Polygraph September 1980 Number 3 Volume 9 Contents Possibility of Detecting Deception By Voice Analysis Ahikiro Suzuki, Shoichi Watanabe, Yutaka Takeno, 137 Tsuneo Kosugi and Takumi Kasuya A Polygraph Examination of a Sexually Molested Child Brian E. Lynch and Brent G. Waters 143 A Technique for Polygraphing the Deaf 148 James Allan Matte Research on the Validity of the Relevant-Irrelevant Technique as Used in Screening 153 Norman Ansley Attitudes of Job Applicants and Employees Toward the Polygraph 162 Ben A. Silverberg, Ph.D. Psychophysiological Evaluation of Detection of Deception in A Riot Case Involving Arson and Murder 170 Takehiko Yamamura and Yoichi Miyake Book Review 182 Gordon H. Barland, Ph.D. 183 Abstracts

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Akihiro Suzuki, Shoichi Watanabe, Yutaka Jakeno, Isuneo Kosugi and Jakumi Kasuya

Preface:

In order to refine the lie detection technique, improvements in the questioning method, interview technique and chart interpretation are necessary, but an improvement in indices is also important. Many workers have paid attention to new indices including EEG, plethysmograph, EMG and others which, to some extent, restrict movement of the subject because of the necessity of attaching sensors. Since voluntary control of voice is easy, the use of voice has not become a subject of discussion in the lie detection technology. Therefore, only a few studies have been done on this subject. Maki (1968), using a noise meter, studied the changes in voices. Fay and Middleton (1941) made a study on subjective analysis of voices and Alpert et al. (1963) used two types of bandpass filters of 100-6000 Hz and 100-250 Hz to analyze voices. Maki suggested the possibility of using changes in voices as a supplemental index. Fay and Middleton showed a detection rate of 55% through use of subjective judgement and Alpert et al. showed that there was hardly any difference in truth and deception when the 100-6000 Hz filter was used but a change in voice amplitude was noted when the 100-250 Hz filter was used. Despite these efforts, lie detection by voice analysis has not reached the practical stage. Voice is not only easy to record but it can be collected without awareness of subject being monitored. A potential for lie detection cannot be underestimated and it should not be discounted too lightly. The key issue of voice analysis in lie detection must exist in methods of processing information in voices. At present, a bundle of analysis methods should be studied by the elimination in order to probe for the better processing system. The purpose of the experiment given in this report was to explore, along the above mentioned line, a possibility of lie detection by means of voice analysis.

A human voice is formed by exhalation, utterance and articulation. A sound wave passes through various parts of the vocal system (mouth, throat, lips, etc.) and produces words and distinctive resonance.

If a subject is psychologically disturbed or telling a lie, we assume there are changes in exhalation muscle tension of vocal cords and resonance characteristics from the vocal tract to the lips, including the mouth and nasal cavity. Although these characteristics are not sufficiently investigated yet, it is hypothesized that a guilty person's utterance to a critical

Suzuki and Watanabe are the Research Psychologists for the NIPS. Takeno, Kosugi, and Kasuya are the Police Psychologists for Criminal Investigation Lab., Metropolitan Police Department. Reprinted with the permission of the authors and the NIPS from <u>Reports of the National Institute of Police Science</u>, 1973, <u>26</u>, 62-66. Suzuki <u>et</u> <u>al</u>.

question is different from his utterance to a control. Based upon this way of thinking, detection of deception through analysis of voices in respect to showing the pitch, intensity, duration and the sonagram has been studied and reported here.

Method:

<u>Subjects</u>: A pilot test on a mock crime did not produce a psychological tension at the critical questioning; therefore, materials taken from actual cases were used for analysis. These materials cover 3 subjects who have been confirmed as criminals by confession or by medical jurisprudence examination. The crimes involved were larceny (pick pocket, intrusion) and rape. Subjects were all males ranging in age from 24 to 30.

<u>Recorder</u>: A Sony ECM-21 microphone was placed approximately 30cm from the subject's mouth. The voice was transmitted through a unidirectional condenser microphone to a Sony TC-777A tape recorder in the next room. The recording was set at a speed of 19cm/second. The recording sensitivity was adjusted by using a UV meter to monitor subject's voice during the pre-test interview. This sensitivity of each subject was maintained through the examination.

<u>Procedures</u>: Subjects were taken into a semi-sound proof room and were given a pre-test interview. POT and comparison question tests (CQT)* were administered to the subjects in accordance with the standard procedure using a Takei TRP-L polygraph. During the examinations, the verbal responses of the subjects were recorded in the next room by a tape recorder.

Instrument processing: When answers to CQT and POT questions were inconsistant, they were eliminated from analysis; for example, when one answered "no" to a certain question in a series and later answered "I do not know." As a result, we selected 21 questions from the 7 charts on subject no. 1, 27 questions from the 11 charts of subject no. 2, and 27 questions from the 11 charts of subject no. 3. In all, there were a total of 75 answers to be analyzed for voice pitch, intensity and duration.

The recorded voices were reproduced by Toshiba GT-710 tape recorder and the output directly connected to Nippon Electronics PI-3A pitch intensity indicator. The reproducing level was $-\infty$. Cdb which is the sound pressure measuring range of the indicator. Therefore, it was adjusted so that the maximum volume of the subject's voice was about -5db. The reproduction level of each subject's voice was kept constant throughout the analysis time. The pitch indicator was set to measure the changes in the range of 90 - 360 Hz. The output of pitch intensity indicator was recorded at 100 m/s on a sheet of Yokokawa EMC-61 electromagnetic oscillograph.

The verbal responses of subject no. 1 were used exclusively in the sonagraph analysis. The materials were limited to those showing conspicuous deception reaction to critical questions on the polygraph charts. Voices were reproduced by Akai 910 tape recorder and put into Kay's sonagraph 662B. The analysis band was set at 0 - 6 kHz and the analysis filter was set at 300 Hz.

*The Comparison Question Text is R/I, rather than a Control Question Test.

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Analysis materials:

(1) A duration was calculated for each answer based on records of the pitch indicator. That is, the time from O Hz before the subject answered and back to O Hz after the answer was measured.

(2) A pitch was first analyzed by using the records obtained by the pitch indicator, but the difficulty was in determining what changes of characteristics in the pitch were products of deception. Therefore, the highest point (pitch) of the subject's answer was picked up and its frequency was measured. The highest point of each answer in each series appeared in the identical location. For example, in answers wakarimasen (I do not know) of each series, the highest point of pitch was recorded at "5i", except in an unusual case. If the highest point was obtained at "se" in some cases, the measurement was taken at that point.

(3) The intensity was analyzed by examination as in the case of pitch analysis, but because of the unknown criterion for judgement and non-linear recording of intensity on the paper, the analysis was very difficult (record paper showed 5mm difference between -40db and -35db, but showed 15mm difference between -15db and -10db although this also shows a difference of 5db.) In the next method, a graph showing the intensity to each question in 1st series was traced on a paper to superimpose, but no peculiar answering characteristics to a critical question was noted. So, only the maximum intensity points of each answer were extracted and measured.

(4) A sonagram is used in voice identification and its ordinate axis gives the time and the abscissa axis indicates the frequency. The density of pattern inscribed on the graph shows the intensity of the voice frequency component. In the graph, voice duration, formant (phonetic) voice intensity and consonant are displayed, but because of the consolidation of multi-dimentional analysis, a subjective judgement was assigned to specialists. Sonagrams which analyzed the answers of subjects of each series were mounted on a board and we had three specialists on voice identification analyze them. The following instruction was given: "These charts are sonagrams of subjects' answers to questions used in the polygraph test. Questions consisted of 4 or 6 in each series. Each series contains one deceptive answer. Please select one chart which shows peculiarity from others and record the number of the chart. When a judgement cannot be made, indicate this by writing so."

Results and Discussions:

The difference in the pitch, intensity and duration of the voice between deception and truth has not been clear. It is not known whether the pitch rises or decreases when a deceptive answer is given. A frequency of the critical question which had either the highest or the lowest pitch in each series questions was counted. In an actual examination, an orienting response occurs at the first question of each series. It is not known whether this orienting response occurs in the voice pitch; therefore, after excluding the answer to the first question, a frequency indicating highest or lowest pitch in critical questioning was also counted. The results are as shown in Table 1. Among the 75 series, 10 highest (14.6%) and 13 lowest (17.3%) pitch responses occurs of curred at the critical questions. A chance expected detection rate would be $\frac{1}{2}$ or 50%, but the rate from the results obtained here is lower. If the voice

pitch increases when a deceptive answer is given, the following can be assumed. Performing "m" series of question list which consisted of "n" question, the number of the critical responses indicating the highest pitch in a series would exceed m/n. This also applies when the pitch is lower. For example, assuming that a 4 question chart in 40 series given a ranking of 1, 2, 3, 4 from the highest pitch in each series, the count is made on the frequency of (1) and (4) during the 40 series. If the pitch decreases during deception, the frequency of (4) should be significantly higher than 10. A binomial test of results given in Table 1 was conducted. When the first answers were eliminated, the 4 question chart was treated as a 3 question chart, 5 as 4 and 6 as 5. The analysis of 5 question 30 series after eliminating the responses to the first question, showed that the pitch was lower than the chance probability, but was not significant (n = 30, $\frac{1}{4}$, p > .2).

A peculiar reaction does not always occur in the field polygraph test using three indices. It is also presumed that this can be said for the voice analysis. A change in the pitch is small and does not produce a satisfactory result.

Table 1

	Total # of Series	Analysis of A	11 Responses	Analysis by Eliminating the First Response		
		Series show- ing highest pitch	Series show- ing lowest pitch	Series show- ing highest pitch	Series show- ing lowest pitch	
4 Question Composition	ı 39	5	8	9	8	
5 Question Composition	n 30	4	5	6	8*	
6 Question Composition	n 6	1	0	1	0	
Total	75	10	13	16	16	

Number of Series Showing Highest and Lowest Pitch Responses to Critical Question Within the Series

* .2 \frac{1}{4})

The results of the analysis of intensity are as shown in Table 2. By using the bionomial test for the 6 question composition, the series showing the maximum intensity to critical question showed a higher frequency: (.1 than in chance probability. There was no sign of increasing or decreasing of voices in intensity during the questioning.

Table 2

Number of Series Showing Highest and Lowest Intensity Responses to Critical Question Within the Series

	Total # of Series	Analysis of A	Analysis of All Responses Analysis by Eliminating the First Response					
		Number of Highest Intensity	Number of Lowest Intensity	Number of Highest Intensity	Number of Lowest Intensity			
4 Question Composition	n 39	8	7	11	7			
5 Question Composition	n 30	4	3	7	3			
6 Question Composition	n 6	2*	0	2	l			
Total	75	14	10	20	11			

* .1<p<.2 bionomial test (6, 1/6).

