisions. If, based on the test results, the examiner's decision was that deception was indicated, the examiner attempted to obtain a confession from the examinee. If the examiner was unsuccessful in obtaining a confession, another examination was conducted. If the examiner's decision, based on the second examination, was that no deception was indicated, then the reported decision for that examinee was no deception indicated. Therefore, if a PG examinee was correctly identified but did not confess, and the result of the second test indicated the examinee was truthful, the examinee was reported as a miss. The rationale for this procedure was to simulate field situations. In most screening examinations, when an examinee's physiological responses to the relevant questions indicated deception, the examinee was questioned and then the examination was rerun.

There is concern regarding whether the psychological significance of the relevant questions for an examinee in a mock laboratory situation is equivalent to the psychological significance of the relevant questions for an examinee in an actual field examination (Furedy, 1986; Iacono & Patrick, 1988). Furedy (1986), and Iacono and Patrick (1988) suggest that the psychological significance of the relevant questions is less for examinees in a mock laboratory situation. There is little research concerning the affect of retesting, in a mock situation, on the

accuracy of PDD test decisions. However, it is well established that physiological responses to a less significant stimulus will habituate faster (O'Gorman, 1977; Sokolov, 1963). Therefore, due to rapid habituation of the less significant stimulus, fewer PG examinees might be identified with repeated testing. In the Barland, *et al.* (1989) study, once the PG examinees knew they had been caught (*i.e.*, confronted with the initial deceptive decision)--even if they did not confess--the psychological significance of the relevant questions may have been reduced. Therefore, if the results of only the first test were considered, more PG examinees were correctly identified than the reported results indicate.

Another criticism of the study concerns the wording of the relevant questions. Examinees were asked if they had committed espionage or sabotage "against the United States." Many of the experienced examiners who participated in the study believed that because the PG examinees had participated in a "mock" crime and had not committed any act "against the United States," the wording of the relevant questions was inappropriate (Barland, *et al.*, 1989). The examiners believed that the question wording might have reduced, even more, the psychological significance of the acts that the PG examinees did commit. This could have contributed to the low accuracy rates for identifying the PG examinees.

The only other laboratory study concerned with screening, conducted by Honts (1989), was not designed to test the validity of the CSP format but to compare the accuracies of decisions identifying PI and PG examinees using two different sets of relevant questions. Eighty-nine percent of the PI examinees were correctly identified but only 58% of the PG examinees were correctly identified. No difference was found between the accuracies of the decisions as a function of the two sets of questions. A detailed report of the research was not written, therefore it is difficult to evaluate the study. However, one possible problem with the design was that the PG examinees were allowed only 10 minutes to execute a complex scenario that included memorizing a lengthy article. Another problem with the study may have been the way the examiners' decisions were reported. The report states, "The CSP examinations were administered just as if they were being given in the field." (Honts, 1989, p.4). This suggests, but does not state, that decisions were reported in the same manner as in the Barland *et al.* (1989) study. If decisions were reported in that manner, then the accuracy of the decisions identifying the PG examinees may have been higher than indicated by the report.

Although the report results of the first study are suspect, combined with the results of the second study they suggest that decisions based on CSP test data are not highly accurate in identifying PG examinees--at least in a laboratory situation. This study was therefore completed to compare the accuracy of decisions obtained concerning PG and PI examinee's veracity using a new screening test format, the Test for Espionage and Sabotage (TES), to that obtained using the CSP-PLC and CSP-DLC question formats.

#### **TES Development**

#### Theoretical Basis: Significance/attention model

The relationship between arousal and attention is well established for respiratory (Obrist, 1981; Sokolov, 1963), electrodermal (Dawson & Schell, 1982; Dawson, Schell, Beers, & Kelly, 1982; Kilpatrick, 1972; Kimmel, van Olst, & Orlebeke, 1979; Nikula, 1991; Ohman, 1979), and cardiovascular (Coles & Duncan-Johnson, 1975; Coles & Strayer, 1985; Jennings, 1986a; Jennings, 1986b) measures of arousal. When a significant change in sensory stimulation occurs, attention shifts to focus on the input. If the significant change is perceptual (increased volume, novel stimulus, etc.) the attention shift is referred to as an orienting response (OR). The physiological arousal associated with an OR is well documented (Jennings, 1986a). When the significant change is in the meaning or content of the stimulus, self-focused attention occurs, resulting in the concomitant physiological arousal (Germana & Chernault, 1968; van Olst, Hemstra, & ten Kortenaar, 1979). In addition, when attention is focused more, the arousal is greater (Carver, Blaney, & Scheier, 1979; Dawson, Schell, & Filion, 1990; Easterbrook, 1959; McLean, 1969; Maltzman, Kantor, & Langdon, 1966; Sampson, 1969; Waid, Orne, & Orne, 1981). Therefore, arousal level is a valid indicator of attention (Glass, Holyoak, & Santa, 1979; Kahneman, 1973). Of critical importance to PDD is the fact that the amount that attention is focused changes in proportion to the degree of stimulus significance (Jennings, 1986b). Therefore, a stimulus of greater significance will elicit a greater focusing of attention that will result in greater physiological arousal.

Several studies have indicated clearly that the act of lying is not a necessary condition for a PDD examination to yield accurate results (Davis, 1961; Dawson, 1980; Gustafson & Orne, 1965; Kugelmass, Lieblich, & Bergman, 1967; Orne, Thackray, & Paskewitz, 1972; Thackray & Orne, 1968; Waid, Orne, & Wilson, 1979). This author would argue further, that PDD tests detect neither deception nor guilt, but merely reflect relative degrees of physiological arousal. The scores assigned based on the physiological arousal indicate only that the examinee focused attention more when one type of question (relevant or control) was asked compared to when the other type of question was asked. The greater focusing of attention indicates a more significant stimulus. Therefore, the physiological responses are used to infer a focusing of attention due to the significance of the questions. However, inferences about why the relevant questions are significant must be cautious. One (the most probable one) of the reasons the relevant questions are significant to an examinee is because the examinee is being deceptive.

The design of this study and the development of the TES format were based on the previous hypothesis--the test does not assess deception, but merely indicates a relative degree of arousal from which significance of the stimulus is inferred. Therefore, the decisions for the TES are either: (a) significant responding (SR) occurred following the relevant questions, (b) no significant response (NSR) occurred following the relevant questions, or (c) the responding following the relevant questions was inconclusive (INC). It is the examiner's job to eliminate,

during the pretest, possible confounding reasons that would cause the relevant questions to be significant to the examinee. Then if the examinee does respond physiologically when the relevant questions are asked, the examiner must ascertain why the relevant questions were significant to the examinee.

# **Control Questions**

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The standard control question is the PLC, in which the examiner manipulates the examinee so the examinee's answer to the question probably is a lie. The major difficulty with using the PLC is the need to increase the psychological significance of the PLC for the examinee. The examinee must believe that responses elicited by the PLC and relevant question are equally important. The examiner must be skillful enough to increase sufficiently, but not too much, the significance of the control question. This requires the examiner to be able to "read" the examinee's stress level and know what level is appropriate. Additional problems associated with the PLC include: (a) the perception that they are intrusive, offensive, and/or embarrassing to some examinees (due to the nature of the associated psychological manipulations); (b) the occasional difficulty of developing a PLC which excludes all aspects of the relevant issue; and (c) possible difficulty associated with maintaining the psychological significance of PLC questions during repeated testing (as sometimes occurs with security screening examinations). DLCs eliminate most, if not all, of the problems associated with PLCs because: (a) they require little or no psychological manipulation, (b) they are easy to explain and it is easy to justify their purpose, (c) the examinee can readily answer them and the veracity of the answer is not in question, (d) they are less sensitive to examiner competence (no psychological manipulation required), (e) the questions and the procedures for introducing them to the examinee are easily standardized, (f) they are not personally intrusive, so they are not offensive or embarrassing, and (g) they can be constructed so they do not overlap the relevant issues.

Based on the positive results of research with DLC questions (Abrams, 1993; Barland, 1981; Honts & Raskin, 1988; Horowitz, 1989; Raskin & Kircher, 1990; Reed, 1990; Reed, 1995), and the numerous advantages of the DLCs, it was decided to include, in the TES format, DLC questions rather than PLC questions. However, each study which used DLCs implemented the DLCs differently regarding: (a) when, during the examination, the acquaintance test was conducted; (b) the rationale for conducting the acquaintance test; (c) the rationale for including the DLC questions; (d) the construction of the DLC questions; and (e) how the DLC questions were pretested. With respect to these issues, the following decisions were made, and incorporated into the TES testing procedures. The acquaintance test (ACQT) is a standard known solution numbers test (Department of Defense Polygraph Institute, 1994a). During a TES examination, the ACQT is conducted prior to the review of the relevant and control questions. The rationale for this is when the ACQT is presented immediately after the explanations of the instrumentation and the physiology and prior to question review, it enhances the logical flow of the pretest. The examinee is told that the purpose of the ACQT is to: (a) demonstrate the examination process to the examinee, (b) allow the examinee to become accustomed to the components and procedures, (c) allow the examiner an opportunity to adjust the instrument, and (d) allow the examiner to make sure the examinee is physiologically capable of responding when lying. In

addition, the rationale for including the DLCs can be explained more easily and efficiently if the ACQT was conducted previously. The examiner refers to the ACQT during the explanation of the purpose of the DLC questions--to make sure the examinee continues to respond physiologically when lying, just as occurred on the ACQT. The examinee is told that if she or he does not continue to respond physiologically when lying, the test results will be inconclusive.

The DLCs are pretested in the following standardized manner. The examiner minimizes the behavior to be discussed ("this is something we all have done"). The examiner asks the DLC question being pretested ("Have you ever violated a minor traffic law?") and obtains a verbal commitment from the examinee that the examinee has, in fact, engaged in such behavior. If the examinee denies having engaged in the behavior, the examiner is required to utilize a different Examiners are not permitted to try to convince the examinee, with examples or DLC suggestions, that the examinee had engaged in the behavior. Once a verbal commitment is obtained, the examinee is asked to think of a specific occasion during which the examinee engaged in the behavior. The examinee is instructed not to tell the examiner about the incident but only to think about it. Examiners are not allowed to suggest that the examinee think about the most recent or most significant incident, but only an incident. After the examiner has obtained a verbal commitment that the examinee has a specific incident in mind, the examiner repeats the question and instructs the examinee to think about the specific incident and then to lie by answering "no" to the question. Finally, the examinee is instructed that when the question is asked during the test, the examinee is to think about the incident and then lie by answering "no."

