

PUBLISHED QUARTERLY

Polygraph 1978, 07(2) ©AMERICAN POLYGRAPH ASSOCIATION, 1978 P.O. Box 74, Linthicum Heights, Maryland 21090 By

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Almost all polygraphists dealing with criminal or specific loss testing attempt to obtain at least two, and preferably three, polygraph charts in which all of the test questions are asked. In almost all of the testing techniques using the reviewed question procedure, the underlying assumption is that each of the test questions is presented by the polygraphist in exactly the same manner on each and every chart. This premise also carries over into the chart analysis where the examinee's psychophysiological reactions to the test questions are evaluated and compared as if the responses are to identical stimuli.

Consider for a moment, however, the actual dynamics of this question-stimulus-reaction process in its most simplistic form. During the pre-test question formulation phase, the polygraphist and the examinee agree upon an interrogatory and put it into an appropriate linguistic form by selecting the right words and phrases to express its meaning. During the actual testing phase, the information goes through a series of transformation by the polygraphist into physiological and acoustic forms (the test questions) in the more formal and rigid question-answer test structure. The listener fits his auditory sensations into a linguistic sequence of words and sentences and the communication process is completed when he understands what the speaker said. He then reacts, or fails to react, to this verbal stimulus. Now this is conceptually very consistent, but it contains pitfalls for the unwary. Experienced polygraphists are conscious of the grammatical and semantic importance of question formulation and considerable effort is directed toward the quality of the test questions. We tend to be less conscious, however, of the linguistic subtlety and nuances which can effect their repetition. Stress and intonation are also an essential part of the language communication process. They are used to express emotional attitude, to make distinctions between questions, statements and doubts, and to indicate the relative importance attached to different words in a sentence. We can actually alter the sense of a sentence simply by using stress and intonation, e.g., Did you steal that money from the bank? Did you steal that money from the bank? Did you steal that money from the bank? Although the same words are used in each question, the meanings are changed. Paradoxically, we also communicate by silence, i.e., by pauses at certain points in the flow of words. We have all heard of the "pregnant pause." We can also alter meaning by the rate and pattern in which the words

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When the first chart reflects classic or textbook reactions to only one category of questions, does the polygraphist start to form an opinion? If identical reactions appear at the same location on the second chart, is the polygraphist's real time chart analysis reflected, however subtlely, by his voice stress and intonation in succeeding charts? The examinee, by virtue of his circumstance is invariably perceptive to anything and everything which might suggest the attitude of the polygraphist or his opinion concerning the progress of the tests. Thus, any language cue may have a multiplier effect on subsequent charts.

To test this hypothesis it was necessary to replicate the test questions exactly on three successive charts. A standard pre-test question formulation interview was conducted and the questions were reduced to writing. The test questions agreed upon were then dictated into a Sony TC-55 Cassette Tape Recorder, using a Sony ECM-95S Electret Condenser Microphone because of its remote switch feature. The dictation was done in the presence of the examinee who was informed that during the test phase, all of the questions would be presented by playback through the recorder and that nothing could be added or deleted until all three charts were complete. It was also explained that a short rest period would be provided between charts while the tape was being rewound. The tests were then conducted in the usual manner with the questions being presented and appropriate spacing maintained by simply using the remote switch to start and stop the question tape. The test format used was the U.S. Army modification of the Backster Zone Comparison:

- 1. Neutral
- 2. Sacrifice Relevant
- 3. Symptomatic
- 4. Control
- 5. Relevant (Strong)
- 6. Control
- 7. Relevant (Strong)
- 8. Symptomatic
- 9. Control
- 10. Relevant (Weak)

The presentation of the actual test questions was always preceded by an open sensitivity/stimulation test. The examinee verbally selected a number between one and ten and was instructed to deliberately lie when his selected number was placed in a series. Since both of the parties knew the number, the examinee was told to try and show no emotional or physical reaction when he lied about his number and to try to "beat" the polygraph. The numbers were then presented as a peak-of-tension test with the pre-selected number enveloped or padded on either side by sequential numbers. Upon completion, the chart was shown to the examinee and his reactions to the questions were explained to him. This part of the test was not pre-recorded since only one chart was involved; however, it presents no special problems and could easily be incorporated into the prerecording procedure. It requires only a counter on the recorder to locate the different program parts.

As a further refinement, the pre-recorded test questions were then presented through headphones which were placed on the examinee just after the stimulation chart and just before the critical phase was to begin. An identical set of headphones was used by the polygraphist to monitor the questions and to control the volume. It was postulated that this would increase the introspective concentration of the examinee and simultaneously reduce or eliminate outside noises to which the polygraphist may have become conditioned.