Table 3 shows the results of analysis on the duration of subjects' answers. An analysis of 5 question composition showed (.05 and analysis of 4 and 5 question composition by eliminating the answers to the first question showed <math>(.1 . Both showed a tendency of longer duration for answering critical questions but this was not significant. Nevertheless, it showed a higher detection rate than by a pitch or intensity method, but it is still under 50% indicating that it is not applicable in actual cases.

In the analysis of sonagram for subject A, all 3 voice identification specialists failed to determine the answer to a critical question. Specialist (1) achieved 4/15 (26.6%), as correct decisions; and the other two specialists each did 2/15 (13.3%) as correct judgements. All three reported that they could not determine the deceptive answers and notable changes. Therefore, the sonagram can be judged as difficult to analyze and not reliable or adaptable for actual cases. From the results of these analyses, the utility of using pitch changes, intensity and duration of voices as a means to detect deception appears slim at this stage.

Table 3

Number of Longest and Shortest Duration Responses to Critical Question Within the Series

	Total # of Series	Analysis (of All Responses	Analysis by Eliminating the First Response		
		Longest Duration	Shortest Duration	Longest Duration	Shortest Duration	
4 Question Composition	n 39	10	10	16 **	12	
5 Question Composition	n 30	9 *	2	10 ***	2	
6 Question Composition	n 6	1	0	1	0	
Total.	75	20	12	27	14	

* .05< p<.l bionomial test (30, 1/5)
** .1<p<.2 bionomial test (30, 1/3)
*** .1<p<.2 bionomial test (30, 1/4)</pre>

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By

Brian E. Lynch and Brent G. Waters. Royal Ottawa Hospital

Abstract

A case is presented of a sexually molested child who was given a polygraph test to verify the purported abuse. A discussion of the polygraph procedure utilized with the child is given. The results of the test suggest that the testing of children does not require any particular modifications to the procedure. It is further suggested that when intelligence and comprehension levels are controlled for, then the testing format with children remains unchanged from the one utilized with adults.

The psychophysiological detection of deception (PDD) is an ever expanding technique with future applications to many varied fields. As of late, its application to psychiatry and related fields has shown increased development in interest and growth (Lynch, 1979). The present case study is an elaboration of work in the area of psychiatry and the law.

There is very little available literature on the use of polygraph with children. In contrast, it has been widely studied across a range of adult populations (Abrams, 1975). Historically, most of the children studies have focused on juvenile delinquents with limited lateral discussion of polygraph with non-delinquent children (Larson, 1927; Lyon, 1936; Rouke and Kubis, 1948; Higley, 1954; and Arther, 1953).

Waters and Lynch (1980) point out a changing focus in cases of access and custody such that the best interests of the child are now being stressed. This change in focus suggests how important a role PDD can play in aiding the delineation and determination of truth in opposing allegations in access and custody cases. Interestingly, very few access and custody cases involve the actual testing of the children concerned. The conspicuous absence of polygraph cases involving children in the literature and the fact that the present case of custody was contingent upon the resolution of allegations of child molestation by polygraph have prompted the following report. This case involves a child who accused his father of sexual molestation. The purpose of the case study is to show that the testing of a child does not necessarily entail serious modifications to polygraph technique presently utilized with adults.

METHOD

Subject (case history): The subject was an 11 year 5 month old boy who was in the legal custody of his mother. He lived with her and his two Brian E. Lynch & Brent G. Waters

sisters, one older and one younger. Two years previously his parents separated and he remained, with his sisters, in his mother's home but with frequent access by his father. Three months prior to our assessment the patient alleged that his father had sexually molested him on two different occasions. The first such occasion involved the allegation that the subject's father had touched his penis while they slept together on a weekend access visit. Six weeks after the first purported incident, the subject alleged that his father placed his mouth on his genitals. Following the disclosure of these allegations to his mother and his request that he no longer see his father, legal counsel was sought and the father's access rights were refused. The father categorically denied the allegations. Although both the subject and his father were psychiatrically interviewed separately and together, both maintained their respective positions.

The father's background did not indicate homosexual or pedophilic tendencies and in fact the marriage breakdown had purportedly been the result of his strong heterosexual drive. At the time of the separation the subject was quite upset by the departure of his father and in particular, was angered by the conditions under which his father had left.

Shortly after the separation, the subject's school work showed a rapid deterioration, he became belligerent at school and he had been passing sexually suggestive remarks to some of his female classmates. There was no indication of any homosexual activity. During this period of upset the subject was referred to the school psychologist because he was making up stories about winning lotteries and similar tales which seemed to be in the service of bolstering his failing self-esteem. However, for one year prior to the present alleged incidents the subject appeared to have returned to his previous level of adjustment.

The subject and his father both underwent a complete psychiatric assessment as an aid in the decision process of access. The assessment consisted of psychological testing (intelligence and personality), electroencephalograms (EEG, brain wave activity) and clinical psychiatric interviews. The psychometric testing suggested that the subject was not depressed, although perturbed by the evaluation process, and he showed no evidence of psychosis. Overall, the psychological testing yielded a normal profile. The subject is of above average intelligence with an IQ of 111 scored on the Revised Wechsler Intelligence Scale for children. Additionally, he showed no evidence of cognitive disability. As the allegations did not become modified through discussion it was decided to try and ascertain the truth through polygraph examinations given to both parties. The subject willingly participated but his father refused for personal and legal reasons.

<u>Apparatus</u>: A Lafayette Four Channel Polygraph (Model 76102) was used in the examination. Standard lie detection measures were taken with the polygraph. Thoracic respiration was measured using a bellows-type pneumograph with a photoelectric transducer (Lafayette, 76007). Electrodermal activity was measured by a multiplex GSR amplifier (Lafayette, 76405) which monitored skin resistance level (SRL) and skin resistance response (SRR) simultaneously. Bipolar GSR finger electrodes (Lafayette, 76602) were attached without paste to the volar surface, medial phalanx of the second and

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third fingers of the right hand. Cardiac functioning was monitored by an electrocardiograph amplifier, transducer and standard arm cuff (Lafayette, 76442-A, 76442-T, 76505 and 76506) attached to the left upper arm, centered over the brachial artery which provided information on pulse rate, relative basal blood pressure changes and dicrotic notch shifts. Additional cardiac information on strength and rate of pulse beat and peripheral blood volume was attained by use of a photoelectric plethysmograph (Lafayette, 76004) at-tached to the ventral surface, distal phalanx of the right thumb. Polygraph recording was done at a chart speed of 2.5 mm/sec. The complete procedure was audio recorded using a Sony cassette-corder (Model TC-LIOB) and Ampex 90 minute cassette audio tapes.

<u>Procedure:</u> The polygraph examination lasted for one hour and 35 minutes. The pre-test interview followed closely the Backster notepack format (Backster, 1969) with modifications appropriate to a psychiatric hospital setting. The subject was very attentive throughout the examination and appeared to view the test as a novel and interesting undertaking. He did not appear overly anxious with a pretest pulse rate of 88 BPM which decreased to 66BPM by the end of the test. As further evidence that he was not unduly anxious he recounted that his mother had told him he had nothing to fear from a "lie detection" examination if he simply told the truth.

The choice of appropriate control questions was difficult to make. In view of the subject's age and from information gathered during the pretest interview, it became evident that the patient had a limited understanding of sexual behavior and previously no exposure to such activities. Therefore, sex related control questions were thought to be too loaded with arousal potential. Hence, the choice of control theme was that of telling serious lies to his mother, teacher and as a means of getting out of trouble. All control questions utilized a time span dating back from age nine. The relevant questions addressed themselves to the issues of genital contact by hand and mouth on two different occasions. The differentiation in time and mode of molestation necessitated two separate specific tests.

The review of the test questions posed no semantic comprehension problems for the boy and he was able to answer all questions with a yes or no. As the subject was the victim in the alleged molestation it required that the critical questions be answered in the affirmative. A total of three charts were run on each of the issues under examination.

<u>Results</u>: All the charts on both issues were quite productive and relatively distortion free. The charts were numerically scored in accordance with the rules set down in the Backster spot analysis chart interpretation rules (Backster, 1969). The plethysmograph channel was scanned for pertinent activity but no numerical score was assigned to this parameter. The numerical total for three charts on the issue of genital contact by hands was +14. The summated total for the two charts on the issue of genital contact by mouth was +12. An indefinite range of ± 6 was chosen as a result of discussions with various polygraph schools in North America that have modified Backster's original indefinite range from ± 8 to ± 6 . Both issue numerical totals fell into the range of a truthful determination. Therefore it was concluded that the subject was being truthful in his allegations of molestation by his father. The finding of truthful could not be verified by any external source as the father refused to take the test and to date has not confessed to the molestation.

Discussion

The results of this case study suggest that the testing of children can be performed in much the same manner as with adults. Previously held assumptions that level of comprehension; inattentiveness; and lack of appreciation of severity of the situation are problem areas frequently encountered in child testing were not born out in this study. Furthermore. it is the authors' opinion that this particular test was administered with fewer problems than are commonly encountered in field testing adults. These assumptions whether violated or not in a polygraph testing situation, are broadly dependent upon the individual's functioning level of intelligence. It has been suggested by the work of Lynch (1979) and Lynch and Bradford (1979) that individuals are testable at levels well below the normal range of intelligence. Therefore, it is difficult to assign an absolute intelligence quotient below which one should not test. With such a paucity of related polygraph studies, the polygraphist is left alone to assess whether or not an individual's comprehension/intelligence level is sufficient to cope with the test. In view of this, the testing of children should not pose any greater problem if the assessment of intelligence suggests sufficient levels of testable functioning. As with the adult, the assessment of whether or not a child is capable of comprehending the questions and ultimately following through the test is at the discretion of the examiner.

As stated earlier in the results, the charts were quite free of movement artifact and distortion. This suggests that it is possible to instruct children to refrain from unnecessary movement and they will follow through in accordance with the instructions. It was not necessary with this child to maintain his attention by playlike behavior on the part of the examiner. This is not to say that in some instances such procedures may have to be implemented to facilitate completion of the test.

The use of a confirmatory type testing format did not produce any particular problems. Backster suggests that in confirmatory tests the three factors of adequacy of case information, intensity of issue and distinctness of the incident under consideration are all violated to some degree. The argument, although generally well taken, was not upheld in this particular case as all three pre-examination reliability factors were rated quite high by the authors. Additionally, the numerical totals suggest that confirmatory tests are not necessarily less interpretable than non-confirmatory tests.