Examiners are instructed to be sure that the examinee actually thinks about the incident because cognitive processing results in increased physiological activity (Jennings, 1986a; Jennings, 1986b). The intent is to make a major component of the physiological response to a DLC be due to the cognitive processing which occurs when the examinee thinks about the specific incident. If the examinee engages in the cognitive processing, the DLCs should elicit strong physiological responses regardless of the emotional valance of the question. Any emotional response to the incident being imagined, would also increase the significance of the question and, therefore, the strength of the physiological response.

# **Question Sequence**

Reed (1995) reported research on a new format in which the relevant and control questions were repeated within the same question sequence. However, unlike standard control question PDD tests, the question sequence was asked only once. The results indicated that, when using a mock screening paradigm to program examinees guilty, 81.5% of the PI examinees and 73.9% of the PG examinees were correctly identified. With minor revisions, the TES format was developed directly from this previous research. The sequence contains two different irrelevant (IR1 and IR2) questions, two different control (C1 and C2) questions, two different relevant (R1 and R2) questions and a sacrifice relevant (Sr) question. The question sequence is IR1 IR2 Sr C1 R1 R2 C2 R1 R2 C1 R1 R2 C2.

# **Pretest Phase**

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A standardized pretest was developed. The examinee is given a brief introduction to the procedures and asked to sign a form indicating his consent to be given the PDD examination. Next, the examinee's physical suitability to undergo the examination is assessed. Then the operation of the polygraph instrument is explained and a brief explanation of physiological responding is given. Next, the ACQT is introduced as an opportunity to demonstrate the procedures to the examinee and to assess the examinee's physiological suitability. After the ACQT is conducted and the results are presented to the examinee, the test questions are reviewed with the examinee. The examiner reviews, with the examinee, the three relevant questions (including the sacrifice relevant question), the two control questions, and the two irrelevant questions, in that order. The precise meaning and intent of each relevant question is explained so the examinee fully understands what behaviors the question includes. If the examinee has any problem understanding a relevant question, alternative relevant questions are available.

# **Testing Phase**

During the administration of the TES, the examiner is not allowed to insert, into the question sequence, more than two irrelevant questions in succession. The inter-question interval (question onset to question onset) is 20 to 30 seconds, with an average of 25 seconds. If a physiological response occurs timely to a question but could have been caused by other factors (movement, orienting response to outside noise, etc.), it is referred to as an artifact and the question cannot be scored. If an artifact occurs during the asking of a TES relevant question, in order to provide three scorable physiological responses for that question, the examiner is required to conduct a "short test" with the following question sequence: IR1 IR2 Sr C1 R1 R2 C2.

# **Test Scoring**

Tests are scored using the 7-point scoring criteria taught at the Department of Defense Polygraph Institute (DoDPI), in which the relevant strength of the physiological responses to a relevant question is compared to the relative strength of the physiological responses to a control question (DoDPI, 1994b). A positive score is assigned if the physiological responses to the control question are greater than those to the relevant questions. A negative score is assigned if the physiological responses to the relevant question are greater than those to the control questions. In most PDD security screening tests, each relevant question is compared to the stronger (relatively more responding) of the two control questions that bracket it. However, based on previous research (Reed, 1995), the first repetition of the first control question is not used when scoring a TES examination. The physiological responses to the first repetition of R1 and R2 are compared only to the physiological responses to the first repetition of the second control question. There are three scores for each relevant question, because each relevant question is repeated three times. The three scores are summed to provide one score for each relevant question. If a short test was conducted, only the relevant question to which the artifact occurred is scored. The other relevant question on the short test is not scored.

# **Decision Criteria**

Multi-issue examinations, in which different relevant questions address separate issues, typically require a score of +3 or greater for each relevant question, for an NSR decision to be rendered. This decision was based on the belief that each question is related to a separate issue and therefore should be treated separately. However, research suggests that 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; Raskin, Kircher, Honts, & Horowitz, 1988). These studies reported that the accuracies of the decisions for detecting deception decreased when responding to specific questions was assessed. Thus, an examinee who committed sabotage might respond physiologically to a question regarding the disclosure of classified information, but not to a question regarding sabotage. Therefore, decision criteria should be based on the test as a whole, not on responses to individual Reed (1995), thus, adopted the following decision criteria for scoring TES auestions. examinations. An NSR decision is rendered if the scores for both questions are positive and they sum to +4 or greater. An SR decision is rendered if the score for either question is -3 or less or if the scores for both questions are -2 (total score of -4). If the scores do not meet either the NSR or the SR criteria, the decision is INC.

# Standardization

Other aspects of the TES format also were standardized. First, the number of artifact-free questions required to calculate a score was standardized. With many PDD formats, the same decision criteria (-3 or less for a deceptive decision) are utilized to reach a decision, whether the score was calculated from two repetitions of the questions or from five repetitions (Department of Defense Polygraph Institute, 1994c; Honts & Raskin, 1988; Horowitz, 1989; Raskin, 1982). Examiners using the TES format are required to calculate scores from the physiological responses to three artifact free repetitions of each question. Second, the sequence in which the questions are asked was standardized. With many PDD formats, the sequence of questions is repeated multiple times (usually 3). With each repetition, the examiner might change the sequence in which the questions are asked. Federal examiners are allowed to modify the sequence of the questions based on their subjective opinions (Department of Defense Polygraph Institute, 1992), whereas Raskin and his colleagues (Honts & Raskin, 1988; Horowitz, 1989; Kircher & Raskin, 1988) systematically and objectively modify their question sequence. The sequence of TES questions is not repeated. Therefore, there is no option to modify the question sequence. Third, between successive repetitions of the question sequence, some examiners interact with the examinee by discussing the examinee's perception of the questions (Horowitz, 1989; Podlesney & Raskin, 1977; Raskin, 1982). This form of interaction is not standardized. The question sequence is not repeated with the TES format. Therefore there is no opportunity for between-test interaction. Finally, the dialogue for administering each of the individual components of the pretest was standardized by providing explicit outlines and examples. This includes: (a) the administration of the ACQT (as described above), (b) the rationale and presentation of the DLC questions (as described above), (c) the explanations regarding the polygraph instrument and the

physiological responses, and (d) the logical sequencing of the presentation of these components of the pretest.

# Methods

# Examinees

Three hundred and six examinees were recruited by a local employment agency under contract to the Department of Defense Polygraph Institute and were paid \$30.00 for their participation. Individuals who met the following criteria were excluded from participation: (a) less than 19 or more than 60 years of age, (b) not in good health, (c) pregnant, or (d) did not have the equivalent of a high school diploma. One hundred thirty-nine male ( $\underline{M} = 26.7$ ,  $\underline{SD} = 7.8$ ) and 167 female ( $\underline{M} = 28.2$ ,  $\underline{SD} = 8.8$ ) examinees were scheduled for testing. There were 69 PI and 33 PG examinees assigned to the CSP-PLC group, 70 PI and 32 PG examinees assigned to the CSP-DLC group, and 67 PI and 35 PG examinees assigned to the TES group.

## Examiners

Twelve certified examiners (11 males and 1 female) from the Office of the Secretary of the Air Force (OSAF) and 6 (5 males and 1 female) from the United States Army Intelligence and Security Command (USAINSCOM) conducted the examinations. The examiners had an average of 6.5 years of experience, with a range of 1.5 to 19 years. Selection of the examiners was determined by the agencies. Although examiner selection was not random (selection criteria generally involve availability and experience), the examiners were considered representative of the CSP examiner population. Examiners were assigned randomly to administer one of the three PDD formats, with the restriction that a format was utilized by two INSCOM and 4 OSAF examiners. Examiners received four hours of training to familiarize them with the format, pretest, scoring rules and control questions to be used. They conducted two practice examinations before conducting an examination for the project. Each examiner completed two 4-hour examinations (morning and afternoon) on seven days and one 4-hour examination on three days for a total of 17 examinations each. The examiners were not given any information regarding the base rates. They did not receive feedback regarding the accuracy of their decisions until the end of the study, and they were blind as to whether the examinee was PG.

#### Apparatus

The examiners used standard field polygraph instruments manufactured by either Lafayette or Stoelting. Standard respiratory, electrodermal, and cardiovascular responses were recorded. The electrodermal component was operated in the manual mode. The examinations were conducted individually in large (20 x 20) rooms in a building located on Ft. McClellan. The scenarios used to program examinees guilty were enacted in another building located approximately two miles from the examination building. There were no video recording devices nor one-way mirrors in the examination rooms. The examinations were audio taped.

#### Scenarios

The PG examinees enacted one of four mock scenarios. Each scenario was representative of one of the four relevant questions. The "espionage" scenario required one examinee to steal a classified document from an office and give the document to a second examinee. The second examinee received the document and placed it inside a vehicle located in the parking lot. Examinees who enacted the "sabotage" scenario, stole either a classified document or a classified computer disk. The examinee either put the document through a paper shredder or with a pair of scissors, cut the disk into pieces. An examinee who enacted the "unauthorized contact" scenario was asked to meet with a German agent who was sitting in a car in the parking lot. The agent requested that the examinee obtain some classified information to be given to the agent at a later time. During the enactment of the "unauthorized disclosure" scenario, the scenario setter was called out of his office midway through briefing the examinee regarding some classified computer information. A third person, who appeared to be fixing a window screen, entered the office and attempted to engage the examinee in conversation regarding what the examinee had been told. All PG examinees received \$100.00 as payment for their participation in the "crime." In addition, all PG examinees wrote a statement indicating that "for the purposes of this project" they had engaged in espionage, sabotage, unauthorized contact, or unauthorized disclosure, depending on which scenario they enacted.

The author did not believe that fear or guilt could be instilled in the examinees. Therefore, the scenarios were not intended to convince the examinees that they had done anything wrong. However, because it is assumed that physiologic; responses occur during PDD examinations due to the significance of the questions, an attempt was made to make the relevant questions significant to the examinees through cognitive means as well as through the behavioral component (*i.e.*, their actual participation in the scenario). Therefore, the scenario setters colluded with the examinees to "beat" the examiners.

# Formats

Three separate PDD formats were employed. Currently, four different relevant questions, each of which is asked once within the sequence of questions, are included in the CSP-PLC format. The sequence of questions is repeated three times, with a short break between each repetition. Probable lie control questions are included in the question sequence. The CSP-DLC format is identical to the CSP-PLC format except the control questions are DLCs rather than PLCs. During this study, examiners who utilized the CSP formats (PLC or DLC) followed the guidelines established and taught at the DoDPI, (1992) with respect to the administration and scoring of the test, and the decision criteria applied to the scores.

Four relevant questions are also repeated three times during the TES examination format, but the sequence of questions differs substantially from that used during the CSP examination. Two of the four relevant questions are repeated three times each during the first series of questions (TES sub-test A) and the other two relevant questions are repeated three times each during the second series of questions (TES sub-test B). The TES examination format requires two question series, rather than the three series used during a CSP examination. The examiner does not mention the sub-test B relevant questions until after sub-test A testing has been completed (including any post test discussions). The same or different DLCs are utilized on the two sub-tests. During this study, if the decision based on the results of the first sub-test was SR, then the second sub-test was not conducted, and if the decision for either sub-test was SR, the examinee was considered SR.