Following the completion of the testing phase, all three of the test charts were evaluated by a numerical analysis procedure. To reduce subjectivity no numerical upgradings were used. All reactions were therefore based on a plus or minus one factor. All three charts of the components were used (the double pneumograph was counted as one) in the numerical evaluation and a plus or minus six was considered sufficient for diagnostic purposes. The instrument used was a Model 22770 Polyscribe manufactured by Stoelting Co. Every case tested was of felony intensity and the case facts were considered adequate or better.

RESULTS:

One must bear in mind that the primary goal of the introduction of the novel procedures was not solely to determine truthfulness or deception on the part of the examinee but rather to see if, by the elimination or reduction of known variables, the quality of the examinee's reactions might be improved. If his selective reaction to the controll and relevant stimuli could be made more discrete, then chart analysis would be simplified with a concomitant improvement in technique accuracy.

The use of real life testing for appropriate case intensity usually precludes retesting with other procedures for comparison. In addition, the conditioning effect of repetitive testing reduces the comparative value. Consequently this less desirable anecdotal reporting method was used.

To date, the procedures described have been used on approximately forty different examinations. The initial impression is that the examinee's reaction patterns are intensified. This may be due to the greater introspective concentration inherent in the use of headphones. For whatever reason, the numerical evaluation increased by slightly over eighteen percent when compared to a similar number of cases using standard voice stimulus procedures. The number of inconclusive or indefinite tests was also reduced but the sample was too small to be statistically significant.

Several unanticipated effects were also noticed:

- 1) the use of headphones entirely eliminated outside noise factors, although the testing environment was relatively noisy and had presented problems in the past.
- 2) the symptomatic or outside issue questions produced virtually no responses. This may well be because it is apparent to the examinee that only the pre-recorded questions can be asked in any test sequence.
- 3) question presentation by merely moving a switch allows the polygraphist more time to observe the examinee at the very instant the questions are asked and to be more precise in the chart markings.

SUMMARY:

The controlled pre-recorded presentation of polygraph test questions through headphones seems to appropriately intensify the examinee's reactions, to reduce or eliminate outside noise influences, to reduce symptomatic or outside noise influences, to facilitate the observation of the examinee during the testing phase, and to simplify chart marking procedures.

It is readily conceded that the work sample from which these observations and tentative conclusions are drawn is very limited. The results are in no sense definitive, but the procedures seems to offer a possible solution to a few of the testing problems in real life cases. The purpose of this paper is to solicit critical evaluation and to stimulate further research toward technique improvement by the elimination of variables in polygraph testing.

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CRIMINAL INTERROGATION WITH THE LIE DETECTOR EIGHT YEARS EXPERIENCE BY THE MICHIGAN STATE POLICE

By

LeMoyne Snyder, M.D.*

[1943]

During the era since the last year, the science of criminal investigation has enjoyed tremendous growth. This quarter of a century has witnessed the development of fingerprinting into a common, everyday procedure. Scientific firearms indentification (improperly called "ballistics") is a development of the last few years. The employment of blood grouping examinations in cases of contested paternity, scientific determination of alcoholic intoxication and many other valuable procedures have all come into use during this same time. The medical profession can take pride in the fact that its members have contributed so generously to the development of this new field.

Probably the most spectacular instrument devised in this era is the lie detector. In localities where it is in common use it has provoked enormous public interest. The idea of being able to detect a liar by means of a machine is fantastic to the uninformed. Many scientifically trained persons who have not yet had the opportunity to see it in actual operation still regard it as a mixture of voodoo and hokum. The Michigan State Police for the past eight years has employed one of the better known lie detectors, the Keeler polygraph. While other types of apparatus have also been employed from time to time, the results obtained with the polygraph have been the most satisfactory. However, the fact that the series of cases reported here is based on results with the polygraph should create no inference that there are not other makes of apparatus that will give satisfactory results.

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Originally published in 15 Rocky Mountain Law Review 162 (1943), now the University of Colorado Law Review. Republished with the permission of the Journal and the Author. The author is a Member of the APA.

Reprinted as part of the archivist series to present the history of the profession.

For thousands of years attempts have been made to establish guilt or innocence by such procedures as the trial by ordeal, and its more modern counterpart, the "third degree." These found expression in an infinite variety of cruelties and were only uniform in expressing the frustration felt by the prosecutor and police. Under this system many guilty escaped, many innocent confessed, and all were mistreated.