In conclusion, it is suggested that if intelligence and comprehension levels are taken into account then the testing of children can be undertaken in much the same manner as with adults. Although this is a single case study of a child, it does highlight the role played by such factors as motivation, attention, intelligence and comprehension. It is hoped that further research into polygraphic testing of children will enhance our understanding of the detection of deception technique.

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* * * * * *

No pleasure is comparable to the standing upon the vantageground of truth.

Francis Bacon.

By

James Allan Matte

In 1978 I attended a polygraph seminar in New York City and the topic of using interpreters in the administration of polygraph examinations arose. From the group's comments, it appeared that deaf persons offered the greatest problem to the polygraphist. Inasmuch as one of my clients has a department manned by deaf persons, I had developed a technique several years ago to facilitate the conduct of their polygraphs and insure the integrity of the examinations. I offer this technique not only in the conduct of polygraph examinations on hearing impaired persons, but also in any examination requiring the use of an interpreter where the loyalty and/or qualifications of the interpreter may be in question by the attending polygraphist or the judicial body that may receive the polygraph results.

Most deaf persons can utter sounds; some never develop intelligible sounds, while others do, which is largely dependent upon the age of onset of deafness and their ensuing education. Some deaf persons will not orally express themselves with non-deaf persons because of embarassment over their poor speech. A good percentage of deaf persons can read lips if the words are spoken slowly. Communication between deaf persons or between a deaf person and an interpreter for deaf persons is conducted through the "Sign Language in Straight English" or "American Sign Language (AMESLAN)",¹ each requiring the use of the hands in communicating. When the individual communicating with a deaf person does not know the sign language, use of the written word becomes necessary.

When confronted with the task of conducting a polygraph examination on a deaf person, one might believe the task impossible without the use of an interpreter for deaf persons. Usually the company or agency requesting the polygraph examination(s) has a person on their staff knowledgeable in the deaf person sign language, especially if there are several deaf persons employed there, to provide essential communication between deaf employees and non-deaf employees. The temptation of the polygraphist to use such a person as an interpreter in the conduct of polygraph examinations must certainly be hard to resist, yet great caution must be exercised, for the following reasons:

- a. The loyalty of the interpreter may be with the subject, not the company and polygraphist.
- b. The interpreter who is also a co-worker of the subject may be an accomplice.

1. Sign Language in Straight English requires that every word be visually represented in sign or fingerspelling, whereas in American Sign Language just the concept is visually represented.

- c. The interpreter may yield to an offer of a bribe by the subject with whom he is acquainted.
- d. The interpreter may yield to blackmail by the subject (coworker) knowledgeable about the interpreter's own illegal activities at the company.
- e. The interpreter may inadvertently make an error in communicating the test question(s) as a result of ineptitude or own misinterpretation.

The interpreter so inclined, may sabotage the polygraph examination by:

- a. Not actually conveying the relevant questions.
- b. Rewording the relevant question(s) (in sign language) so that the examinee's answer(s) will not be a lie to the examinee.
- c. Substituting an irrelevant or neutral question for the relevant question(s).

The polygraphist not knowledgeable in the sign language for deaf persons would be unable to detect any of the above means of sabotage. However the following technique which I developed in about 1974 and have since used on many occasions has proved effective in eliminating countermeasure attempts by the subject, and the need for an interpreter for deaf persons during the actual administration of the polygraph examination, and if necessary, the entire examination. Ideally the polygraphist should be assisted by an interpreter to facilitate the conduct of the pre-test interview. The interpreter would also assist in the presentation of the cards containing the test questions during the actual examination, although this could be done by any third party selected by the polygraphist.

Administration of this technique requires that one of the examinee's hand and arm, preferably the right, be free of any instrument attachments. For best results, an electronic polygraph instrument equipped with a Cardio Activity Monitor (CAM) is recommended. The CAM is placed over the radial artery of the left wrist with palm facing upward, while the left arm and hand is in a limp, relaxed position. If this position produces poor results, the CAM may be placed over the left thumb nail with palm facing down. Other positions for the CAM may be used as recommended by the manufacturer at the discretion of the polygraphist. The Galvanic Skin Response (GSR) electrodes are then placed on the index and ring fingers (or other alternate fingers) of the same hand (left hand). I have noted no adverse effects on the GSR tracing as a result of the fingers bearing the GSR electrodes being in an upward position or palmar side up. This procedure leaves the right hand completely free.

A 3 x 5 card as depicted below is taped near the end of the right arm rest of the polygraph examination chair, so that the examinee's right index finger may reach the card without moving his right arm or hand. I have noted that movement of the right hand during the polygraph examination did not cause tracing distortion as long as the arm itself was not moved.



You will note that the card depicted above offers three choices for an affirmative answer and three choices for a negative answer; in red, green, and yellow.

All of the test questions are typed in large capital letters, double spaced, each on a separate 3 x 5 card numbered consecutively. Within the text of each question is inserted the word RED, or GREEN, or YELLOW. Example: "WERE YOU BORN IN THE GREEN UNITED STATES?" or "DID YOU STEAL THAT MISSING \$100? RED" or "DURING THE FIRST 18 YEARS OF YOUR LIFE - DO YOU RE-MEMBER GREEN EVER STEALING ANYTHING?"

The subject is instructed to point his finger at the plus or minus sign of the color reflected somewhere in the question. This necessitates that the subject read the question in order to answer it properly; that is with a "yes" or "no" answer in the appropriate color.

The cards containing the test questions are presented to the subject by a third person sitting directly in front of the subject as depicted in the photograph below. This assistant is given a signal by the polygraphist with his free hand while the polygraphist marks the beginning of the question on the polygraph chart with his writing hand. However the polygraphist does not attempt to mark the end of the question since his only reliable clue is when the examinee places his finger on the appropriate sign at which time the polygraphist marks the subject's answer on the polygraph chart at the exact time given.

The assistant is cautioned not to make any sound nor make any unnecessary movement that may distract the subject. The polygraphist must follow the sequence of each question with his own question formulation worksheet, containing the same color code he assigned to each question on the 3×5 cards. The polygraghist should be very attentive to the examinee's answers and be on the alert for answer(s) given in the wrong color code as this is an indication that the examinee has not read the question.

The normal procedure of not reviewing the test questions in the same order they are asked on the test, some eliciting an affirmative and some a negative answer, further provides the polygraphist with a means of determining whether the subject read the question by verifying a correct answer was given.



Above photograph depicts a deaf person posed by Sylvia M. Keohane, Polygraphist at Matte Polygraph Service, Inc., being shown a 3×5 card containing a test question by Thomas E. Armitage, Polygraphist for the Buffalo Police Department, and the author administering the polygraph examination.

Two sets of 3×5 cards containing the test questions should be made; one set with the color code inserted into each question, and one set without the color code. The subject should be given an opportunity to read each card (without the color code) to assure the polygraphist that he fully understands each and every word on those cards.²

Use of the color coded answer signs assure the polygraphist that the examinee understands each and every question, that he has read each test question before giving his answer, and that his answer is clear and emphatic, free from chart tracing distortion caused by speech impediment and undesired stimulus resulting from the emotion of embarassment it may cause the examinee.

2. A deaf person's ability to read may be below normal because of his deafness and lack of natural development of language and vocabulary.

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The aforementioned technique removes the possibility of subject countermeasure, interpreter sabotage, and identifies the presence of communication problems at the most critical stage of the polygraph examination.



Above photograph offers another view of the technique used to polygraph the deaf.

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One and the same thing can at the same time be good, bad, and indifferent, <u>e.g.</u>, music is good to the melancholy, bad to those who mourn, and neither good nor bad to the deaf.

- Benedict Spinoza

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Research on the Validity of the Relevant-Irrelevant Jechnique As Used in Screening

By

Norman Ansley

The use of the Relevant-Irrelevant (RI) polygraph technique in employment screening goes back to 1931 when Leonarde Keeler began a program of testing employees of banks in Chicago on a systematic basis to detect and prevent embezzlement and theft (Keeler, 1931). Federal use of the RI technique in screening began in World War II with a program to protect the atom bomb project (Trovillo, 1951) and another program involving the screening of German prisoners of war for post-war police assignments in Germany (Linehan, 1978). After the war the Government developed polygraph screening programs for the protection of intelligence operations and agencies, programs that continue to exist (Hearings, 1974). The screening of Chicago bank personnel also continues, and commercial testing has expanded dramatically into other fields. Although other techniques may be used, much of the commercial employment screening is conducted with the RI technique, and almost all of the Federal security screening is done with RI technique.

Criticism

Criticism of RI technique has been confounded by inaccurate descriptions. For example, in their textbook on Reid Control Question Technique, Reid and Inbau give the following description of RI technique:

It contains some questions pertaining to the issue under investigation (relevant questions) and other questions that are irrelevant but chosen because the answers are known to be truthful . . The responses to the relevant and irrelevant questions are then compared and if the subject responds more to the relevant (issue) questions than to the irrelevant (known truthful) questions, the subject is considered as not telling the truth, but if there are no significant responses to either the relevant or irrelevant questions, the subject is reported as truthful. (Reid, 1977)

This description is significantly incomplete and inaccurate; and ignores the detailed descriptions of RI by the authorities on two current major forms (Weir, 1974; Harrelson, 1973). In fact, RI examiners may use control questions and control methods, question repetition, guilt complex questions, and other types of questions and procedures which were not mentioned above. The book by Leonard Harrelson, <u>The Keeler Technique</u> and the lengthy article by Raymond J. Weir, Jr., "In Defense of the Relevant-Irrelevant Polygraph Test" are readily available; the former from the Keeler Institute in Chicago and the latter from the APA Reference Service. Another proponent of control question technique, David C. Raskin, gave the following description of RI technique

The author is a Director of the APA, Editor of APA Publications, and a Federal examiner. For reprints, write to the author at 35 Cedar Road, Severna Park, Maryland 21146.

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during his presentation in opposition to employment screening at a symposium on the polygraph at the 1979 meeting of the American Psychological Association:

In its simplest form, the relevant-irrelevant technique includes questions about the crime (relevant) and questions totally unrelated to the crime (irrelevant) . . . The simpleminded theory of that test is that an individual who is deceptive above his involvement in the crime feels very threatened by the relevant questions and shows larger autonomic physiological reactions to those questions. However, the innocent subject does not have those strong concerns, and therefore shows no greater reactions to the relevant as compared to the irrelevant questions (Raskin, 1980).

While Raskin took care to say this was the simplest form, and put it in the setting of the 1920's and 1930's under John A. Larson and Leonarde Keeler, the casual reader might be misled to think that this is an adequate description of current RI technique. It is, of course, utterly inadequate. In fact, it is not even a fair description of how many of the RI tests were conducted in the 1930's (Cf. Keeler, 1938). Keeler was using recognition factors in RI relevant questions in which the significance of certain details would be known only to the perpetrator (Keeler, 1931) and Lee was teaching and practicing the use of guilt complex questions; threatening questions which appear relevant to the subject, which are answered truthfully. Then, as now, it was common practice to combine RI and peak of tension tests in a single interview (Lee, 1943). It is not at all unusual for that combination to be used now in complex screening cases.