Questions. Barland, et al. (1989) were criticized for using relevant questions containing the phrase "against the United States." Based on the significance/attention model proposed earlier, a test will be more accurate if the examinee's attention is focused on the actual issues being tested. Field examiners apply this principle to test question construction by including "time bars" or "situation bars" which are caveats to a question. The caveats are intended to direct the examinee's attention to a specific time or situation (e.g., prior to 1993 have you ever ... ). Therefore, in order to focus the PG examinee's attention on the mock scenario, the caveat "during this project" was added to each question. The same four relevant questions were asked with each format. The relevant questions were: (a) Sabotage, "Have you committed an act of sabotage during this project?" (b) Espionage, "Have you committed an act of espionage during this project?" (c) Disclosure, "During this project, have you provided classified material to an unauthorized person? and (d) Contact, "During this project, have you had unauthorized contact with a foreign national?" During the pretest phase of each examination, the precise meaning of each relevant question was explained to the examinee. In order to standardize the control questions, a list of ten PLC questions was developed for use with the CSP-PLC format and a list of ten DLC questions was developed for use with the CSP-DLC and TES formats. The specific DLCs were chosen because they: (a) concerned trivial behaviors (e.g., minor traffic violations), (b) were questions that were not likely to appear personally intrusive, and (c) were questions that did not overlap with the relevant issue. The same sacrifice relevant (Sr) question (Regarding the project security questions, do you intend to answer truthfully?) and the same list of four irrelevant questions were used by all examiners.

#### Procedures

During each session, eighteen examinees were given information regarding the research project, their participation, and the PDD examination. If they agreed to participate, they signed a form indicating their consent to participate in the research project. The examinees were taken in groups of two either to another building to be programmed guilty, or to the testing site. The PG examinees received information regarding the purpose of the scenario and signed an additional consent form indicating their agreement to participate in the scenario. After they enacted one of the scenarios, they were transported to the testing site. The transportation of the examinees to the testing site was timed so the examiners were not able to discern which examinees were PI and which were programmed guilty.

The examinations were conducted and each examiner provided a numeric score and a decision (SR, INC, NSR) based on the numeric score, for each test. The decisions were rendered

#### Deception Accuracy Rates Obtain Using the Counterintelligence Scope Polygraph and the Test for Espionage and Sabotage Question Formats

according to the decision criteria for the format utilized. An NSR decision concluded the examination (NSR to both sub-tests for the TES format). If the decision was INC, the examiner briefly discussed the questions with the examinee to determine if the examinee understood the questions. Then, the test was administered again. If, based on the data from the second test, the examiner's decision was INC, then the decision for that examinee was INC. When the examiner rendered an SR decision, the examiner confronted the examinee with the results.

Programmed guilty examinees were instructed to confess their guilt if they were confronted by the examiner, but not to reveal any details of their activities. Once a PG examinee confessed, the examination was concluded. However, a PI examinee who responded significantly to the relevant questions--a false positive (FP) decision--was questioned by the examiner to determine if there was a legitimate, "real-world" explanation for the examinee's physiological response to the relevant questions. The examiner recorded any information provided by the examinee and concluded the examination. Two examiners, otherwise not involved with the study, independently evaluated the information obtained from the examinees who received FP decisions. If the two examiners agreed that the information was significant enough to justify the examinee's physiological responding--a false positive decision with justification (FPWJ)--then that examinee's data was not included in the original data analyses. All of the examinees tested during a session were debriefed simultaneously. Examinees who participated in mock scenarios returned the \$100.00.

## **Data Reduction and Analyses**

The data from 277 examinees were included in the analyses. The remaining 29 examinees were excluded for the following reasons: Eight PG examinees confessed their guilt to the examiner prior to the examination; six examinees were not medically suitable to be tested; four examinations were incomplete; three examinees were DoDPI employees; and eight FPWJ examinees were excluded. The differences in the number of excluded examinees in each of the three groups were not significant.

If the scoring based on the physiological responding during an initial test resulted in an inconclusive decision and a second test was conducted, unless otherwise indicated, only the result of the second test was included in the analyses. The percentages of correct and incorrect decisions were calculated for each group. Simple proportionality tests were conducted to determine if differences between sets of percentages were significant. Unless otherwise stated, the significance criterion was set at .05 using a two-tailed probability distribution.

Three examiners who did not conduct any of the examinations each scored a different third of the tests conducted with each of the three formats. The blind raters rendered decisions based solely on their scoring of the recorded physiological reactions, whereas the original examiner's scoring, and therefore their decisions, might have been influenced by their interactions with the examinees.

# Results

The major finding was that when a conclusive decision was made (*i.e.*, inconclusive decisions were excluded) the decisions of the examiners who administered the TES format were significantly more accurate (83.3%) identifying the PG examinees than were the decisions of the examiners who administered either the CSP-PLC (55.6%) or the CSP-DLC (58.6%) format. There were no significant differences among the accuracies of the examiners' decisions identifying the PI examinees.

## **Original Examiners' Decisions**

#### Table 1

# Number of Correct Decisions, Inconclusive (INC) Decisions, and Errors Made by the Examiners in Identifying Programmed Guilty and Programmed PI Examinees

Crrors	
2	
2	
5	
3	
3	
6	

Note: Frequencies within columns with different subscripts are significantly different from each other at p < .05.

The number of correct decisions, inconclusive decisions, and errors made by the examiners are presented in Table 1. The accuracies of the decisions obtained using the three formats to identify PG examinees (inconclusive decisions excluded) were 83.3%, 55.6%, and 58.6% for the TES, CSP-PLC, and CSP-DLC formats respectively. The accuracies of the

decisions identifying PG examinees were significantly different, among the three formats. When inconclusive decisions were excluded from the analyses, the decisions made by examiners who administered the TES format were significantly more accurate identifying the PG examinees than were the decisions made both by examiners who administered the CSP-PLC format ( $\underline{z} = 2.28$ ,  $\underline{p} = .022$ ) and by examiners who administered the CSP-DLC format ( $\underline{z} = 2.09$ ,  $\underline{p} = .036$ ). Similarly, when inconclusive decisions were included in the analyses, the decisions made by examiners who administered the TES format were significantly more accurate identifying the PG examinees than were the decisions made both by examiners who administered the CSP-PLC format ( $\underline{z} = 2.60$ ,  $\underline{p} = .009$ ) and by examiners who administered the CSP-DLC format ( $\underline{z} = 2.40$ ,  $\underline{p} = .016$ ). The accuracies of the decisions identifying PG examinees for the two CSP formats, including and excluding inconclusive decisions, were not significantly different. The accuracies of the examiners' decisions identifying the PI examinees were not significantly different, among the three formats. The accuracies of the decisions of the three formats identifying PI examinees (inconclusive decisions excluded) were 88.9%, 95.3%, and 95.2% for the TES, CSP-PLC, and CSP-DLC formats, respectively.

Eight FPWJ examinees were excluded from the previous analyses because two independent judges agreed that the examinees' explanations regarding their cognitive activities during the test were sufficient to justify physiological responding to the relevant questions. When those eight examinees are included in the analyses of the accuracies of decisions identifying PI examinees, the percent accuracies are 81.4%, 95.3%, and 90.8% for the TES, CSP-PLC, and CSP-DLC formats, respectively. The accuracies of the examiners' decisions in identifying PI examinees were significantly different among the three formats, both when inconclusive decisions were excluded from the analyses, and when inconclusive decisions were included in the analyses. Decisions made by examiners who administered the CSP-PLC format were significantly more accurate identifying the PI examinees than were the decisions made by examiners who administered the TES format (excluding inconclusive, z = 2.43, p = .015; including inconclusives, z = 2.48, p = .013). The accuracies of the decisions identifying PI examinees were not significantly different for examiners who administered the CSP-DLC format compared to the decisions of examiners who administered the TES or the CSP-PLC formats.

# **Blind Raters' Decisions**

The number of correct decisions, inconclusive decisions and errors made by the blind raters are presented in Table 2. Sample sizes are smaller than in Table 1 because the blind raters scored INC some examinations which the original examiner scored conclusive (SR or NSR). Additional testing would have been required for the blind raters to reach a decision. Therefore, these examinations were not included in the blind raters' decisions. There was no statistically significant different among the number of examinations omitted from each format group.

The decisions of the blind raters were significantly more accurate in correctly identifying PG examinees when the data were collected with the TES format (81.0%), than were their decisions when the data were collected with either the CSP-PLC format (57.2%) or the CSP-DLC

format (42.9%). The differences among the accuracies of the blind raters' decisions identifying the PG examinees were significant both when inconclusive decisions were excluded from the analyses (TES vs. PLC,  $\underline{z} = 2.01$ ,  $\underline{p} = .04$ ; TES vs. DLC,  $\underline{z} - 2.54$ ,  $\underline{p} = .011$ ) and when inconclusive decisions were included in the analyses (TES vs. PLC,  $\underline{z} = 1.97$ ,  $\underline{p} = .05$ ; TES vs. DLC,  $\underline{z} = 2.84$ ,  $\underline{p} = .004$ ). The accuracies of the blind raters' decisions in identifying the PI examinees were not significantly different, among the three formats. The accuracies, based on the blind raters' decisions, of the three formats in identifying PI examinees (inconclusive decisions excluded) were 88.5%, 93.2%, and 94.4% for the TES, CSP-PLC, and CSP-DLC formats, respectively.

# Table 2

# Number of Correct Decisions, Inconclusive (INC) Decisions, and Errors Made by the Blind Raters in Identifying Programmed Guilty and Programmed PI Examinees

Decisions

Format	Correct	INC	Errors
	Program	nmed guilty examine	ees
CSP-PLC	12,	1	11
CSP-DLC	9,	4	12
TES	17 <sub>b</sub>	1	4
	Program	nmed PI examinees	
CSP-PLC	55	3	4
CSP-DLC	51	5	3
TES	46	0	6
CSP-PLC CSP-DLC TES	55 51 46	3 5 0	4 3 6

Note: Frequencies within columns with different subscripts are significantly different from each other at p < .05.

# **Interrater Reliability**

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Pearson correlation coefficients were calculated between the numeric scores of the original examiners and the numeric scores of the blind raters, for each format, to determine interrater reliability. Within each format, a separate correlation coefficient was calculated using the data

from each of the four relevant questions. The correction coefficients are listed, by format and question, in Table 3. In addition, the reliability of the categorical decisions (SR, NSR, INC), based on the numerical scores of the original examiners and the blind raters, was high for each format. The percent agreements were 89% (Kappa = .76, t = 6.9), 89.5% (Kappa = .70, t = 7.7), and 89% (Kappa - .73, t = 6.7) for the TES, CSP-PLC, and CSP-DLC formats, respectively. All of the reliability measures were significant (p < .0001).