I. Physiology Involved

When most persons deliberately tell a falsehood, certain physiological reactions take place. These may exhibit themselves as blushing, dryness of the throat, swallowing and many other ways. Following the pioneer work of Lombroso,¹ Marston, Benussi, Larson and others, Leonarde Keeler in 1926 developed the polygraph. On a moving strip of paper this instrument records simultaneously changes in the blood pressure and changes in depth of respiration. Earlier investigators had noted that immediately following the telling of a lie the blood pressure rose and soon fell again to approximately normal.

Likewise it was apparent that during the telling of a lie and for a short time afterwards, respirations were apt to be shallow. A period of shallow breathing was usually followed by extraordinarily deep respirations in an endeavor for the subject to recover his breath. Consequently by interspersing the questions which are directly related to the crime with questions which had no bearing to the subject under investigation, it is possible to throw the significant changes into bold relief. For instance, a typical series of questions might be something like this:

- 1. Did you have breakfast this morning?
- 2. Do you smoke?
- 3. Do you drive a car?
- 4. Did you shoot John Doe?
- 5. Do you live in Michigan?
- 6. Do you know who killed John Doe?
- 7. Is today Thursday?
- 8. Have you lied in any of these questions?

Recently an electrodermal response unit has also been incorporated in the machine which is a device for measuring fluctuations in the electrical resistance of the subject during questioning. It is attached to the hand of the person being questioned and is of value in some cases. This unit has been used in only a few of the cases reported here.

The reaction of most persons is quite uniform when first informed of the lie detector and its method of operation. They express themselves usually about like this, "If I were ever put on a lie detector I would be so nervous that I am sure my reactions would indicate that I was guilty even if I were innocent." Fortunately such is not actually the case. Practically all persons exhibit some nervousness when first run on the polygraph. The experienced operator can detect this easily and make proper allowances for it. As a matter of fact, the records are very barren of innocent persons being unjustly accused by reason of their polygraph tracings. In our own experience, we know of no such case.

The next question is quite apt to be, "Is the machine infallible?" That question is exactly like asking whether a clinical thermometer, stethoscope, X-ray machine or compound microscope is infallible. A trained scientist may be mistaken in which he sees or hears by any of these devices. Like the thermometer and stethoscope the polygraph is simply an instrument for noting or recording physiological processes and it is possible for the operator to be mistaken in his interpretation of the recording. Even in the best of clinics the interpretation of X-ray film is not 100 per cent accurate, but that does not imply the machine should not be used. The same can be said for the polygraph.

There are two essential requirements for the successful employment of the lie detector: first, a competent operator, and second, a proper place in which to conduct the examination.

What should be the background and training of a person who is to conduct polygraph cases? The first essential is that he have a long experience in criminal, business, social, and professional matters. In other words he must know how "the world operates." He must combine a scientific approach to his problems with complete and absolute honesty. The temptation to indulge in wishful thinking in the interpretation of polygrams is often great. The requirement of the operator to interpret the tracing as it actually is, rather than what he hoped it would be, is basic. When such a person is properly trained in the use of the apparatus, he should make an excellent operator. A medical training would often be helpful but is by no means essential.

In what surroundings and under what conditions should a lie detector test be given? When the Michigan State Police started using the polygraph eight years ago, it was frequently taken all over the state and tests run on subjects in county jails, prosecutors' offices, or any vacant corner that seemed to be convenient. It soon became apparent that this was a mistake. The general excitement and confusion present usually made it impossible to run a satisfactory test. Furthermore, there was a distinct tendency on the part of the local police officers to substitute the lie detector for an adequate investigation from the police angle. To attain any degree of success with the instrument, it is necessary for the operator to have all of the procurable facts with respect to the subject prior to the test. Consequently when suspicion is directed toward an individual in connection with a crime, he should not be subjected to a polygraph examination until the police have completed an exhaustive inquiry into the crime and all related facts.

When it became apparent that this method of conducting an examination was unwise, a special room was constructed at the headquarters' post in East Lansing. This room is situated in a quiet section of the building and is sound proof. The walls are decorated, the floor carpeted, comfortable furniture has been installed and everything done to produce a quiet, restful atmosphere without unnecessary fixtures and pictures which will distract the attention of the subject. No officers in uniforms are present and the atmosphere is that of a quiet, business-like office.