Some of the critics of RI technique are adherants of control question techniques who have been trained in only one method and believe that theirs is the only way to conduct a test. Although Frank Horvath was initially trained in a control technique, he has had the opportunity to study the whole polygraph profession. In an article on the state of the art, Horvath commented particularly on parochial training in which the student acquires knowledge of only one technique:

Many examiners tend to believe that control-question testing is the ultimate approach - the most sophisticated, advanced, and useful procedure that exists or ever will exist. These people have been trained in a way not unlike the way you train fleas. If you put fleas in a jar and cover it, the fleas will jump so high, but no higher - they will be unable to escape. Examiners who believe that control question testing or one variation of it is the ultimate technique or that it is always the only way to conduct polygraph examinations are trained fleas. (Horvath, 1980)

One of the more serious allegations of critics is that the RI screening technique produces an unacceptably large number of false positive errors, truthful statements erroneously called lies. The statistical probability arguments raised against screening (Lykken, 1974; Raskin, 1980) make the assumption that false positives and false negatives are nearly equally distributed among the errors made by examiners. Research suggests that assumption may be false, rendering the analyses specious so far as RI is concerned. None of

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the research shows a false positive rate as high as the false negative rate. Research at the University of Georgia (Correa, 1979) did not produce any false positive errors in their simulation of employment screening. There were no false positive errors among those employees examined by Professor Mac Nitt (1941). Similarly, Blum and Osterloh had a false positive rate of less than one-tenth of one per cent, which represented only one false positive in the four errors he made in testing the truthfulness of 2,120 subsets of information (Blum, 1968).

In the laboratory setting, it is customary to make decisions in every case, something which does not happen in the world of daily practice. In the laboratory, when a decision is made where the evidence is not clear, the error rate may be increased. In the real world, the examiner often exercises his option to conduct additional examinations at a later date. Even with a reexamination, there are cases that must be reported as inconclusive. The problem of risk versus accuracy in screening is addressed in an interesting study in Israel in which different cutoff points in scoring the charts were established to match the purpose of the examination (Ben Shakhar, 1969).

Research

Research on the RI polygraph technique as used in employment screening has demonstrated that the technique has high validity (Correa, 1980; MacNitt, 1942). One study, which compared RI with the validity of the highly regarded peak of tension technique, showed that the RI method was superior to the peak in detecting both prior activity and specific knowledge (Gustafson, 1964). The RI technique is also highly valid in detecting deception where stories may be partly true and partly false, all true, or all false, a situation common to screening (Blum, 1964). That research, using RI technique and police informants as subjects, indicated correct decisions in 99.9% of the decisions. A report on the use of RI technique in specific criminal cases, and using only the electrodermal parameter, indicated an accuracy rate of 94.1% (Guertin, 1954). In a criminal case involving 81 suspects, using the most basic RI methodology, supplemented with peak of tension tests, produced correct results in finding all of them innocent (Bitterman, 1946). It turned out that the thief was not among the suspects examined by Bitterman.

Critics have suggested that screening may be ineffective in those cases where the motivation is quite low, particulary when the lying is cognitive rather than emotional. However, in a study where motivation was low and stimulus intensity was strictly controlled, a laboratory screening test to detect false biographical entries on application forms indicated that significant electrodermal responses occurred to the pure act of deception (Hemsley, Heselgrave & Furedy, 1979). Moreover, practical experience suggests that the motivation of most applicants is quite high.

In regard to the reliability of chart interpretation, there is evidence that RI charts from screening examinations can be read blind with a high degree of reliability. In a report on a government research project involving charts from real screening cases, there were agreement rates between the examiner and the blind rater on reaction or no reaction on each of three channels (7,590 decisions) of 96% for cardiovascular, 95% for electrodermal, and 96% for respiratory responses (Edel & Jacoby, 1975).

Abstracts of RI Research

The purpose of this paper is to summarize the research which has been done in connection with the RI technique, particularly as it relates to employment screening. The following is a series of abstracts of each of the published research papers on the topic of the relevant-irrelevant technique that have some bearing on the use of the technique in screening.

Bersh, Philip J. "A Validation Study of Polygraph Examiner Judgments," A Report prepared for the Department of Defense Joint Services Group on Lie Detection Research, April 1968, United States Army Behavioral Science Research Laboratory, Washington, D.C. Subsequently reprinted in <u>Journal of</u> <u>Applied Psychology</u>, 1969, 53, 399-403.

The lie detection judgments of polygraph examiners in criminal investigations conducted by the military services were validated against unanimous guilt-innocence decisions by a panel of four Judge Advocate General (JAG) attorneys. The panel of lawyers had access to the complete investigative file, except that all references to the polygraph examination were removed. Cases involving confession were ruled out because some polygraph examiners could have made their judgment of deception after the subject had confessed. Cases were selected at random from those conducted from 1963 to 1966. There were about an equal number of control question and relevantirrelevant tests, and within each type, an equal number of judgments of deception indicated and no deception indicated. No cases where the examiner reported inconclusive were employed.

A Total of 323 case files were submitted to the panel. Each member of the panel was initially required to judge whether a file contained sufficient evidence to warrant a decision of guilt or innocence. Files with inadequate evidence were eliminated from further consideration, and 157 remained. Then each attorney made an independent judgment of the guilt or innocence of a suspect. The attorneys were given explicit instructions to disregard all legal technicalities and to judge each case sclely on the evidence contained in the file.

The polygraph examiners and the JAG panel agreed on 92.4 percent of all cases. In seven cases the examiner reported "deception indicated" and the panel decided "not guilty" (4.5%). In five cases the panel decided "guilty" and the examiner reported "no deception indicated" (3.2%). There are no separate figures for RI and control question techniques. Because these were real cases, there is no way in which to decide who was correct, the panel or the examiner judgments agreed. It is also possible that when the panel and examiner judgments agreed, they were both wrong. However, the results do show the agreement between a panel of attorneys and the judgment of a polygraph examiner is significantly above chance.

Bitterman, M.E. and Marcuse, F.L. "Cardiovascular Responses of Innocent Persons to Criminal Interrogation," <u>Minor Studies From the Psychology</u> <u>Laboratory of Cornell University</u>, 1946, 407-12.

A theft of \$100 took place in one of the rooms of a campus dormitory.

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The psychologists, who had no polygraph training but did have some books and articles on the topic, conducted polygraph examinations on the 81 men who lived in the dormitory. They were unable to devise a method for evaluating the pneumograph pattern, but did devise a systematic method to evaluate the cardiosphygmograph pattern. They prepared a seven question test which opened with two irrelevant questions, then a relevant question, an irrelevant question, and three relevant questions. The last question was a general one, asking the subject if he had answered all of the questions truthfully.

In their first series of examinations, they cleared of guilt all but seven of the subjects (8.6%). Those seven, and twenty other students, were also given peak of tension tests after the relevant-irrelevant tests. The authors thereupon concluded that none of the students was guilty of the theft. Obviously, there were no false positive errors after the peak of tension tests. The question of false negatives, calling the thief or thieves not deceptive, was solved some time later when investigation disclosed that the theft was committed by someone else, who was not among those tested. Accordingly, the results were correct in 100% of the decisions.

Blum, Richard H. and Osterloh, William. "The Polygraph Examination as a Means for Detecting Truth and Falsehood in Stories Presented by Police Informants," <u>Journal of Criminal Law</u>, <u>Criminology and Police Science</u>, 1968, <u>59</u>, 133-137.

A total of 17 male and 3 female informants who had given information on criminal cases to local or federal agencies were selected and paid to engage in the experiment. Great care was taken to protect their identities and the fact that they were cooperating with the police, as their lives would otherwise be in danger. Some of the stories that the informants were to tell the polygraph examiner were true, some were false, and some were partly true and partly false. The true stories were those which had been provided to their handler on a previous occasion which had stood the scrutiny of investigation. A false story was one jointly invented by the officer and the informant, but compatible with the informant's ordinary role and opportunities and containing credible information. True stories with false information followed the same rules as the true story, and the false items were important to the investigation, such as the name of the offender, the place where goods were hidden or fenced, etc. The story was first written, then rehearsed with the police handler. In all, there were 106 statements to be checked for veracity in each of the 20 cases, for a total of 2,120 statements. The examiner used the RI technique.

Of nine stories that were all true, the examiner was correct in his diagnosis of all of them. None of these true stories were designated as false or partly false.

Of the eleven stories that were either partly or entirely incorrect, the examiner was correct in saying that each of these was either partly or wholly false. None of these were diagnosed as completely truthful.

The examiner made four errors among the seven subjects who told stories that were only partly true. In two cases, the examiner made an error in

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judging a lie as the truth in one of the five elements of a partly true story. In the other case, the examiner made two errors among the five subsets, calling one truthful element deceptive and one deceptive element truthful. Of the 106 statements made by twenty subjects (2,120 statements), the examiner was correct in all but four (99.8%). The error rate was slightly under .2% in terms of verifying information. If one considers any error in a subset as an erroneous case, then the examiner was incorrect in three of the twenty cases, correct in 17 (85%).

Correa, E.I. The validity of the pre-employment polygraph examination and the effects of motivation. Unpublished dissertation, University of Georgia, 1979.

In a research project at the University of Georgia, forty subjects took pre-employment examinations, conducted with the RI technique. Half were to tell the truth, and half were to be deceptive to three of the nine questions. Polygraph recordings included respiration from a thermister probe at the nostril, EKG for heart rate, and electrodermal activity. A cardiosphygmograph was not employed.

The experimenter, in separating the truthful and untruthful subjects, was correct in all cases, for 100%. Identification of lies, by subject, ranged from 68% to 100%. There were no cases in which a truthful person was called deceptive (false positives). All of the errors were in failing to identify a lie.

Lying responses were characterized by significantly larger increases in conductance in the electrodermal activity and larger decreases in heart rate, than the responses to telling the truth. Respiration showed no significance in these recordings.

An attempt to separate subjects by motivation, offering half of the group \$25.00 if they could deceive the examiners, showed no significant difference.

Edel, Eugene C. and Jacoby, Jacob. "Examiner Reliability in Polygraph Chart Analysis: Identification of Physiological Responses." <u>Journal of</u> <u>Applied Psychology</u>, 1975, <u>60</u>, 632-634.

Actual case charts from 40 polygraph screening cases, involving responses to 2,530 questions were examined in detail by ten experienced examiners, working separately. The technique was relevant-irrelevant.