# **Inconclusive Decisions**

The percentage of PI examinees who were retested due to INC decisions when the examiners administered the TES (either sub-test), CSP-PLC, and CSP-DLC formats were 21.4%, 23.1%, and 19.7% respectively. The percentage of PG examinees who were retested, due to INC decisions, when the examiners administered the TES (either sub-test), CSP-PLC, and CSP-DLC formats were 13.3%, 10.3%, and 29.0% respectively. The percentages of INC decisions were not significantly different among the three formats.

## Table 3

# Pearson Product Moment Correlation Coefficients Calculated Between the Original Examiners' Numerical Scores and the Blind Raters' Numerical Scores to Each Question

**Ouestion** 

Format	Espionage	Sabotage	Disclosure	Contact
TES	.82*	.84*	.77*	.78*
CSP-PLC	.82*	.88*	.80*	.87*
CSP-DLC	.78*	.89*	.86*	.87*

\* <u>p</u> < .0001.

# **Confounding Variables**

There were no significant differences in the distributions of PG examinees or PI examinees among the examination formats, as a function of either ethnic origin or gender. In addition, inferential statistical analyses calculated to determine if the number of PG examinees

participating in each scenario differed significantly among testing formats indicated the differences were not significant.

### **Physiological Response Scores to Specific Questions**

To ensure that no question elicited stronger physiological responses from the examinees, than any other question, the PI examinees' numerical scores for each question were analyzed with a Quade non-parametric repeated measures analysis. The relative strengths of the PI examinees' physiological responses to the four questions were not significantly different from one another. To determine if the PG examinees' physiological responses were greatest to the question specific to the scenario they previously enacted, the PG examinees' numerical scores for each question were analyzed with a Quade non-parametric repeated measures analysis. The data from PG examinees who had enacted different scenarios were analyzed separately. Therefore, four separate analyses were performed, one for each scenario. The data from PG examinees who were administered the TES format were not included in these analyses, because many of those examinees were not administered the second sub-test. The relative strength of the physiological responses to the other three questions, only when the sabotage scenario had been enacted [Quade (3, 15) = 5.39, p < .01].

# Table 4

Scenario	Espionage	Sabotage	Disclosure	Contact
Espionage*	1	0	1	6
Sabotage**	0	6	0	0
Contact*	0	1	7	2
Disclosure	0	1	2	5

# The Number of Programmed Guilty Examinees, Administered a CSP Examination, with the Most Negative Score for Each Question

Question

Note: Analyses tested the significance of the distribution within each scenario. \* p < .01. \*\* p < .001. The data in Table 4 are frequency distributions in which the columns are the question to which the PG examinee received the most negative score (strongest physiological response), and the rows are the scenario in which the PG examinee participated. The data include only CSP (PLC and DLC) examinations and only examinations in which the strongest negative score was - 3 or less (*i.e.*, true positive results). To determine whether PG examinees' physiological responses were stronger to the question specific to the scenario they had enacted, rather than to any other question, the data in Table 4 were analyzed using the Chi-square. Four separate Chi-square statistics were calculated, one for each scenario. The distributions were significantly different from chance for the espionage [ $X^2$  (3) = 11, p < .015], sabotage [ $X^2$  (3) = 19, p < .001], and contact [ $X^2$  (3) = 11.6, p < .01] statistics.

When the PG examinees had enacted either the sabotage or contact scenario their strongest physiological responses were usually to the question related to the scenario they had enacted. The same trend was true for the disclosure scenario but the effect was not significant. However, the PG examinees had enacted the espionage scenario their physiological responses were usually stronger to the "disclosure" question than they were to the "espionage" question. Overall, 59% (75%, if the data from the espionage scenario are not included) of the examinees responded most strongly to the question specific to the scenario previously enacted. However, 8 of the 32 examinees received a score of -3 or less to at least two questions and for 3 of those examinees neither response was to the question specific to the scenario (espionage) previously enacted.

## **Development of new TES Scoring and Decision Criteria**

The data from the current study were utilized to determine if different scoring and decision criteria would yield more accurate results and/or fewer inconclusive decisions. The sets of decision criteria are listed in Table 5. The data were reevaluated, using each set of decision criteria, once when the data were scored using the physiological responses following the first repetition of the first control question (1C1) for scoring purposes and again when the physiological response to 1C1 were not used for scoring purposes. In general, decision criteria which were less stringent for assigning an NSR decision resulted in slightly higher accuracies in identifying PI examinees and slightly lower accuracies in identifying PG examinees. The opposite was true for decision criteria which were less stringent for assigning an SR decision. Similarly, using the physiological responses to 1C1 for scoring purposes, resulted in slightly higher accuracies in identifying PG examinees. The opposite was true when the physiological response to 1C1 were not used for scoring purposes, resulted in slightly higher accuracies in identifying PG examinees and slightly lower accuracies in identifying PG examinees. The opposite was true when the physiological response to 1C1 were not used for scoring purposes. The accuracies of the decisions using the different decision criteria were not significantly different from the original decision accuracies.

Because each set of decision criteria increased the detection rate of one category of examinee (PI or PG) and decreased the detection rate of the other category of examinee, it was decided to keep the original decision criteria but to try to retain the benefits of scoring the data with or without the physiological responses to 1C1. Because including the physiological data from 1C1 increased the detection rate of PI examinees and excluding the physiological data from

1C1 increased the detection rate of PG examinees, the combined detection rate might be increased if both approaches were utilized.

The detection rate of the PI examinees was increased first. The initial scoring of the test used the physiological responses to 1C1. If the decision was conclusive (SR or NSR), then the decision was final. However, if a conclusive decision could not be made then the physiological responses to the first two relevant questions were reevaluated using only the physiological responses to the second control question (1C2) as a comparison. The rescoring results in the same or less positive scores, because the physiological responses to 1C1 typically are stronger than the physiological responses to 1C2. The new scoring method identified the PI examinees first, then, if a conclusive decision could not be made, the rescore identified more of the PG examinees.

The new scoring method did not result in significant differences in the accuracies of detection. However, it reduced the number of initial INC decisions. With the original scoring and decision criteria, 13 PI and 4 PG examinees received INC decisions. With the new scoring method, only 1 PG and 6 PI examinees received INC decisions. However, statistically, the decreases in the number of inconclusive decisions were not significant.

# Table 5

SET	NSR Decision	SR Decision
Original	R1 + R2 >= +4 and $R1$ and $R2 > 0$	R1 or R2 <= -3
1	R1 + R2 >= +4 and $R1$ and $R2 >= 0$	R1 or R2 <= $-3$
2	R1 + R2 >= +3 and $R1$ and $R2 > 0$	R1 or R2 <= $-3$
3	R1 + R2 >= +3 and $R1$ and $R2 >= 0$	R1 or R2 <= $-3$
4	R1 + R2 >= +4 and $R1$ and $R2 > 0$	R1 or R2 <= $-2$
5	R1 + R2 >= +4 and $R1$ and $R2 >= 0$	R1 or R2 <= $-2$
6	R1 + R2 >= +3 and $R1$ and $R2 > 0$	R1 or R2 <= -2
7	R1 + R2 >= +3 and $R1$ and $R2 >= 0$	R1 or R2 <= $-2$

#### Sets of Decision Criteria Used to Evaluate the Data

**Decision Criteria** 

Note: Any test score which did not meet either the SR or the SR decision criteria resulted in an "inconclusive" decision.

# Discussion

The decisions of the examiners who administered the TES format were significantly more accurate (83.3%) at identifying the PG examinees than were the decisions of the examiners who administered either the CSP-PLC (55.6%) or the CSP-DLC (58.6%) format. There were no significant differences among the accuracies of the examiners' decisions at identifying the PI examinees. The accuracies of the decisions obtained using the three formats to identify the PI examinees were 88.9%, 95.3%, and 95.2% for the TES, CSP-PLC, and CSP-DLC formats, respectively. The results were supported by the accuracies obtained from blind scoring of the examinations. The accuracies of the blind raters' decisions with the TES format were similar to the accuracies of the original examiners' decisions. When the data were collected with the TES format, the decisions of the blind examiners were significantly more accurate (81.0%) in correctly identifying PG examinees, than the decisions obtained when the data were collected with either the CSP-PLC format (57.2%) or the CSP-DLC format (42.9%). The accuracies of the blind raters' decisions identifying the PI examinees were not significantly different, among the three formats.

One possible explanation, consistent with the significance/attention model, for the significant differences among the decisions made using the formats to identify PG examinees is the amount of information to which the examinee was required to attend during the examination. Four relevant questions, each of which addresses a separate issue, are asked during the administration of a CSP test (PLC or DLC). Therefore, these examinees are given information and questioned regarding four separate issues. Perhaps, having so much information to process and focus on diffuses the examinee's attention, reducing the physiological responses, thereby reducing the accuracy of PG identification. Only two relevant questions are asked during each TES test, which reduces the amount of information presented to the examinee during a test. A proponent of the significance/attention model would predict higher detection rates when fewer issues are involved. This also could explain why detection accuracies typically are higher for specific issue criminal examinations (single issue examinations) than for security screening examinations (multiple issue examinations). However, there is little research assessing the affect of the number of issues addressed during an examination on the detection accuracy of the test.

Barland *et al.* (1989) assessed the differences in detection rates between single and multiple issue examinations. The authors reported that accuracies of the decisions obtained using single and multiple issue tests were not significantly different. However, the study did not test the issue adequately. The principle investigator (G. Barland, personal communication, September, 1993) stated that the examiners conducting the single issue examination were instructed to conduct the three examinations as separate examinations (*i.e.*, pretest only the two relevant questions for the first exam, conduct the exam, and so on). However, a random sample of the single issue examinations administered during that study indicated that the time between the examinations was only 1 minute and 8 seconds longer than the time between the tests (charts) within an examination. One minute and 8 seconds is not sufficient time to pretest two relevant and 3 control questions. Therefore, it is possible that some of the examiners, contrary to

instructions, were pretesting all of the relevant questions prior to conducting any of the examinations. If all six relevant questions were discussed with the examinee prior to any testing, the examinee could have been thinking about all six relevant questions, even though only two relevant questions were asked on any one test. In addition, the number of PG examinees for whom INC decisions were rendered was significantly greater when the multiple issue examination (28.3%) was administered than when the single issue examinations (10.5%) were administered (test of proportionality,  $\underline{z} = 1.96$ ,  $\underline{p} < .05$ ). Raskin, *et al.* (1988) reviewed multiple issue field examinations conducted by a federal agency and found there was a negative relationship between the number of issues on a test to maximize decision accuracy. Studies should be conducted to compare the accuracy of decisions identifying PI and PG examinees when different numbers of relevant issues are addressed.