After reviewing the case with the officers, this operator discusses the matter privately with the subject. The purpose of this is to enable the operator to determine the precise points of conflict between the accused's story and the available evidence. The interview also serves to impress the subject that he will be fairly and civilly treated.

II. Techniques of the Test

By the very nature of the examination, the full consent and co-operation of the subject is required. There is no possible way to force a person against his will to submit to an examination. To try to do so would be precisely like attempting to get a satisfactory electrocardiogram on a hostile and recalcitrant individual. Consequently the "third degree" and the lie detector technique represent opposite extremes in criminal interrogation. Any show of bodily violence, threatening, shouting or abusive language preclude any success with this apparatus.

The manner in which the test is conducted is explained to the accused. He is told that he will suffer no pain more than the slight discomfort from the blood pressure cuff about his arm. After the subject has consented to take the test, he is taken into the examination room and seated in a straight chair with the apparatus placed in back of him. The chair should be equipped with wide arms so that he is perfectly comfortable.

All the questions asked can be answered by a simple "yes" or "no" and the person examined is told to reserve any explanations or qualifications of his answers until the test is completed.

The blood pressure cuff is then applied and the pneumograph tube is adjusted around his chest. The instrument is then started and recordings made of his blood pressure and respiration for a minute or so with no questions being asked. This is to allow the fluctuations in these recordings due to nervousness and anxiety to subside.

The subject is then given a numbers test. This is done by showing him 10 cards numbered from 1 to 10. He is told to select one of the numbers and keep it in his mind but to lie about it when he is asked if that is the number which he has selected. In other words, the subject is to answer "no" when each card is presented to him. The instrument is then started and each card is shown to him slowly and he is asked if that is the card he has selected. Of course he answers "no" to all of these questions including that on the number he has chosen.

The purpose of this test is to see how he reacts under actual questioning and to record his response on the blood pressure and pneumograph tracing when he lies. There is seldom much difficulty in determining the number chosen. This test also has a certain psychological value by impressing upon the subject that it is possible to tell by means of the apparatus when a person is evading the truth.

Following this, he is asked a series of 7 to 10 questions which deal with the crime itself as previously outlined. Questions dealing directly with the crime are interspersed with those of an irrelevant nature. After this test is run the pneumograph tube and the pressure cuff are loosened and a short rest period allowed. The test is then usually repeated once or twice more using different irrelevant questions and placing the pertinent questions in a new order. When these tests are completed, the operator usually is convinced that the subject has guilty knowledge of the crime or is entirely innocent. Occasionally however, the tracings may be of such a nature that the operator can arrive at no definite conclusion with respect to the guilt or innocence of the subject.

There are many conditions which may contribute to the making of a tracing upon which no analysis can be made. The subject may be of such a low intellectual caliber that he has no normal responses to questions of guilt or innocence. Such conditions as an uncontrollable emotional reaction or a bad cough may cause considerable difficulty. Organic conditions such as hyperthyroidism, auricular fibrillation or other circulatory diseases will cause difficulty in the interpretation of the tracings. However it is extremely difficult for a person who is physically normal to run an innocent tracing when he has guilty knowledge of the crime. In fact the harder he tries to, the more pronounced the guilty response is likely to be.

III. Results of the Lie Detector Test

TABLE 1

POLYGRAPH CASES CONDUCTED BY THE MICHIGAN STATE POLICE

	Cases	Subjects	Tests	Admissions	Knowledge	Cleared	No Analysis
1935	92	165	660	41	54	96	15
1936	88	197	591	20	26	43	19
1937	75	107	381	23	44	57	6
1938	127	233	485	69	104	125	4
1939	153	222	354	49	98	111	12
1940	145	235	465	39	75	155	5
1941	121	239	545	33	72	156	11
1942	104	153	473	34	90	60	3
Totals	905	1551	3954	308	563	803	75

The above table shows the results in the use of the polygraph on 1551 subjects over a period of 8 years. All of these tests were conducted by

either Captain Harold Mulbar or Detective W. M. Petermann. On 563 subjects the instrument gave an indication of guilty knowledge and in 308 of these cases an admission was obtained at the completion of the test. In 803 cases the subject was cleared as having no guilty knowledge of the crime and in 75 cases the tracings were of such a character that no definite analysis could be made.

In a table of statistics such as shown above, there are of course some unknown quantities. One might ask, "How about those subjects on whom the instrument indicated guilty knowledge but from whom no admission was obtained?" Some of these were tried and convicted, others were found not guilty and some were not brought to trial. However a much more important fact is that in no case where the instrument indicated that the subject had guilty knowledge of a crime have later events proved an erroneous conclusion was drawn!