Because each examiner made judgments of reaction or no reaction to each question, of which there were 2,530, on each of three channels, he made 7,590 decisions. The channels were cardiovascular, electrodermal, and respiratory. The agreement between the original examiner and a blind rater was 96% for cardiovascular, 95% for electrodermal, and 96% for respiratory responses. In terms of total agreement between all examiners who read all of the charts, the agreement was 96% for cardiovascular, 91% for electrodermal, and 96¢ for respiratory responses. The overall percentage of agreement for rater versus rater was 94%.

Of the total 22,770 judgments there were 21,626 agreements for an overall agreement rate of 95%, including the examiner-rater and rater-rater combinations.

Guertin, Wilson H. and Wilhelm, Paul L. "A Statistical Analysis of the Electrodermal Response Employed in Lie Detection." Journal of General Psychology, 1954, 51, 153-160.

The author selected 34 criminal cases in which guilt or innocence was established by independent means. There were 19 cases of guilt and 15 cases of innocense among the 31 men and three women.

The records from an electrodermal unit, with which the examiner used a relevant-irrelevant technique, were subsequently evaluated blindly. The re-sulting analysis was correct in 32 of the 34 cases (94.1%).

Gustafson, Lawrence A. and Orne, Martin T. "The Effects of Task and Method of Stimulus Presentation on the Detection of Deception." <u>Journal of</u> <u>Applied Psychology</u>, 1964, 48, 383-387.

The study was designed to investigate the relative effectiveness of two different polygraph techniques, relevant-irrelevant and peak of tension. Subjects were given two RI and two POT tests. 29 were guilty, and 24 subjects had guilty knowledge. Only an electrodermal measure was scored for this research.

The RI method proved more effective in detection than the POT method when subjects were trying to deceive as to which item of information they possessed, in the guilty information paradigm. There was no significant difference in the effectiveness of the RI method of stimulus presentation between the guilty person paradigm and the guilty information paradigm. The POT method proved significantly less effective than the RI method in the guilty information paradigm, and significantly less effective in that paradigm than it was in the guilty person paradigm. In general, subjects found it easier to deceive in the guilty information paradigm where they could attempt to "appear guilty" on a non-critical item, especially in the peak of tension because they could anticipate the order of presentation of the items.

Hemsley, Gordon; Heslegrave, Ronald J. and Furedy, John H. "Can Deception be Detected When Stimulus Familiarity is Controlled?" Paper presented at the Annual Seminar of the Society for Psychophysiological Research, Cincinnati, Ohio, October 18, 1979.

Using a pre-employment test paradigm with the relevant-irrelevant technique, ten male and ten female subjects were divided into two groups, one which was to be deceptive to some of the 20 items of biographical information supplied on application forms, and one group which was to be truthful about all of the biographical information on the forms. Because the stimulus familiarity was controlled, with all biographical information known to the subjects in advance, the issue was whether or not larger ANS responses would occur to deception alone. Skin conductance response was used to measure ANS response.

The skin conductance response was significantly, (F=64.1) greater for deceptive (S = 2.28 umhos) than for honest (X = 1.40 umohs) responses.

Neither an habituation effect nor a sex difference emerged. The experimenters concluded that the design allows the skin conductance response to detect, in the laboratory, "pure deception", because that emotional arousal associated with question content, and enhanced stimulus familiarity or signal value associated with the relevant alternative, had been eliminated as confounding sources.

MacNitt, Reginald D. "In Defense of the Electrodermal Response and Cardiac Amplitude as Measures of Deception." <u>Journal of Criminal Law, Crimi-</u> <u>nology and Police</u> Science, 1942, 33, 266-275.

Professor MacNitt conducted 59 cases using the relevant-irrelevant technique that involved employees made available by the Columbus, Ohio Merchants Audit Bureau. Prior investigative results were withheld from him. There were employees whose honesty and integrity were above reproach, employees who had confessed to stealing goods and money, but were told to lie, and employees who were suspected of stealing and about whom there was quite a bit of evidence already in the possession of authorities. The latter group was expected to lie.

MacNitt said that his results were "correctly reported ... and checked by confessions or the verifiable records of the employees, the examiner failing only on a few minor details. In all of these 59 cases, the electrodermal response was the more accurate of the two employed." The other channel recorded cardiac rate and amplitude.

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By

Ben A. Silverberg, Ph.D.

Introduction

Opponents of the polygraph argue that the practices of preemployment screening and periodic testing in private industry may violate a worker's basic right to human dignity and privacy (3-9). Critics contend that polygraph testing involves an unconscionable intrusion into personal thoughts, attitudes, and beliefs. The uninformed and misguided publicly insinuate that the polygraph is used for mental intimidation, and because of its Orwellian image, elicits unwarranted and irrelevant personal revelations. Labor commentators purport that employees view polygraph testing as a reflection of management suspicion and distrust, a situation which will adversely affect the employment environment. Moreover, the polygraph is accredited by its detractors as causing a loss of self respect by the individuals tested and a feeling of humiliation.

Unquestionably, privacy is highly regarded in today's society, and is considered to be linked to individual dignity and the needs of human existence. Clearly there is a growing disquietude with the polygraph. Union campaigns, media editorials, civil libertarians, liberal legislators and congressional committees indicate that the invasion-of-privacy issue is at the real core of civic protest and the objections to the growing use of the polygraph for commercial testing. If these prodigal condemnations are not requited, and the issues remain unresolved, the demise of the polygraph in private industry is likely.

To legitimize their arguments against the commercial use of polygraphy, critics assumed that individuals being tested were under duress and considered the procedure to be an invasion of privacy. However, as evinced by a precedent 1972 survey of real attitudes of pre-employment applicants toward the polygraph(1), it is easy to over estimate the degree of resistance to polygraph examinations by individuals who are requested to take them. Of the 241 subjects surveyed, 86.3 percent thought the test fair; 91.3 percent were not offended; 83.0 percent did not feel that their privacy was invaded; 96.3 percent were willing to take the test to get a job; 87.6 percent were willing to take it continually to keep a job; and 96.7 percent were willing to be tested to find a thief at their company. Recent studies by the American Polygraph Association and John E. Reid & Associates(2) aimed at increasing funded knowledge of examinee attitudes toward the polygraph, erode further the notion that a polygraph examination is an undue invasion of privacy undertaken under duress.

Reprints of this article are available from the author at the following address: Dr. Ben A. Silverberg, Director, Applied Polygraph Sciences, Inc., 10 Foxbar Road, Toronto, Ontario, Canada M4V 2G6. Notwithstanding that these studies have facilitated an understanding of job applicant attitudes, there remains a definitive lack of data on the attitudes of employees who regularly take periodic polygraph examinations a curious situation in light of the availability of data which has the potential for disarming polygraph critics. The present study, then, not only complements the findings of existing surveys but enhances them by quantifying as yet unsolicited periodic examinee attitudes.

METHOD

Subjects

A total of 220 polygraph examinees were surveyed to determine their real attitudes toward the polygraph procedure. The 220 subjects were distributed between two groups: employment applicants (N = 102) who were given a pre-employment polygraph examination; and employees (N = 118) who were given a routine periodic polygraph examination.

Procedure

Each subject, after the completion of the examination, was asked to answer an eight item questionnaire designed to solicit individual opinions of the process. Each question, in addition to calling for a YES-NO response, provided space for open-ended comments. Further, each questionnaire instructed the subject to complete a short biographical sketch. To provide a basis for estimating the degree to which subjects' responses were anchored in polygraph familiarity, all subjects were asked about the number and types of previous polygraph examinations taken. Each subject was assured of confidentiality and was left unattended to complete the survey. Completed survey forms were deposited by the subjects in a sealed receptacle. The questions asked were:

- 1. Were you in any manner embarrassed, humiliated or degraded during any part of the polygraph examination?
- 2. Do you think the test was unfair in any way?
- 3. In your opinion was there any objectionable or unwarranted invasion of your privacy during the conduct of the polygraph examination?
- 4. Did the test, or any part of it, offend you?
- 5. Do you believe you will be more secure and comfortable in your work environment knowing that your employer uses the polygraph to assist in personnel evaluation?
- 6. If the occasion arose would you take a test like this again as an applicant for a job?
- 7. If you knew the questions to be asked beforehand, would you consent to take a polygraph examination on a regular basis to ensure employee honesty at your company?

8. If a loss occurred at your company and you were asked to cooperate by taking a polygraph test to help find the person who caused the loss, would you?

For periodic examinees, modifications in question-wording were made as follows:

- 5. Do you feel more secure and comfortable in your work environment knowing that your employer uses the polygraph as one means of ensuring employee honesty?
- 6. If the occasion arose would you take a pre-employment polygraph examination as an applicant for a new job?
- 7. Would you consent to taking periodic polygraph examinations if requested to do so by a new employer?

RESULTS AND DISCUSSION

<u>Subject Characteristics</u>. The age, sex and education of subjects showed that there was little variation between pre-employment and periodic examinees with respect to these characteristics. Females were predominant, comprising 79.4 percent of the pre-employment survey group and 79.7 percent of the periodic survey group. The mean age of job applicants was 30.6 years and the mean age of employees was 32.8 years. The average subject had completed 4 years of high school education. Two of the 102 job applicants had previously taken a pre-employment polygraph examination. Each of the total sample of 118 employees in the periodic survey group had taken a pre-employment screening examination as well as a mean of 2.0 periodic examinations. None of the examinees had ever been requested to take a polygraph examination to resolve a specific criminal matter.

Examination Results. In pre-employment applicant screening the principal object was to validate or disprove background information furnished by individuals seeking employment. The examination, normally lasting one hour, progressed from the recording of verifiable facts regarding the employment background of an applicant to other relevant issues. A tabulation of the results of 102 job applicant interviews indicated that 74 applicants (72.5 percent) were recommended for employment consideration, 19 applicants (18.6 percent) were not recommended for further consideration, and 9 (8.8 percent) were given a qualified or cautionary recommendation. Reasons for disqualifying applicants from further employment consideration included chronic alcohol or drug abuse, job-jumping, and amateur as well as professional work-related theft.

In periodic testing of employees, the main objective was to ascertain whether employees had remained honest since previously being tested. Only work-related issues were topic areas for polygraph testing. The specific questions asked on the periodic examination had been publicized by all the employers from the onset as part of their in-house promotion of a full polygraph protection program. One hundred eleven (94.1 percent) of the periodic subjects were recommended for continued employment; 5 periodic subjects (4.2 percent) were given a qualified recommendation as a result of violating known company regulations and procedures; and, 2 periodic examinees (1.7 percent) were not recommended for further employment based on admissions of embezzlement or inventory stealing. These data are summarized in Table I.