An additional complicating factor with multiple issues tests is that the examinee does not always respond, physiologically, to the question to which she or he is being deceptive. Whether a deceptive examinee's greatest physiological responses occur following the question to which the examinee is being deceptive has implications both for the number and type of relevant questions asked on a PDD test, and the criteria used to render a decision based on those responses. Barland (1981) reported that the accuracy of PG examinee identification decreased when responding to specific questions was assessed. He concluded that the correctly identified PG examinees were responding to questions other than the one to which they were lying. Also, Correa and Adams (1981) using an R/I format, reported better detection rates when the test was evaluated as a whole compared to the detection rates based on individual questions. Barland, et al. (1989), also concluded that the examinees were not always responding to the specific question Raskin, et al. (1988) reported similar results with field to which they were deceptive. examinations conducted by a federal law enforcement agency. They concluded that the tests did not detect deception at the level of the individual crime, which suggests that numerical scores associated with individual relevant issues may be a poor guide in choosing the issue for interrogation.

The data from the current study support the previous findings. Although there was a relationship between the scenario enacted and the specific question to which the examinee responded physiologically, the relationship was modest. In fact, 41% of the PG examinees did not have strong physiological responses to the question related to the scenario in which they participated. Therefore, decision criteria should not be based only on the physiological responses to individual questions but also on the relevant questions as a group. It should be noted that strong physiological responses to one relevant question do not indicate that it is the most significant question nor the only significant question for the examinee.

The results of this study indicate that a proportion of individuals have strong physiological responses to one or more relevant questions because the question is significant to the individual for reasons other than deceptive responses to the questions. Forty-five percent of the PI examinees who received FP decisions (9% of all PI examinees) following a TES examination were deemed to have concerns sufficient to expect strong physiological responding to one or

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more relevant questions. In addition, field experience indicates that examinees often have concerns about a question, or the question brings something not directly related to the question to mind, which they, initially, do not discuss with the examiner. During the examination, the examinee may focus more attention on that question thereby producing physiological responses to the question (consistent with the significance/attention model). Because the TES format is more sensitive to identifying the PG examinees, it also will be more sensitive to identifying individuals with "outside" issues. This was apparent from the larger number (although not significant) of FPWJ examinees identified when the TES was administered compared to the number when either CSP was administered. Therefore, it is important to determine why an examinee responds physiologically to a relevant question. Future studies need to assess: (a) what proportion of PI examinees have concerns related to the relevant questions, (b) what proportion of those examinees actually respond to the relevant questions, and (c) what effect pretest disclosure of information has on the likelihood the examinee will respond to the questions (*e.g.*, is the examinee less likely to respond to the relevant questions, if the personal concerns are discussed prior to the test).

It also is possible that the decision accuracies obtained with the TES format might have been attenuated by examiner unfamiliarity with the format. The examiners who administered the TES format were not familiar with the format, whereas the examiners who administered either of the CSP formats were familiar with the CSP format. There are many differences (including the pretest and the actual conduct of the examination) between the TES and the standard CSP format. Tape recordings of the early TES examinations, are interpreted as indicating that the examiners were not comfortable with what to say and often did not pretest the relevant questions sufficiently. If an examinee was thinking about something not specifically related to the relevant question and the examiner did not adequately deal with the issue, the examinee might have responded to the questions during the test. Once examiners become more familiar with the format, accuracy rates might increase.

The numbers of male and female examinees in the three conditions were not significantly different nor were the numbers of African-American and Caucasian examinees in the three conditions. Therefore, it is unlikely that the significant differences among the accuracy rates obtained using the three formats to identify PG examinees are not attributable to gender or racial differences. In addition, the number of PG examinees who participated in each scenario did not differ significantly among the testing formats. Therefore, the significant differences among the accuracy rates obtained using the three formats to identify PG examinees are not attributable to gender or racial differ significantly among the testing formats. Therefore, the significant differences among the accuracy rates obtained using the three formats to identify PG examinees are not attributable to differences among the scenarios.

The significant differences among the accuracy rates obtained using the three formats to identify PG examinees do not appear to have been due to the different types of control questions. If the DLC questions had contributed significantly to the higher detection rate of the PG examinees who were administered the TES format, then the detection rate of the PG examinees tested with the CSP-DLC format should have been higher than the detection rate of the PG examinees tested with the CSP-PLC format. It was not. Similarly, the DLCs do not appear to

have affected the detection rates for PI examinees. Although the differences were not significant, PI examinees who were administered the TES format were identified less frequently than PI examinees who were administered either CSP format. In addition, when the FPWJ examinees were included in the analyses, significantly more PI examinees were correctly identified using the CSP-PLC format versus the TES format. However, in both sets of analyses, the number of PI examinees correctly identified using the CSP-DLC was not significantly different than the number identified when either the CSP-PLC or TES was administered. Therefore, any differences among the accuracy rates in detecting PI or PG examinees is not attributable to differences between the PLCs and the DLCs.

The syntax of the relevant questions is an issue that affects the generalizability of the results. A previous study (Barland, *et al.*, 1989) was criticized for using relevant questions that included the phrase "against the United States," because the examinee did not commit a crime "against the United States." Proponents of a significance/attention model would argue that a test would be more accurate if the examinee's attention is focused on the actual issues being tested. In fact, field examiners have been applying this principle for years in the development of control questions and sometimes relevant questions (DoDPI, 1994d). Field examiners caveat their questions with "time bars" or "situation bars" to narrow the examinee's attention to a specific time or situation (*e.g.*, prior to 1993 have you ever ...). In the current study, it was decided to caveat the relevant questions with the phrase "during this project" and to omit the phrase "against the United States" to ensure that the subject's attention was focused on the test issues.

There is no reason to expect that the caveat added to the relevant questions would differentially affect the accuracies of decisions obtained using the three different formats. Therefore, it is unlikely that the differences in decision accuracies among the three formats are attributable to the caveat. However, because the relevant questions were designed to focus the examinee's attention on the project, it is possible that the accuracies obtained during the study may not be an accurate reflection of the accuracies that would occur in the field. Studies should be conducted to assess the impact of "time" or "situation" bars on PDD test accuracy. This is an important question because the practice is so popular in the field.

In conclusion, the new TES format may be a viable alternative to the CSP format currently utilized for security examinations. The TES format differs from the CSP formats in that: (a) the number of issues being tested in a question series is reduced; (b) a maximum of three question repetitions are used to calculate question scores; (c) between-test stimulation is eliminated; (d) the order of questions within the question sequence cannot be altered; (e) each relevant question is compared to the same control questions; (f) the pretest is brief, more standardized, and follows a logical sequence of information presentation; and (g) problems associated with PLC questions are reduced by using DLC questions. Some of these differences might account for the fact that in a laboratory mock situation, the decisions of examinees than were the decisions of examiners who administered either CSP format. If future testing with the TES format continues to demonstrate high accuracy rates for discriminating between PI and PG examinees, the federal government should consider changing their security screening programs to utilize the TES as their primary PDD examination.

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# APPLICATIONS OF POLYGRAPH TO THE PSYCHOPATHIC PERSONALITY

#### By

## Debra A. Krsnich

"For Chrissakes, Ames," Bailey said, "you must know that the man has a pulse and blood pressure and breathes normally. That and the ability to comprehend articulated questions are all it takes to submit to a lie test." (Bailey, 1971) So went the argument a young F. Lee Bailey posed to proceed with a polygraph exam for Albert DeSalvo, the infamous Boston Strangler.

While it may be true that those basic requirements are all that it takes to physically submit to the test, we must examine the accompanying studies that address whether deception may be detected in psychopaths and the role of the examiner in this process.

# The Research

Raskin and Hare evaluated a sample of 48 prisoners, half of whom were diagnosed as psychopaths, to determine whether psychopaths are able to "beat" the polygraph due to being electrodermally hypo-responsive, and whether the control question test was effective in the detection of deception in those cases.(Raskin and Hare, 1978) In this study, the prisoners were polygraphed in regard to the theft of \$20; half the prisoners were "innocent", and half had been instructed to remove the money from an envelope when the guard was not looking. The innocent subjects were told of the "crime" of the "guilty" subjects and would receive a \$20 bonus if they could prove their truthfulness in the exam. The "guilty" subjects could win \$20 by "beating the polygraph." Not a single "guilty" subject was able to replicate a truthful response. Raskin and Hare found that "sufficient aroused or motivated psychopaths are not hypo-responsive."

The cautionary advice inserted in the study underscores the role of the examiner, which cannot be overlooked: "Since the wording of each control question must be selected by the examiner and individually adjusted according to the subject's answer to the question, the training and skill of the examiner play an important role in determining the accuracy of the outcome. Furthermore, the manner in which the examination is conducted and the way the examiner interacts with the subject can also influence the outcome." (Raskin and Hare, 1978)

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In 1989, Patrick and Iacono presented the findings of their study in which 24 psychopathic and 24 nonpsychopathic prisoners were examined. Previous research had suggested that psychopaths tend to be nonreactive to unpleasant stimuli (Hare, 1978) and so might be unconcerned over relevant questions posed, and therefore less likely to produce clear deceptive outcomes. Instead of offering individual bonuses for truthful results, the bonuses for the group as a whole hinged on an individual's performance. Further, the subject was informed that a list of names of those who passed or failed would be provided at the end of the testing, so that everyone would know who caused the group to fail, and subsequently be cheated out of their bonus. This was meant to create an artificial threat. Patrick and Iacono found in this study that guilty psychopaths were just as easily detected as guilty nonpsychopaths, but they did have some difficulty in identifying the innocent subjects.

In 1993, Christopher Patrick tested 54 incarcerated sexual offenders who were divided into three equal groups of psychopathic, nonpsychopathic and "mixed" subjects, using Hare's (1991) criteria for psychopathy. They were shown a variety of slides depicting slides of pleasant, unpleasant and neutral scenes. Pleasant slides portrayed opposite-sex nudes, food, sports scenes, and children; unpleasant stimuli included mutilations, aimed guns, and snakes; neutral slides depicted household objects and nonexpressive faces. Blink startle reactions to noise probes introduced during 6 of the 9 trials for each slide type were recorded along with skin conductance and HR responses. Patrick found that instead of showing heightened startle reactions during exposure to aversive slides, the reactions of psychopaths were actually inhibited, relative to neutral slides. He concluded that "the result is consistent with the hypothesis that psychopaths process emotional stimuli differently from normal subjects and, specifically, that their reaction to aversive events is deviant or deficient."(Patrick, 1993)

We recognize that skin conductance or resistance can be measured in the psychopath, and that they are not hypo-responsive as previously believed. We also know, however, that although their autonomic nervous response is the same as non-psychopaths, they react differently to aversive stimuli. Other studies indicate that rather than responding to fear and the threat of punishment, psychopaths are responding with what Ekman (1985) terms "duping delight." This suggests that the autonomic responses are caused by the psychopath's enjoyment of the game and interest in the relevant questions. I propose that whether they are fit subjects for polygraph examination is determined by the skill of the examiner.