A similar question might be raised as to the 803 persons who were cleared by the polygraph. In many of these cases the diagnosis of innocence was substantiated by the subsequent confession of other persons. In only one instance out of this series did the operator conclude the subject was innocent and later have him confess to the crime. Upon subsequently reviewing the graphs, the operator acknowledged that the indication of guilt was there but the error lay in the interpretation of the tracings.

IV. Interpretation of Cases

Occasionally it happens that a person is innocent of the crime about which he is being questioned but has committed some other offense that disturbs his reactions. For instance, a truck driver was brought in for an examination who was accused of having stolen funds that he had collected on his delivery route. At the interview prior to the polygraph test, he stated that he had a wife and 3 children. During the test when questioned with respect to the missing money, he ran a perfectly clear record but showed a great deal of disturbance at the supposedly irrelevant question, "Are you married?" The question was repeated several times with similar results. When questioned with respect to his marriage it developed that he never had been married to the woman with whom he was living and who was the mother of his children. He stated that they always had intended to get married but had neglected to do so until the arrival of the children made it impossible.

During the last 8 years that the lie detector has been in use by the Michigan State Police, one of the striking advantages it has offered has been in the clearing of innocent persons. There have been several instances where the evidence against a person was so strong that he probably would have been convicted had the case gone to trial. Borchard² has pointed out that persons who are entirely innocent of wrong doings are occasionally convicted of serious offenses.

Some time ago a salaried employee of the state received his pay check and left to spend the Christmas holidays at a small town in Minnesota. When he returned to Lansing about two weeks later, he reported that he had lost the pay check and requested that another one be issued. In due course a duplicate check was given to him and the matter forgotten. A year later while spending the holidays in the same Minnesota town the original check was cashed, the only alteration being that it was dated a year later. The cashed voucher returned to Lansing before he got back and when he arrived he was placed under arrest. Of course he protested his innocence, but the fact that the check had been cashed in the same small town that he was known to be in at the time, and where he had not been for a year, made a strong case against him. Even the endorsement appeared to be his.

On the polygraph this man ran a completely innocent tracing and on the strength of that alone he was released. A few weeks later the truth of the matter became known. The check was lost as he had contended and fell into the hands of a man who had exactly the same name. He held the check for several months, finally altered the date of the year, endorsed and cashed it. The fact that the state employee happened to be in the town at the same time was pure coincidence. Enough similar experiences have happened to warrant the conviction that the polygraph is a great source of protection to the innocent person.

Likewise the apparatus is of great aid to the police where the evidence against the suspect is rather weak but the polygraph shows he has guilty knowledge of the crime. Even without an admission it gives an incentive to the police to keep working on the case until more evidence is uncovered. In the experience of the Michigan State Police, many cases have been followed through to a successful conclusion which undoubtedly would have been dropped early in the investigation had not the polygraph convinced the officers they were on the right track.

V. Status of the Polygraph in Court

Inbau³ in his recent book Lie Detection and Criminal Interrogation has completely covered this topic. Only a few attempts have ever been made to introduce polygraph evidence in court. In Michigan no direct attempt has ever been made to introduce this type of evidence. The occasion seldom arises when such a move is necessary or even desirable. While the instrument has definitely proved its worth, still there are not set standards for either apparatus or operators. Consequently it is apparent that one fiasco in court might retard the usefulness of the devide for many years. The lie detector is not an instrument that can be turned on and played like a phonograph. It is simply one useful aid to the criminal interrogator, yet the attempt is usually made to put the polygraph on the stand rather than the operator. In court it is like trying to examine a microscope rather than the pathologist. After more years of experience have been accumulated with this device and standards of technique have been established, it may be possible for trained criminal interrogators to give an opinion as to guilt or innocence partially based on lie detector recordings.

VI. Report of Case

On December 1, 1942, a report came to the East Lansing detachment that Mrs. Ellen Pitts was missing and a routine investigation was started. The investigators learned that Mrs. Pitts was married, mother of 4 children, and a few weeks earlier had deserted her family who lived on a farm near Morrice. The investigation also disclsed that she was keeping company with Harland Nevins, aged 28, married and father of 4 children, living at 528 South Detroit Street, Lansing Township. Nevins had bought a homemade housetrailer situated in an abandoned clay pit about a half mile from his residence and there had installed Mrs. Pitts.