TABLE I

Distribution of Results of 220 Polygraph Tests and Whether Examinee Was Told Results

	Type of Examination					
	Pre-employment	(N = 102)	Periodic	(N = 118)		
Recommendation	No.	1/2	<u>No</u> .	<u>%</u>		
Recommended Qualified Recommendation Not Recommended	74 9 19	72.5 8.8 18.6	111 5 2	94.1 4.2 1.7		
Told Results						
YES NO	52 50	51.0 49.0	60 58	50.8 49.1		

<u>Attitudes of Examinees</u>. The distribution of YES-NO responses to the eight questions solicited by the attitude survey is given in Table II. Regardless of group, the vast majority of examinees expressed significant acceptance and approbation of the polygraph procedure.

Employment applicants (N = 102) expressed overwhelmingly favorable attitudes towards the polygraph procedure. In addition to being unanimous that the test was fair, 95.1 percent of the subjects stated that they were not embarrassed, humiliated or degraded; 98.4 percent did not feel that their privacy was invaded; 97.1 percent were not offended; 90.0 percent felt secure knowing their prospective employer used the polygraph in personnel evaluation; 93.1 percent were willing to take the test to get a job, as well as take routine periodic tests to ensure employee honesty; and 96.1 percent of the subjects were willing to take it to find a thief at their company.

Periodic subjects (N = 118) were unanimous that the test was fair and that it was not an invasion of their privacy. Further, 99.2 percent of the examinees did not feel embarrassed, humiliated or degraded by the polygraph procedure; 98.3 percent were not offended; 94.9 percent felt secure knowing their employer used the polygraph as one means of ensuring employee honesty; 99.2 percent would take a pre-employment polygraph examination to get a new job; 98.3 percent were willing to participate in periodic testing on a new job; and 99.2 percent were willing to take it to solve a specific theft.

The greater convergence of attitudes displayed by periodic examinees is undoubtedly a result of the group's familiarity with polygraph testing in general. Moreover, their employers have undertaken several approaches, including audio-visual and lecture presentations, to promote an understanding of polygraphy amongst employees. Previous studies(1, 2) tended to indicate a lesser degree of willingness by pre-employment applicants to undergo subsequent periodic examinations. The data in the present study suggest, however, that if questions for periodic testing are publicized internally by the employer, the apprehension or concern of prospective employees for the propriety of the procedure will be allayed.

TABLE II

Distribution by Type of Examination of Responses of 220 Polygraph Examinees to Questions Concerning Feelings About the Polygraph

Type of Examination

		Pre-emp	Loyment (N=102)	Perio	iic (N=118)
Que	stion	No.	2	No.	2
1.	Embarrassed, humiliated or degraded?	YES 5 NO 97	4.9 95.1	1 117	0.8 99.2
2.	Test unfair?	YES O NO 102	0.0 100.0	0 118	0.0 100.0
3.	Was it an invasion of privacy?	YES 2 NO 100	2.0 98.4	0 1 18	0.0 100.0
4.	Did it offend you?	YES 3 NO 99	2.9 97.1	2 116	1.7 98.3
5.	Secure knowing that employer uses it?	YES 91 NO 11	89.2 10.8	112 6	94.9 5.1
6.	Would you take it to get a job?	YES 95 NO 7	93.1 6.9	117 1	99.2 0.8
7.	Would you take it on a regular basis?	YES 95 NO 7	93.1 6.9	116 2	98.3 1.7
8.	Would you take it to find a thief in your company?	YES 98 NO 4	96.1 3.9	117 1	99.2 0.8

Effects of Knowledge of Results on Examinee Attitudes. The survey was designed so that some examinees were informed of the results of their examination before they were asked to complete the questionnaire; some were not so informed (see Table I). The data are summarized in Table III. For periodic subjects, prior knowledge of results had no significance. For pre-employment subjects, knowledge of results did not significantly affect attitudes concerning whether the test had embarrassed, humiliated or degraded the examinee; whether the test was fair; whether it was an invasion of privacy; or, whether it offended the subject. There was a moderate difference, although not a significant one, with respect to the last three survey questions, between those who were informed of their results prior to the survey and those who were not. There was a slight tendency for the uninformed to respond negatively to the prospect of taking another preemployment examination; a similar tendency regarding future periodic and specific testing was also shown amongst the uninformed. Notwithstanding the lack of significance in these particular inclinations, enhanced relationships amongst parties (polygraphist/subject/employer) by informing employment applicants of the test results, support, at least subjectively, the practice of straightforwardness in polygraph testing. To contribute overall to somewhat more favorable attitudes toward the polygraph procedure, it is fundamental to a sound polygraph protection program, however, that employment applicants, whether informed of results or not, are frankly advised that polygraph testing is only one tool in the entire employment screening process.

TABLE III

Attitudes of Examinees in Relation to their Knowledge of Results of their Examination

Type of Examination

		P: <u>Tol</u>	re-empl d (N =	oyment (<u>52)</u> Not	(N = 102) Told(N =	<u>50)</u>	Peri Told	odic (N = (N = 60)	118) <u>Not</u>	Told (N =	<u>58</u>)
Que	stion	<u>No.</u>	2	No.	Z		<u>No.</u>	Z	No.	Z	
1.	YES NO	2 50	3.8 96.2	3 47	6.0 94.0		1 59	1.7 98.3	0 58	0.0 100.0	
2.	YES NO	0 52	0.0 100.0	0 50	0.0 100.0		0 60	0.0 100.0	0 58	0.0 100.0	
3.	YES NO	1 51	1.9 98.1	1 49	2.0 98.0		0 60	0.0 100.0	0 58	0.0 100.0	
4.	YES NO	1 51	1.9 98.1	2 48	4.0 96.0		1 59	1.7 98.3	1 57	1.7 98.3	
5.	YES NO	47 5	90.4 9.6	44 6	88.0 12.0		56 4	9 3. 3 6.7	56 2	96.6 3.4	
6.	YES NO	50 2	96.2 3.8	45 5	90.0 10.0		59 1	98.3 1.7	58 0	100.0 0.0	
7.	YES NO	50 2	96.2 3.8	45 5	90.0 10.0		59 1	98.3 1.7	57 1	98.3 1.7	
8.	YES NO	52 0	100.0 0.0	46 4	92.0 8.0		59 1	98.3 1.7	58 0	100.0 0.0	

Effect of Examination Results on Examinee Attitudes. Table IV summarizes the attitudes of examinees based on the outcome of their examinations. Not surprisingly, the data indicate that the seven periodic subjects, who admitted serious transgressions, were less favorably disposed toward the polygraph than were the lll employees recommended for continued employment. Similarly it is not surprising that job applicants given unfavorable recommendations based on deficiencies in employment record and/or character exhibited less favorable attitudes toward their polygraph examination than those who were recommended. Regardless of examination results, all groups of subjects expressed unanimous feelings that the examination was fair. Even those employees caught in the act of being deceptive did not consider the polygraph examination an invasion of their privacy.

TABLE IV

Attitudes of Examinees in Relation to the Recommendation Based on their Examination

			Pre	-empl	oyment	(N=10)	2)		Periodi	.c (N=	=118)		
Que	stion	R(N No.	<u>=74)</u> %	QR(1 No	<u>N=9)</u> %	NR(1 No.	<u>N=19)</u> Z	<u>R(N</u> No.	<u>1=111)</u>	QR(1 No.	<u>N=5)</u> Z	NR No	(N=2)
1.	YES	1	1.4	1	11.1	3	15.8	0	0.0	0	0.0	1	50.0
	NO	73	98.6	8	88.9	16	84.2	111	100.0	5	100.0	1	50.0
2.	YES	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	NO	74	100.0	9	100.0	19	100.0	111	100.0	5	100.0	2	100.0
3.	YES	0	0.0	0	0.0	2	10.5	0	0.0	0	0.0	0	0.0
	NO	74	100.0	9	100.0	17	89.5	111	100.0	5	100.0	2	100.0
4.	YES	0	0.0	1	11.1	2	10.5	0	0.0	0	0.0	2	100.0
	NO	74	100.0	8	88.9	17	89.5	111	100.0	5	100.0	0	0.0
5.	YES	72	97.3	6	66.7	13	68.4	111	100.0	2	40.0	0	0.0
	NO	2	2.7	3	33.3	6	31.6	0	0.0	3	60.0	2	100.0
6.	YES	73	98.6	7	77.8	15	78.9	111	100.0	5	100.0	1	50.0
	NO	1	1.4	2	22.2	4	21.1	0	0.0	0	0.0	1	50.0
7.	YES	73	98.6	7	77.8	15	78.9	111	100.0	5	100.0	0	0.0
	NO	1	1.4	2	22.2	4	21.1	0	0.0	0	0.0	2	100.0
8.	YES NO	74 0	100.0 0.0	9 0	100.0	15 4	78.9 21.1	111 0	100.0 0.0	5 0	100.0	1 1	50.0 50.0

Type of Examination

<u>Open-ended Comments</u>. For each question, provision was made for individual comments explaining the examinee's answer. Of the combined survey sample of 220, 94 examinees (76 job applicants and 17 employees) responded with comments. The only negative-type response obtained was proffered by a female employment applicant who stated that "being honest is not always easy or comfortable." No derogatory comments were made concerning the accuracy of the polygraph procedure or the propriety of questions asked. The most frequently offered favorable comment indicated that the test was good, fair, accurate, and should be used more often. The second most frequent response found the test new, interesting, and enjoyable. A number of employees reported increased confidence and respect in the technique after they took the test.

CONCLUSIONS

The opposition to the rise of the polygraph in private industry is no longer based primarily on its scientific acceptability and accuracy but on the right to privacy issue. The present study supports earlier surveys(1, 2) showing it is easy for critics to overestimate the degree of resistance to polygraph examinations by the job applicants asked to take them. Employees participating in routine periodic testing programs were unanimous that the polygraph test was fair and that it was not an invasion of their privacy. Both employment applicants and employees agreed that there is no great sacrifice of human dignity and privacy in polygraph testing. Continued research and the dissemination of surveyed subject attitudes towards the polygraph would help to enlighten and dissuade critics.

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"An honest man is The noblest work of God." - Tombstone of William Stansbury of Baltimore, 1716 - 1788."

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Psychophysiological Evaluation of Detection of Deception in

A Riot Case Involving Arson and Murder

By

Jakehiko Yamamura & Yoichi Miyake

Summary

The technique in the actual detection of deception was evaluated psychophysiologically by examining 95 male subjects in a riot case.

The guilty person paradigm (GPP) for the purpose of classifying whether there is any relevancy to the case, and the guilty information paradigm (GIP) for estimating the subject's knowledge about the case were employed. The detectability of GPP was found to be superior to that of GIP.

Respiration was the most effective index in the actual detection of deception, and its effect as a countermeasure to calm a subject's mental excitement is discussed.