#### The Psychopath

How does a polygraph examiner know that his examinee is a psychopath? As examiners we do not diagnose the condition, or even refer to an opinion of such in our notes. At times we will be aware of a diagnosis of psychopathy as a result of the subject's previous mental commitments or penal reviews. The experienced investigator will recognize those personality types conducive to the form of exam I propose in this paper, but where does the neophyte look for guidance? The most valuable resource will be the Psychopathy Checklist developed by Dr. Robert Hare, and found in his book Without Conscience: The Disturbing World of the Psychopaths Among Us.

Psychopaths have been referred to as "having ice water running through their veins." If psychopaths comprise approximately one-third of the prison population, as has been suggested, it becomes extremely important to understand our ability to accurately test these individuals. Dr. Robert Hare developed his Psychopathy Checklist as a tool for professional clinicians. Previous diagnosis was dependent on the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* and the descriptions of Hervey Cleckley (*The Mask of Sanity*, 1941). Hare spent ten years compiling and improving the procedures now used worldwide to distinguish true psychopaths from those who merely break the rules. Hare's checklist uses the following descriptors of the emotional/interpersonal symptoms of the psychopath: Glib and superficial, egocentric and grandiose, having a lack of remorse or guilt, lack of empathy, deceitful and manipulative and having shallow emotions. The other part of the remaining symptoms reflect the psychopath's deviation from social norms: The psychopath is impulsive, exhibits poor behavior controls, has need for excitement, lack of responsibility, and had early behavior problems and adult antisocial behavior. (Hare, 1993)

According to former Special Agent Paul Roemer of the FBI, the psychopath is basically unsocialized, repeatedly in conflict with society, incapable of loyalty to a group, has no social values, is grossly unselfish, acts on impulse, is unable to feel guilt or learn from punishment. His frustration and tolerance level is low. He tends to blame others for his behavior. His traits are macho, loner, but has undue dependencies on others at times. He is a sexual experimenter, self-centered, an extrovert, and experiments with different criminal behaviors. The sociopath (Roemer used anti-social, sociopath and psychopath interchangeably) is generally glib, extremely intelligent, with an IQ of 100-150, and usually dates with a long commitment. His physical body type is generally muscular, in good shape. This is in contrast to the personality type of the inadequate personality, the "born loser," Certainly, those individuals can and do commit murders and other crimes as well but the differences will be evidenced not only in the nature of the crime scene but in their appearance, demeanor and personality and your interview approach would differ from that of the psychopath, which we are discussing here. The psychopath prefers individual sports and needs to be the center of attention. His employment is usually in masculine-type jobs. He likes to purchase flashy cars, and loves to drive them. He socializes in the bars at night; among his friends, he is the leader, and he often carries a weapon. He does not like authority, is very cunning and manipulative and can adapt very quickly to any environment. Crimes that he usually commits are murder, rape and contract killing. If he commits a burglary, he may rape women while at the location of the burglary. If he kills, it will probably be children or elderly people, or lust-type murders. The psychopath likes to size up your investigation and offer to assist. (Author's notes, 1992)

# **Preparing for the Exam**

As an examiner, you must recognize that the value system of the psychopath may not only be unfamiliar to you, but distasteful, as well. Their perceptions are not your perceptions, and as such, you may find yourself unsuccessful in utilizing references and themes that have worked for you in the past. When you go into this polygraph exam you must be fully prepared in all of the areas--the biography and pre-test interview, the polygraph charts, and the post-test interview or interrogation.

You must first familiarize yourself thoroughly with the case facts. Do your homework and get to know your subject prior to the exam. The psychopath respects his opponent's ability to participate in the game, but will be alert to any sense of weakness and this includes your preparedness. Disorganization, or a Columbo-type of bumbling approach will quickly erode the psychopath's interest in speaking with you, except to emphasize his own comparative brilliance.

Place the crime in context. You may wish to consult the *Crime Classification Manual*, which is the result of a 10-year project by the FBI's Center for the Analysis of Violent Crime. Case studies list background and victimology, offender characteristics, forensic findings and investigative considerations. With the psychopath, your crime scene will indicate an organized offender (*FBI Law Enforcement Bulletin*, 1985). If the scene has disorganized aspects, the investigators may have examined the possibility of multiple suspects and you will need to be familiar with the nature of the offender presented for your exam. *Practical Homicide Investigative Tactics, Procedures and Forensic Techniques* is an excellent tool to use in formulating your biographical questions (Vernon J. Geberth, 1996). If you understand the generalized profile then you can make more specific inquiries. Use this information to frame questions regarding travel, employment or family. If the subject indicates discipline or arrest in the past for fire setting or animal abuse, be alert to the existence of the McDonald Triad (childhood cruelty to animals, childhood fire setting and enuresis).

Having the examination room prepared in advance. The psychopath respects competence. Have the secretary advise you when he arrives and refer to you in his presence by a formal title, such as "Detective" rather than your first name. This may additionally serve to stroke the ego of the psychopath, who believes he is deserving of such attention. Remember that he would not submit to a polygraph exam unless he believed he could beat it. Create a seating arrangement that is suitable for both the pre-test and the polygraph exam with a minimum of rearrangement. Use straight-backed chairs that do not lend themselves to a posture of relaxation, with both the examiner and the subject on the same eye level. Preferably this is accomplished in a room specifically set aside for this purpose, as it should be devoid of distraction and personal touches. By all means, remove personal photographs from any area you speak with such a subject to avoid having him attempt to create an air of intimacy or uneasy familiarity.

#### **Question Formulation**

Listen closely to the phrasing and terminology used by the subject when you ask him to discuss the issue at hand. Remember to ask open-ended questions that encourage conversation. You may find the psychopath annoyingly verbose, but control your urge to interrupt initially. It has been said that only 4.7 seconds elapse after the average police officer asks a subject to tell him what happened until he interrupts. In a book entitled *The Riverman: Ted Bundy and I Hunt for the Green River Killer*, Bob Kepple gathered some interesting insights to the mind of a serial killer. Bundy suggested that the detective needs to display an active interest in or a fascination for murder. (p.336) He further says that the art of interviewing a serial killer was clearly interviewing without being judgmental. (p.339) Again, remember that the values of the psychopath may not reflect your own and that you need to be especially alert to your own nonverbal communication. Review of materials such as *Practical Kinesic Interview and Interrogation* by Stan B. Walters (1995) may assist you in your evaluation.

Set aside the concept of developing the sort of rapport you have established in other exams. The psychopath evaluates you in terms of how you can assist him in reaching his goal, which is the perception of a truthful response. He may compliment your appearance or your knowledge. Stanton Samenow writes, "The criminal values people only insofar as they bend to his will or can be coerced or manipulated into doing what he wants. Constantly he is sizing up his prospects for exploiting people and situations. To him the world is a chessboard, with other people serving as pawns to gratify his desires." (Stanton E. Samenow, 1984) In so many other courses we have learned to utilize nonverbal communication in our assessments, but when faced with the psychopath listen to the words and separate them from the body language. Says Dr. Robert Hare, "Psychopaths often make effective use of body language when they speak, and often it is hard not to follow their actions with your eyes. Psychopaths also tend to intrude into our personal space. ... Overall, their display can be so dramatic or unnerving that it serves to distract, impress, control, or intimate us, drawing our attention away from what is actually being said." (p. 146) "If you have any weak spots in your psychological makeup, a psychopath is sure to find and exploit them. ..." (p. 147) In your role as an examiner you are only their "best friend" so long as you facilitate their goals. You cannot play to a sense of morality or injured pride for their lack of cooperation, as those human gualities are soft, vulnerable spots to be torn away and consumed.

Michaud and Aynesworth wrote that as Ted Bundy was being investigated for the attempted abduction of Carol DaRonch, he was said to answer the questions of Detective Forbes with "an imbecilic excuse that suggested either Ted was a fool, or, more likely, that he thought Forbes was one. Ted would often insult a questioner's intelligence. Ted always underrated the opposition." As detectives searched Ted's apartment for evidence, they were careful not to tip their hand as to the real object of the search. But they, writes Michaud, "needn't have worried; having his apartment searched was fun, like playing with matches, for Ted."

"Jerry," the detective remembers Ted taunting him, "you do a pretty good job."

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"I think I do a damn good job," Thompson answered.

"Now you've got straw," Ted went on with manic delight. "You're trying to fill up a broom. Keep going and one of these days you might make it."

Don't imagine that your own feelings or value judgements will have an impact on the psychopath, except to assist them in gauging their responses. The psychopath does not have an emotional investment in the pain and suffering of others. "Guilt?" Ted Bundy remarked in prison, "It's this mechanism we use to control people. It's an illusion. It's a kind of social control mechanism--and it's very unhealthy." (Michaud and Aynesworth, 1989) As an examiner, the issue becomes how to develop good questions for an individual who relates to life outside the scope of your experience.

Psychological set involves the concept that a person's fear, anxieties and apprehensions will be focused on the area or areas that create the greatest immediate threat to his self-preservation or general well-being. If a psychopath exhibits a lack of traditional conscience how do we develop a psychological set that will allow us to create a measurable response? By focusing on the rewards rather than the consequences. Avoidance of detection is important, not due to an innate fear of being caught but because of the delight in the gamesmanship. Therefore, as you develop and review relevant questions, emphasize the action of the event. Use descriptors to focus the subject's attention on the event. For example, if the victim is likely known to the offender or has been depersonalized in the assault, use a more detailed question format that recreates the incident in his mind. Instead of "that girl" use the name of the victim or a more complete description of the location.

Evidence connecting questions will be extremely critical. Evidence connecting questions contain information which will connect someone to a crime by having knowledge about the crime. It may involve being present but not involved, by planning or assisting after the fact. In some crimes this might identify the receiver of stolen property, for example, or elicit a response concerning the location of a weapon. Where this becomes important in the polygraph examination of a psychopathic offender is in recognizing signature aspects of a crime and using them to develop your evidence connecting questions.

Vernon J. Geberth, retired Lt. Commander with the New York City Police Department, and well-known author and instructor on Practical Homicide Investigation, writes "the signature aspect of a violent criminal offender is a unique and integral part of the offender's behavior. The signature component refers to the psychodynamics, which are the mental and emotional processes underlying human behavior and its motivations." A sexual offender may be subconsciously acting out a sexually significant behavioral pattern and those paraphilias evidence at the crime scene have a unique meaning within developmental experiences of that offender. An example of paraphilia manifested in a crime scene is offered in Geberth's most recent text (1996, p. 757) and reveals that a serial killer in Bellevue, Washington, who had a background of fetish burglaries and paraphiliac attraction to women's high-heeled shoes, posed his victim wearing a pair of red high-heeled shoes taken from her closet. In each case, the victim was posed at the

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scene in a sexual posture meant to shock the viewer. While the psychopath may not have a strong, emotional attachment to the murder itself, which is frequently simply an unfortunate but necessary event in order to achieve gratification, he will carry mental images of those signature aspects and you should be aware of their significance and possible application to your exam. Ted Bundy insisted that "violence was never an end in itself, that sex was almost perfunctory, and that to the extent it was possible the victims were spared pain. . . . the gratification lay not in the assault but in the possession of the victim." (Michaud & Aynesworth, 1983) Signature differs from *Modus Operandi*, which is a learned behavior that changes as offenders gain experience, build confidence, or become involved in the criminal justice system. (Geberth, 1996)

In the case mentioned above, several antique rings were also taken from the victim. The organized offender collects "trophies" of his victims, often in the form of costume jewelry, which he may present to a significant female as a gift to perpetuate the fantasy. This is not the same as "souvenirs" taken by the disorganized offender. Information like this can be invaluable to you as polygraph examiner if used properly. Inquiring about the location of the jewelry in this case would very likely invite a stronger response because the offender has a deep, psychological attachment to the act that is perpetuated in the presence of the trophy, much more so than the burglar who steals a piece of jewelry that holds no personal significance.

Be very familiar with the case facts. Only use confirmed information here; if you make an invalid assumption regarding evidence you may cause the psychopath to relax and lose his psychological set on the issue. Not only that, but the offender has often spent a good deal of time planning the event and he is well aware of what evidence is available to the police.

In developing your control questions, I suggest that you refer to available criminal profiling data as referenced earlier in this article. If you assume that ordinary conscience issues don't apply to the psychopath, you would also have to assume that control questions will naturally be weaker in nature. However, by familiarizing yourself with those offender characteristics you are better able to target likely areas for control question material. For example, discipline problems follow the organized offender, both in school and in the military and he will likely have a history of assaultive behavior. Knowing this, you would recognize that those issues are more important than the injury of or theft from a female, for example, for whom he has little respect except for the immediate value she offers him and his personal mission.

At whatever point you chose to introduce the physiology and psychology of lying to the examinee, remember that this offender is very intelligent. Know your instrument and explain the concept in a professional and competent manner. Don't talk down to this individual; if anything, compliment his intelligence and the fact that he would easily understand this. Avoid the comparison to guilt and lying, referenced to how their parents would know when they lied. Instead, suggest the challenge of lying and "getting away with it," and how that makes the heart beat faster, etc. Relate the physiological changes to this response. Psychopaths do know when they are lying. Emphasize the excitement in lying, and that they did all those physical things, all the appropriate nonverbal communicators and perhaps the other person did not know they were lying, but the examinee did. Let them know that they know when they lie and that if that

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was their intention today, you will know soon, as well. Ask them if they came to the exam to lie to you. They will say no, because now they're into the game and you've challenged their ability to lie.

#### Conclusion

Within the framework of establishing proper psychological set, psychopaths react physiologically as anyone else. The ability to polygraph a psychopath will depend on your skill as an examiner, and requires patience and study beyond any other exam you might administer. In the end, you may simply be a chess piece in the game and you need to understand that, as well.

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No man thoroughly understands a truth until

he has contended against it.

- Ralph Waldo Emerson

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# WHEN THE STATE COURT RULES CONFLICT WITH THE APA

By

#### Albert L. Thompson

#### Abstract

This report is written as a result of several recent Wisconsin criminal court cases which are inclined to contest the standards of the American Polygraph Association (APA) Constitution and By-Laws. While membership in the APA is not mandatory in order to be a polygraph examiner, it is the largest professional polygraph organization. The largest number of the APA members are in the profession of law enforcement who, through the polygraph examinations they administer, seek the truth regarding crimes and criminal activity. These examiners must first and foremost obey the rules of their respective courts. They are placed at a disadvantage when they must choose between legal actions by the courts or possible investigation and expulsion by the APA for violations of the APA Constitution or By-Laws. In general, APA members from law enforcement are faced with a dilemma.

There is no question that in recent years polygraph testing has gained increasingly widespread acceptance as a useful and reliable scientific tool. In 1989 the U.S. Court of Appeals, Eleventh Circuit decided the case *United States of America v. Julio Piccinonna*, 885 F.2d 1529 (1989) in which the court stated that polygraph evidence is not per se inadmissible and that the polygraph evidence may be admitted to impeach or corroborate testimony of witnesses at trial within the discretion of the trial judge. The Court also stated that the polygraph expert testimony must help the trier of fact to resolve issues and be relevant, and cannot be admitted if its probative value is substantially outweighed by the danger of unfair prejudice. Past courts have excluded polygraph evidence typically on three grounds: 1) the unreliability of the polygraph test, 2) the lack of standardization of polygraph procedures, and 3) undue impact on the jury.

The first of the three grounds for exclusion concerned the unreliability of the polygraph test. Courts have generally favored the general acceptance requirement which originated in the 1923 case of *Frye v. United States*, 293 F.1013 (D.C. Cir. 1928). Courts had applied the *Frye* standards to various types of scientific tests, including the polygraph. Most courts have little difficulty with the desirability of excluding the polygraph evidence and thus, applied the *Frye* standards with little comment. Recently, however, the application of the *Frye* standard to exclude

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polygraph evidence has been subject to growing criticism. Since the *Frye* decision, tremendous advances have been made in polygraph instrumentation and techniques and better equipment is being used by more adequately trained polygraph examiners. Further, polygraph tests are used extensively by government agencies. Field investigative agencies such as the FBI, the Secret Service, military intelligence and law enforcement agencies use the polygraph. It is no longer accurate to state categorically that polygraph testing lacks general acceptance for use in all circumstances.

The second issue considered by the courts when determining non-acceptance concerns the lack of polygraph procedures. This is where most oft the work of polygraph proponents has been directed and where the differences exist between the state courts and the polygraph proponents.

The American Polygraph Association (APA), the largest international organization of polygraph examiners, has attempted to address this issue through the development of an Association Constitution and By-Laws. According to the association Constitution, the goal of the APA is to provide mankind with a valid and reliable means to verify the truth of the matter. This goal is achieved by:

a. Serving the cause of truth with integrity, objectivity and fairness to all persons.

b. Encouraging and supporting research, training and education to benefit members of the Association, as well as those who support the purpose and by providing a forum for the presentation and exchange of information derived from such research, training and education.

c. Establishing and enforcing standards for admission to membership and continued membership in the association.

d. Governing the conduct of members of the Association by requiring adherence to the *Code of Ethics* and a set of *Standards and Principles of Practice*.

It is this fourth goal that is sometimes in conflict with established rules of the respective state courts.

In April 1995 the Wisconsin Court of Appeals decided *State of Wisconsin v. Cary Johnson*, 193 Wis.2d 382, 535 N.W.2d 441 (1995). In July 1994, Johnson was charged with one count of sexual assault of a twelve-year-old child, in violation of WI Stat. 948.02(1). The juvenile involved was a babysitter for Johnson's children. During the ride home from babysitting in June 1994, Johnson allegedly assaulted the juvenile. After the preliminary hearing and bindover, the State gave notice of its intention to introduce oral and inculpatory oral and written statements Johnson made following a July 1994 polygraph examination.

Originally, the police administered a pre-polygraph interview, explaining the process to Johnson and obtained a signed *Miranda* advisory and release form. Due to Johnson's lack of

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sleep, police were dissatisfied with the charts and results of the partial polygraph examination. The examination was rescheduled.

At a subsequent examination, the police reviewed Johnson's signed *Miranda* waiver with him and conducted a complete polygraph test. Shortly thereafter, the police officer escorted Johnson to an office adjacent to the polygraph lab and questioned Johnson's truthfulness as to the incident. The officer asked Johnson if he was sorry for what happened. He then asked Johnson to write a letter of apology. After eliciting the letter of apology, the officer asked Johnson what happened that night, and Johnson made the inculpatory admissions.

The trial court ruled that the statements made by Johnson could only be used for impeachment purposes. The State appealed the trial court's order, which excluded from evidence in the State's case-in-chief, statements Cary Johnson made after a polygraph examination. The Appellate Court concluded that the post-polygraph statements were voluntary and reversed the part of the trial court's order which excluded this evidence from the State's case-in-chief.

The Appeals Court explained that although polygraph test results are inadmissible in criminal proceedings, statements made in post-polygraph interviews may be admissible. If the post-polygraph interview is so closely related to the mechanical portion of the polygraph examination that it is considered one event, the post-polygraph statements are inadmissible. This determination is made after consideration of the totality of circumstances of the individual case. Here, the court concluded that the actual polygraph examination and the subsequent interview were sufficiently separate events as to both time and content. Johnson's inculpatory statements were made after the completion of the actual mechanical polygraph portion of the examination while he was not attached to the polygraph apparatus. Additionally, the post-polygraph examination took place in an adjacent room. From the hearing, it was evident that the police officer questioning Johnson did not refer to polygraph charts or tell Johnson he had failed the polygraph test to elicit inculpatory statements. Although the post-polygraph interview was temporally proximate to the actual test, no courts have proscribed a bright-line rule of timing, but look to the totality of the circumstances.

It is this ruling by the WI Court of Appeals that is contrary to the By-Laws of the APA.

Paragraph 7 of Division IV of the APA By-Laws states:

a member shall afford each person undergoing a polygraph examination a reasonable opportunity to explain physiological reactions to relevant questions evidence on the polygraph charts.

Paragraph 21 of this same division states:

a member who administers or attempts to administer any polygraph examination in violation of these Standards and Principles of Practice or who violates any

#### Albert L. Thompson

section of this Division shall be subject to investigation, censure, suspension, or expulsion from this Association.

Paragraph 7 requirements may be acceptable when addressing the physiological reactions to relevant questions evidence on polygraph charts for examinations of a non-criminal nature. However, in the State of Wisconsin the examiner is forbidden from referring to the polygraph charts or telling the examinee that he or she failed the polygraph test to elicit inculpatory statements. In Wisconsin not following the directions of the State Courts and giving the examinee an opportunity to explain physiological reactions will probably result in the inadmissibility of any confession. On the other hand, to violate the By-Laws of the APA may result in an investigation, censure, suspension, or expulsion from the Association. The degree of harm is subject to interpretation by the individual examiner. The rulings of the Courts of the State of Wisconsin may be unique to us only, however, other state courts may also feel this same way. Each individual examiner must decide for him/herself which edict to follow. Maybe the APA should change Paragraph 7 to allow for an amendment to this rule based on rulings of individual State Courts.