The arousal level of the subject seriously influenced the chart evaluation, and could lead to errors when not taken into account.

Introduction

In recent years, various lie detection methods have been conducted in the laboratory for estimating the methodology of detection of deception. Measurements of physiological indices and their relative effectiveness (Ellson, Davis, Saltzman & Burke, 1952), evaluation of psychological parameters, minute procedures concerning the situation of examination, observation of the subject's implicit set against the examination (Orne, Thackray & Paskewitz, 1972), and theoretical approaches to lie detection (Ben-Shakhar, Lieblich & Kugelmass, 1970), etc., have been the major topics of research. Views on these experimental lie detection along with other similar experiments are reasonably and conclusively uniform.

However, the fact is that laboratory findings are not always applicable to its use in actual lie detection, and there is a different view in each field. Apart from the criticism of extreme dependence of the actual procedure of detection of deception on the tester's effect (Skolnick, 1961), an anomaly, which appears to be metaphysical, arises between the laboratory and the actual testing. It is that the GSR, which is considered to be the best

Takehiko Yamamura holds a B.S. from the Faculty of Science, Kwansei Gakuin University and is a M.D. candidate in Hyogo Medical College. He is a licensed polygraph examiner (1965), and is chief examiner at the Psychological Section, Scientific Investigation Research Lab., Hyogo Prefectural Police Hqs. Yoichi Miyake holds a B.A. from the Dept. of Psychology, Kwansei Gakuin University. He is a licensed polygraph examiner (1971) and is a staff examiner at the Psychological Sect., Scientific Investigation Research Lab., Hyogo Prefectural Police Hqs. Reprinted with the permission of the authors and the NIPS from <u>Reports of the National Institute of Police Science</u>, 1978, <u>31</u>, 121-7. physiological index in the laboratory (Cutrow, Parks, Lucas & Thomas, 1972; Thackray & Orne, 1968; Yamaoka & Suzuki, 1973), is less reliable and the respiration is regarded as a more effective index in the actual testing situation (Inbau & Reid, 1953; Imamura, Yamashita & Suzuki, 1965). The special emotional atmosphere and the subject's affective responses in the actual test (Trovillo, 1953), along with the use of multiple stimuli (Lieblich, Kugelmass & Ben-Shakhar, 1970), will invalidate the significance of experimental findings on detection of deception. It can not be denied that the deception produced in the laboratory is not a real one, but it exists only as the deception designated by the experimental procedure. Moreover it is assumed that the complex psychophysiological interactions in the actual situation is one of the powerful factors which makes it difficult to employ the rigid controls acquired in scientific inquiries.

Essential solutions of these complicated facts must be achieved by accumulating the results obtained from actual cases, based on the recognition that the development of lie detection methodology was made possible through passing on experience. It is believed that the scientific technology of detection of deception should be accomplished through research using actual cases.

Based on this viewpoint, the present article attempts the psychophysiological evaluation of polygraphic examination of detecting deception, conducted on several subjects under the same period and types. Thus, under a well controlled condition, the comparative evaluation of every individual case undertaken in the actual detection of deception is as studied.

Method

Situation: The incident taken up in this article is the riot case which took place in K city involving murder and arson. Around 9:30 p.m., after a festival sponsored by the city had ended, some in a crowd of approximately 5,000 people who gathered for the occasion, quarreled with a taxi driver, and they overturned a taxi. During the 7 hours until around 5 o'clock in the morning, 153 cars were damaged by stones. Shops and police stations were set afire. Twenty citizens and news-reporters were assaulted and 48 police officers, including two seriously injured, received bodily harm. Moreover, they occupied a police wagon, which was abandoned to avoid possible death, and they ran over a news-cameraman who had fainted and, unfortunately, was lying on the road. Polygraph examinations were conducted on the suspects, who participated in this mob crime, after they signed a consent to the examination of their relevancy with the incident.

<u>Subjects</u>: Ninety-seven males ranging in age from 15 to 23 were examined. Of these, two were excluded from further examination. One was under an intoxicating medication (A Gurelan-anodyne) and the other was an extreme insomniac. Subjects were made up of 62 suspects who had been arrested, 11 suspects not under arrest, and 22 witnesses. About 86% were youngsters, 52% of which were students and 16% were belonging to a group known as the <u>Bosozoku</u> (reckless drivers). Past criminal or guidance records were not checked, and none of them had been previously examined on a polygraph.

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<u>Apparatus</u>: Physiological responses were recorded by a PC-4 model polypsychograph manufactured by Takei Kiki Kogyo. Respiration was recorded by a mechanical air pressure exchanger through a pneumo-tube wrapped around the abdomen of a subject. Silver electrodes were attached to the second and fourth fingers of the left hand to measure the skin resistance (SR) amplified through a bridge circuit by a electric current method before and after the examination. The SR responses were recorded during the examination by a condenser circuit. The blood pressure and pulse wave were obtained from the air pressure transmission by a cuff attached to the upper right arm.

The examinations were performed in a semi-noise proofed room. The temperature was maintained at $22 + 2 C^{\circ}$.

<u>Procedure:</u> After confirming the consent obtained earlier, a simple explanation on the purpose, method, etc., of the examination was given. Then all measuring sensors were attached. The examination started after a rest period of about 3 minutes. Questions prerecorded on a tape were played back at intervals of 15 seconds. Eleven questions for the POT technique were repeated twice, and the entire procedure followed the standard technique of detection of deception developed in 1977 by the National Research Institute of Police Science, Psychological Section.

<u>Analysis</u>: Deception was determined by inspecting visually the relative abnormalities in the phasic change of the response to questions in each series (Barland & Raskin, 1973). The success or failure in detection was identified by referring to the results of investigation performed later. The skin conductance level (SCL), known as the best indicator of the subject's arousal level (Duffy, 1972), was calculated from the SR measured before and after the examination. Then, the average SCL changes were computed from the following formula to measure the fluctuation of arousal level during the examination:

(SCLpre - SCLpost) / (★ x (SCLpre + SCLpost))
Note: SCLpre = The SCL before the examination
SCL post = The SCL after the examination

Results and Discussion

A segment of a polygraph record is shown in Figure 1. The results are summarized in Table 1. The upper portion of Table 1 is categorized under a guilty person paradigm. Those having relevancy with the incident and determined to be deceptive by the examination are summarized as positive (deceptive), those telling the truth with admitting their relevancy as positive (Truthful), and those determined to have no relevancy as negative. The number of successful and unsuccessful cases and the percent detectability are shown. The success rate was 95% for positive (truthful), 90% for negative and 80% for positive (deceptive). The mean success rate was 89%. This rate confirms the previous findings obtained from several other studies (Abrams, 1973; Hikita, 1971). The lower portion shows the detectability under a guilty information paradigm. The detectability was obtained from the success and the failure to questions:

"Did you: 'throw stones to the Task Forces'

'lay violent hands on taxicab & others'
'assault the police vehicles'
'attack to the cameraman', and
'destroy the police box & otherthings'".

Overlapping acts of individuals are counted in each case. The mean detectability was 79%. The results show that the polygraph examination in the guilty person paradigm produced higher detection rates than the guilty information paradigm. On the summarization of detection results of actual cases. it is indicated that several questions which relate to each other with the incident are employed (Lieblich, Naftali, Shumueli, & Kugelmass, 1974), and that the chart interpretation technique in the actual cases is influenced by outside information around the subject (Horvath & Reid, 1976). Nevertheless, the problem of evaluation of actual decisions must be taken into consideration. In other words, the problem may be reduced to the lack of logical categorization of the qualitative structure assumed to the technique of detecting a lie. Relevancies of subject to the incident must be firstly investigated in the actual detection, and then, if detected, a judgment on his part in that incident is made. The significance of this dual stages in the actual detection of deception and reconfirmation toward this direction are believed to be essential.



Figure 1: Segment of polygraph record. The first marking line indicates the questions by the POT technique (0 shows the critical question). The second is "respiration", the third, "galvanic skin response", and the fourth, "cardiovascular changes". The paper speed is 2.5mm/sec. The subject is a male, aged 17. The irregular respiration cycles until the critical question, and the large amplitude of galvanic skin response and disorders of cardiovascular response to the critical question were observed.

Table 1

Results of the actual detection of deception by the guilty person paradigm and the guilty information paradigm

	No. of successful subjects	No. of unsuccessful subjects	Detectability
Guilty person paradigm:			
Positive (deceptive)	24	6	80%
Positive (truthful)	42	2	95%
Negative	19	2	90%
Total.	85	10	89%
Guilty information paradigm:			
Did you:			
"throw stones to the Task Force?"	56	18	76%
"lay violent hands on the taxi & others?"	55	13	81.%
"assault the police vehicles?"	50	11	82%
"attack to the cameraman?"	6	1	86%
"destroy the police box & other things?"	12	4	75%
Total	179	47	79%

The effectiveness of physiological indices in different questions can be compared. Twenty-four subjects were selected to be positive (deceptive) to the question "Did you throw stones to the Task Forces?" and the stimulation test involving a card selection. As shown in Table 2, 12 of the 24 cases demonstrated the effectiveness of respiration in the question, "Did you throw stones to the Task Forces?" This supports a striking relative effectiveness of respiration over the other indices. On the other hand, the effectiveness observed with the card test was roughly the same in all three indices. It is believed that this is due to the differences between the questions on the actual incident and on the card or to the differences in the procedure of introducing the situation. Since the social and the traditional trends in the individual deceptive behavior differ in themselves, it should be more emphasized that a discussion originated from the substantive concept of 'deceptive act' is necessary.

Psychophysiology Evaluation

Table 2

Relative effectiveness of physiological indices to different questions by the visual inspection of the chart. The question of "Did you 'throw stones to the Task Forces' was compared with 'select the card No. - '.

Did you?	No. of Subjects	Res.	GSR	CV
"throw stones to the Task Forces"	24	12	8	4
"select the card no."	24	8	9	7
Note: Res. GSR = CV =	= respiration galvanic ski cardiovascula	n response r response		

In regard to the respiration as the most effective index, a study from the viewpoint of countermeasure in the actual lie detection must be discussed. It is psychophysiologically indicated that the emotional state accompanying the variation of arousal level by stress, tension and anxiety and most of the autonomic responses are dependent on the skeletal responses (Cohen, Goodenough, Witkin, Oltman, Gould & Shulman, 1975; Dudley, 1969; Katkin & Murry, 1968; Obriat, Webb & Suttler, 1969). In the sedative method of autonomic functioning, such as autogenic training (Schultz & Luthe, 1969) and Yoga meditation (Ellson, Hauri & Cunis, 1977), regulation of the respiration is known to be an effective strategy. Moreover, the respiration control will affect the heart rate and the skin resistance response (Harvis, Katkin, Lick & Habberfield, 1976). The modification of autonomic response by controlling the respiration is closely related to a countermeasure of the subject under the lie detection situation. It is not difficult to imagine that a subject can easily become aware of the increased arousal level, and he will try to decrease it as a countermeasure. In order to accomplish this, he may regulate his respiration. However, as mentioned earlier, the degree and the direction of regulation is normally not constant, which may afford us a proper cue to discriminate the deception. In this way the effectiveness of respiration to detect deception is clearly evident. The problem is not on a satisfaction with this phenomenon but on the modification easily achieved in the physiological response like the respiration. It is apparent that with practice, a successful voluntary countermeasure can produce a misleading result. It is recognized, therefore, that the modification of respiration as a countermeasure is a problem which needs to be quickly resolved.

The SCL and the mean variance of SCL measured before and after the examination are given in Table 3. The results obtained from the following five groups were analyzed, <u>i.e.</u>, the positive (deceptive) (P-d group) showing deception although connected with the incident, the positive (truthful) group (P-t group) admitting their connections with the incident, the negative group (N group) not being connected with the incident, the false positive group (FP group) determined deceptive although not connected with the incident, and the false negative group (FN group) determined not deceptive although connected with the incident. The FN and P-d groups show the greatest change, 19.5 and 19.1 micro-mhos, respectively, which was followed by 17.6 in the FP group, 16.0 in the P-t group and 15.6 in the N group. As a whole, a significant difference at .05 level was found (Kruskal-Wallis, H=10.1, df=4). By using the Mann-Whitney test, a significant difference (.05) was found between the three groups, FN, P-d and FP, and the two groups, P-t and N.

Table 3

Skin Conductance Level for Each Group

	No. of Subjects	Mean SCL before & a fter (its difference) in micro-mho	Mean variance of SCL
Positive (Deceptive)	24	19.1/23/4(4.3)	0.20
Postive (Truthful)	42	16.0/17/3(1.3)	0.08
Negative	19	15.6/16.0(0.4)	0.02
False positive	4	17.6/22.9(5.3)	0.26
False negative	6	19.5/20.5(1.0)	0.05

On the other hand, as to the difference in the SCL before and after the examination caused by disturbances of arousal level of subject in the state of examination, the FP group shows the greatest change of 5.3 micro-mho, followed by 4.3 in the P-d group, 1.3 in the P-t group, 1.0 in the FN group and 0.4 in the N group. Even by the mean variance of SCL calculated for the purpose of dealing with the effect of the law of initial values resulting from the individual differences in SCL (Wilder, 1957), the difference in the former two groups is more than 0.2 and in the later three groups it is less than 0.1. These differences are significant at .05 level (Mann-Whitney, u=10). These conditions are pictured in Figure 2.

It is pointed out that the three types of subject's situations: the deceptive phase, the truthful phase, and the false phase from the viewpoint of subject's arousal level in the lie detection, are classified. Moreover, these are governed by two factors: the arousal level of the subject before the examination and its fluctuation as the examination progresses (normally, the increase of arousal level is expected in real life situations). In comparison with the high arousal level before the examination in the deceptive phase and the large fluctuation of arousal level during the examination, the arousal level before the examination in the truthful phase is low and the fluctuation is small. This is based on the subject's primary cognitive set toward the detection of deception and it agrees with the psychophysiological characteristics which were often observed in real life examinations.



Figure 2. Mean skin conductance level (SCL in micro-mho) before (Pre) and after (Post) the polygraphic examination on the 95 male subjects. It is noticed that the low SCL of false positive, similar with positive (truthful) and negative, before the examination produces very large fluctuation during the examination, while the high SCL of false negative, similar with positive (deceptive), before the examination does not show the particular fluctuation with the progress of examination.

As for the errors, the difference between the FP and the FN groups must be discussed. The FP group showed a comparatively low SCL before the examination and produced a very large fluctuation during the examination,

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while the FN group, with a comparatively high SCL before the examination, did not show much fluctuation. This clarifies that the "false positive" and the "false negative" may be caused by a completely different factor. It is believed that the high arousal level of the FN group and the low level of the FP group before the examination follow the psychophysiological law of initial values that the responsiveness to stimulus in the high arousal level is smaller than the one in the low level. However, at this time, it is only a supposition since there is no definite identification concerning the responsiveness and the form of population distribution of SCL (Edelberg, 1972; Fowlers, 1974).

Next, the results will be discussed from the viewpoint of actual detection. Conceptually, the subjects in the FN group should be the same as the P-d group, and the FP group is the same as the P-t and the N groups. However, in the FN group, which shows a high arousal level as in the P-d group, its fluctuation of arousal level during the examination is small in comparison with that in the P-t and N groups. From the fact that there is no significant statistical difference in the arousal level before the examination between the P-d and the FN group is attributed to the technique of questioning itself. In this example in which only the POT technique was employed, the incompleteness based on hypothetical selection of the items which should be remembered by the criminals is pointed out. It is true that false negative errors can not be avoided so far as we are depending on this technique alone. It suggests the necessity of also using a relevant-irrelevant technique, such as the CQT, etc. (Yamashita, 1970).

Although the FP group shows a comparatively low arousal level, the fluctuation of arousal level during the examination is large as compared to the other groups, and the total amount of fluctuation resembles that of the P-d group. It is believed that a significant higher arousal level of the FP group before the examination than the one of the P-t and the N groups originates from the difference in individual-response stereotypy (Sternbach, 1966) of the subjects in the FP group. But because of the difference population of both groups, a definite conclusion can not be indicated. Errors depend greatly on the method of making a decision. The most common method at present employs a visual inspection for irregularities (Barland, 1972). There are methods based on a relative comparison of response to neutral stimuli. It is true, however, that experience and practice seriously affects the outcome (Suzuki, 1968, 1974). Therefore, one should be fully concerned with errors in the selection of non-controlled responses from the entire series. A rapid change in the arousal level disrupts the control of autonomic response, and at the same time, it hinders the visual interpretation because of the apparent irregular responses.

Conclusion

Polygraph examinations were conducted on 95 male subjects, employing the same questions in the actual detection of deception under the same condition and control.

The detectability in the guilty person paradigm was shown to be superior to that in the guilty information paradigm. The dual structure of technology of polygraphic detection of deception indicated that it is not strictly a means to search for and collect the information.

The respiration was confirmed as the most effective physiological index to detect the actual deception. Arguments were done on the stimulus-response specificity as well as on the voluntary modification of respiratory responses as a countermeasure in the actual detection.

It was recognized that the fluctuation of subject's arousal level in the actual detection influences the detectability, and a false decision is strongly affected by the degree of fluctuation of arousal level during the examination. It supported the contention that evaluation of base levels is important. Moreover, by the method of visual inspection of the chart in the actual detection of deception, errors will be reduced through experiences and practice, but the limit of the visual inspection is expected.

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We know the truth, not only by the reason, but also by the heart.

> "Thoughts" Blaise Pascal

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Book Review

By.

Gordon H. Barland, Ph.D.

Matte, J.A. The art and science of the polygraph technique. Springfield: Illinois: Charles C. Thomas, 1980. Pp. 304. \$19.75 U.S.

This is the first book on the detection of deception to be written by a graduate of Backster's school. As such, it is strongly influenced by Backster's approach and philosophy of the detection of deception. It contains a great deal of information about the Backster technique. However, the book is far from being a catalogue of Backsterian concepts.

Matte has written a book which sparkles with the rare brilliance of original ideas and concepts. These include expansion of Backster's tri-zone technique into quadrizone and quinque-zone formats. Matte's quadrizone test includes a novel "inside issue" factor to help the examiner determine whether reactions to the relevant questions are caused by deception or by an innocent person's fear of a false positive error.

This book includes numerous illustrations of charts and examples of criteria of reactions. It includes the most complete and detailed information on how to score charts numerically yet published in book form. Because it contains so many new ideas, some of them will be controversial and will inspire research to question or confirm them. For example, Matte suggests that when there are equal but small reactions to both a relevant question and its associated control question, it should be scored as a zero, but that if there are large reactions to the two questions, it should be scored as a minus one, even when they are of equal size. There is a veritable mountain of other nuggets in the book which excite the inquisitive mind and which may be weighed at leisure.

Some of the chapters in the book include discussions on hypnosis, drugs, privileged communication between the attorney, client, and examiner, and on the use of the polygraph in private business and industry. There are a number of useful appendices which give sample formats for various types of interviews and reports. It also includes a model polygraph licensing act, a bibliography, and a detailed index, which greatly enhances the usefulness of this book.

There are several errors, such as wrong dates, and occasionally beliefs are stated as if they were facts, such as the assertion that only single issue tests can be numerically scored (pp. 161-62), but these are quite minor imperfections compared to the enormity of the book itself.

The thoughs contained in this book represent a step forward in the evolution of the polygraph technique. It is an exciting book to read, and is definitely a book that should be carefully studied by every thinking examiner.

Electrodermal

Sagberg, Friduly. "Dependence of EDR Recovery Times and Other Electrodermal Measure on Scale of Measurement: A Methodological Clarification," <u>Psychophysiology</u>, 17 (5) (1980): 506-509.

Edelberg (1970) and Boucsein and Hoffmann (1979) found shorter recovery times with a constant voltage method as compared with a constant current method. In the present paper it is pointed out that this effect may be due to the use of different scales of measurement rather than to any electrophysiological aspects of the recording procedure. The mathematical relationship between resistance and conductance implies that recovery times are shorter for Skin Conductance Responses than for corresponding Skin Resistance Responses. For demonstration purposes, recovery times were computed from an SR Record and compared with those computed from the same record after computerized transformation to SC. Research implications of the demonstrated effect are discussed, and the relevance of measurement scale to two other electrodermal measures, area below the curve and range-corrected amplituce, is pointed out.

Address requests for reprints to: F. Sagberg, Institute of Psychology, University of Oslo, P.O. Box 1094, Oslo 3, Norway.

Social Motivation to Tell the Truth

Luchins, Abraham S., and Luchins, Edith H. "Strengthening Motivational Factors to Tell the Truth." Journal of Social Psychology, 1970, 55-62.

An experiment was designed in which subjects were under pressure from fellow students to confirm false results during a laboratory research project. The percentage that yielded to the social pressure was high. When the professor in charge of the project exhorted them to give factual results because the laboratory research was being used to validate a psychological test, the false reports persisted at a high level. Subjects were then confronted with a (fake) lie detector, which gave mild electric shocks to all lies (lies known to the experimenter). This resulted in a significant reduction in the false reporting.

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When we risk no contradiction, It prompts the tongue to deal in fiction.

"The Elephant and the Bookseller" John Gay

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