## Update

In late 1996 the Wisconsin Court of Appeals ordered the Vilas County Circuit Court to hold a new trial for an individual convicted in 1994 of First Degree Sexual Assault of a Child. In February 1997 the Trial Court ruled that a 1994 post-polygraph confession by the defendant was inadmissible after learning that the federal polygraph examiner who administered the examination advised the examinee that he was being deceptive and had failed the polygraph examination in order to elicit inculpatory statements.

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# HISTORY OF POLYGRAPH IN CROATIA

By

## Romeo Vrecko, B.A.

The first polygraph experimental tests in Croatia took place in Zagreb, at the Institute for Criminal Forensics in April 1959. The Institute was park of the Ministry of the Interior of the Republic of Croatia (formerly Yugoslavia). The experiments were made by Ivan Babic, head of the forensic laboratory. The Keeler polygraph was bought in the United States of America.

In the beginning, polygraph tests were being given secretly because the orthodox socialist doctrine had a negative or at least ambivalent attitude towards this process, as was the case in the U.S.S.R. It was well known that polygraph was an efficient means in fighting crime from the experience of the American police, but ideologically it was "a capitalistic inquisitorial means for getting admission of guilty" (information we got in the conversation with Mr. Babic). Only a small number of police executives and chiefs knew about these experiments.

In those days, the results of the experiments on our criminal population were not being published in our internal police publications nor in the press. Apart from the stated reasons, there also was a certain aversion of police chiefs towards writing about polygraphs "so that criminals would not find out about it," and so that judicial bodies would not make any questions about its legal justifiability.

The described situation did not last long. Soon the experimental phase with polygraph was over and the operative phase of its usage in fighting crime started.

The first significant case solved by using polygraph was spectacular and has paved the way to the usage of polygraph.

In November 1969, in a village near Zagreb a man was missing, and every attempt to find him was a failure. Some clues indicated that he had been murdered by his own son and that the body had been hidden. A polygraph investigator, D. Papes questioned the suspect using the POT method based on police suspicions of where the body might be hidden. The investigator was using a sketch of the terrain made for that purpose. After 14 days of daily questioning, on the basis of suspect's reactions, a place in a meadow was located where the body of the murdered victim had been buried. The murderer was convicted to 11 years of imprisonment.

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#### Romeo Vrecko, B.A.

The case was published in an official police magazine as well as in newspapers. This inspired the interest of police stations and of the whole police operational body for the usage of polygraph in their operational work. Doubts about the efficiency of polygraph have been removed and its use has been spread throughout the Republic of Croatia and former Yugoslavia, and since then it has been used in any complicated and serious criminal acts.

In those days there were neither expert literature on polygraph nor polygraph schools, also for the ideological and security reasons polygraph experts were not allowed to specialize abroad.

A significant step forward was made when, for the police purposes, the following books were translated into Croatian: C.D. Lee, *Instrumental Lie Detection* (ed. 1953); Inbau-Reid: *Lie Detection and Criminal Interrogation* (ed. 1953); Inbau-Reid: *Truth and Deception* (ed. 1966); Burkett-Feldmonn: *Manual for the Use of Lie Detector*; and Inbau-Reid-Lee: *Truth and Deception* (ed. 1977).

In the period between 1959 and 1967, polygraph was being used only at the Zagreb police; other police administrations in Croatia had neither polygraphs nor polygraph experts. Therefore, polygraph experts from Zagreb had to work hard in investigating all serious crimes in Croatia and in the Federation of former Yugoslavia. During this period several polygraph experts worked on the polygraph. They all gave their contribution to the implementation of polygraph in police work. Unfortunately, in this period, a negligible number of expert works on polygraphs was published; the education of beginners was just oral teaching and application-oriented approach. There was no theoretical approach nor research. The first investigators who worked with polygraph were lawyers (3) and crime investigators (2). Polygraph investigations were carried out from time to time -- there was no continuity in this work because those investigators had other obligations in police works.

The year 1967, was in a way, a breaking point in the development of polygraph technique in Croatia. The polygraph investigator in the Zagreb Police was Zvonimir Roso, who at that time was a student of psychology and a criminal inspector. Already during the first year of his work, he made a great success in the usage of polygraph in finding the perpetrator of serious crimes.

In 1967, the court of Croatia had, for the first time, given its opinion about the legal status of polygraphs. This happened on the occasion of a case of attempted murder. Z. Roso, a polygraph investigator, who acted as a witness, explained that material evidence was gathered by polygraph testing. Using the POT polygraph method, he had discovered the place where the suspect had hidden a rifle, used, according to expert opinion, by the suspect in a shooting. The perpetrator was sentenced, and in the Zagreb District Court verdict, among other evidence, the results of polygraph tests were mentioned. The Croatian Supreme Court has declined the appeal of the sentenced person and has confirmed the first-instance verdict. As far as we know, this was the first case that a Supreme Court of an European country has accepted polygraph testing are no longer admissible as evidence in legal proceedings in Croatia. Today, they are only a means used by police in the investigation of criminal acts. Roso introduced standards for polygraph investigators on the model of American ones. His work and recommendations helped polygraph to achieve professional status. As a result investigators work continually, not occasionally from case to case.

The polygraph lab was fully equipped, new instruments were purchased, new conditions and standards were set, professional literature was regularly read. The education of policemen on the possibilities of polygraph in their work was carried out. Zagreb Polygraph School was established, the only one in former Yugoslavia. Roso wrote some thirty professional works and studies on the use of polygraph in police investigations and two books: *Polygraph in Criminalistics* (1987) and *Police Investigation (Policijsko ispitivanje*, 1988, 1995). He did not neglect education; he unselfishly carried over his practical and theoretical knowledge to his colleagues and students at the Police Academy. In the period between 1967-1979, he trained all the polygraph investigators in Croatia and former Yugoslavia. This made possible the establishing of polygraph labs in all important police centers.

He also made personal and written contact exchanging experiences with the leading polygraph experts in the world.

He has classified polygraph documentation and established polygraph files, construed polygraph forms and records. A statement in writing about free will consent is a standard part of polygraph documentation. Earlier, an oral consent was enough. He made photo-studies of polygraph investigations and reports for the court, which was a novelty in those days. He requested that a polygraph investigator had to be present at the briefings concerning serious crimes, so that they could get first-hand information about the events and in order to create a plan for testing. His request was accepted. After more than 13 years of working on polygraph in the Zagreb Police, in 1979 he started lecturing at the Police Academy in Zagreb. He retired in 1990 and since has been doing theoretical work in criminology and truth verification.

Polygraph Lab	Lab Established	Technical Equipment	Number of Polygraph investigators-profession	Total number of tests made until 1 January 1995
PA <sup>1</sup> Zagrebacka	1960	Lafayette Diplomat (2)	2 crime investigators	20836
PA Primorsko-Goranska	1970	Lafayette Diplomat - 1 Ambassador - 1	2 psychologists	4538
PA Splotsko-Dalmatinska	1977	Lafayette Ambassador (1)	1 crime investigator and 1 lawyer	6569
PA Osjecko-Baranjska	1986	Lafayette Diplomat (1)	l lawyer	1242
PA Istarska	1994	Lafayette Ambassador (1)	l lawyer	208

#### Truth Verification in the Republic of Croatia

<sup>1</sup> Police Administration

# Polygraph Labs in the Republic of Croatia

# (Investigators and Equipment)

1. Police Administration - Zagrebacka

Lab established in 1960.

Polygraph investigators since the establishment of the lab: Ivan Babic, Dragutin Papes, Josip Lohna, Sthepan Rajki, Stojan Kolevski, Vjekoslav Spehar, Milan Turkalj, Petar Smolcic.

Polygraph investigators currently working at the lab: Rudolf Perkovic and Romeo Vrecko.

Technical equipment: Polygraph "Lafayette" model "Diplomat", ink print-out, 2 pieces.

The total number of polygraph tests: 20,836.

2. Police Administration - Primorsko Goranska

Lab established in 1970.

Polygraph investigators since the establishment of the lab: Branko Vamas, Radoslav Banic, Momcilo Danilovic.

Polygraph investigators currently working at the lab: Sonja Klaric and Ante Papic.

Technical equipment: Polygraph "Lafayette" model "Diplomat", ink print-out and polygraph model "Ambassador", thermal print-out.

Total number of polygraph tests: 4,538.

3. Police Administration - Splotsko Dalmatinski

Lab established in 1977.

Polygraph investigators since the establishment of the lab: Zelijko Gulisija, Jovo Njegovan and Morislav Skorput.

Polygraph investigators currently working at the lab: Mile Adzic and Ranko Britvic.

Technical equipment: Polygraph "Lafayette" model "Ambassador", thermal print-out.

Total number of polygraph tests: 6,569.

Polygraph, 26 (2)(1997).

4. Police Administration: Osjecko Baranjska

Lab established in 1986.

Polygraph investigators since the establishment of the lab: Zvonko Jurman and Danko Vojnovic.

Polygraph investigator currently working at the lab: Stjepan Medugorac.

Technical equipment: Polygraph "Lafayette" model "Diplomat", thermal print-out.

Total number of polygraph tests: 1,242.

5. Police Administration: Istarska

Lab established in 1994.

Polygraph investigator: Danko Vojnovic.

Technical equipment: Polygraph "Lafayette" model "Ambassador", thermal print-out.

Total number of polygraph tests: 208.

# **New Polygraph Labs**

# 6. Police Administration: Varazdinska

Lab established in 1995.

Polygraph investigator: Kreso Bosak.

Technical equipment: Polygraph "Lafayette" model "Diplomat", ink print-out.

# 7. Police Administration: Dubrovacko Neretvanska

Lab established in 1995.

Polygraph investigator: Vladimir Cica.

Technical equipment: Polygraph "Lafayette" LX2000-305.

These labs are planned to start working in September 1995.

Polygraph, 26 (2)(1997).

# Comparison Table of Polygraph Tests in the Republic of Croatia 1993 - 1994

Polygraph Lab	199	3	1994		Increase compared	
	tested persons	% of total	tested persons	% of total	to 94-95	
Rijeka	280	15.3	344	17.1	+64	
Split	538	29.4	505	25.1	-33	
Pula	-	-	208	10.3	-	
Osijek	292	15.9	168	8.3	-24	
Zagreb	718	39.3	787	39.1	+69	
Total	1828	-	2012	-	+184	

# Testing in Relation to the Number of Investigators

# (for 1994 an average of 251 persons on 1 investigator)

Rijeka	-158 persons	= -62.9%
Split	+3 persons	= + 1.2%
Pula	-43 persons	= -17.1%
Osijek	-83 persons	= -33.1%
Zagreb	+285 persons	= +113.5%

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Polygraph, <u>26</u> (2)(1997).

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