On being questioned by the police, Nevins asserted that he had not seen Mrs. Pitts for a week or so but thought that she had obtained a job as a domestic. The trailer was searched and everything found to be in order.

On December 8, Mrs. Nevins came to the police post and said that her husband while intoxicated had told her that he had shot and killed Mrs. Pitts and buried her in a hole that he had dug in the back yard of their home on Detroit Street. She stated that he admitted the shooting occurred on November 21, 1942 and then he had buried her on November 28. Officers went to the Nevins home, and although there was a heavy fall of snow on the ground the grave was located and on digging down about a foot and a half, they found the body of Mrs. Pitts. An autopsy discosed that she had been shot with a .22 caliber bullet squarely between the eyes. The bullet had fractured the base of the skull and coursed downward toward the back of the neck.

Nevins was arrested but insisted that he did not shoot Mrs. Pitts. His story was that when he went up to the trailer at about 7 P.M. on November 21 he found her dead and didn't know whether someone else had shot her or whether she had committed suicide. He told in great detail how he had picked the body up and kissed it but had finally left it as he found it. The following day he had returned and cleaned up the blood and laid the body out carefully on the floor. He came nearly every day until the eveing of November 28 when he placed the body in the back seat of his car and took it home. He borrowed a shovel and dug a hole in the back yard, and when some neighbors inquired what was going on, he replied he was digging a new privy vault. The body was placed in the hole and covered up.

The bullet which had killed Mrs. Pitts had been fired from a rifle owned by Nevins. He said that the rifle had been loaned to her sometime ago for protection as she lived in a lonely place. In the meantime he had taken the rifle home.

When run on the lie detector, the card test was first employed. Nevins showed a definite reaction to card number 3 which was the one he had selected. When questioned on the shooting of Mrs. Pitts, Nevins showed definite reactions to the questions:

- 5. Did you shoot Mrs. Pitts?
- 7. Did you have an argument with Ellen?
- 9. Have you lied to any of these questions?

A repetition of the test disclosed identical reactions. Following the polygraph examination, Nevins signed a confession that he had intentionally shot and killed the victim.

The facts were that Nevins had become jealous because Mrs. Pitts was running around with some other men. On November 21, Nevins went up to the trailer in the morning and took her with him. They had been together practically all day drinking beer in several different taverns. About 6 o'clock in the evening they went back to the trailer and the argument started about Mrs. Pitts' relations with other men and during the argument Nevins picked up the rifle and shot her while she was sitting on a box. From that point on, the story was substantially as related by Nevins prior to his confession.

This illustrates a rather common type of case. Nevins was distinctly the bully type, often threatened and abused his wife, was a heavy drinker, had been arrested for assault and battery but never was involved in serious trouble. Had Nevins stuck to his original story it is exceedingly doubtful if he could have been convicted of the murder charge. Picking his chosen number on the card test had definite value. Following the examination Nevins was told that he was not telling the truth with reference to the 3 pertinent questions and it was pointed out to him on the tracings just what his reactions were. As happens frequently in cases of this type, his armor of defense crumpled and the confession followed.

Summary and Conclusions

During the last 8 years the Michigan State Police has made use of the lie detector in the investigation of 905 criminal cases. Fifteen hundred fifty-one persons have been tested with the instrument and of these 563 showed guilty knowledge of the crime under investigation. Following the test, 308 of these persons made admissions of guilt, 803 persons were cleared and no analysis was possible in 75 cases.

The lie detector used by this department is an instrument which records changes in blood pressure and respiration. Like all apparatus which records physiological reactions, the interpretation of the findings is the crux of the procedure.

We recognize that the lie detector test has certain pitfalls, and every precaution must be taken to guard against errors of interpretation. As far as it is possible to check the results, the device and technique has shown a high degree of accuracy. By means of this technique many persons have confessed to the commission of serious crimes, who without the use of the lie detector, undoubtedly would never have been convicted. Likewise in several instances persons against whom there was strong evidence of guilt have been cleared by the lie detector and their innocence later substantiated. In the opinion of the Michigan State Police, interrogation by means of the lie detector provides a scientific, humane and highly accurate adjunct to criminal investigation.

Footnotes

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¹Lombroso, C.: L'Homme Criminel 2nd ed., (1895) 1:336-346.

²Borchard, Edwin M.: Convicting the innocent, New Haven, Conn., Yale University Press, 1932.

³Inbau, Fred E.: Lie Detection and Criminal Interrogation, Baltimore, Md., The Williams & Wilkins Co., 1942.

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Answers to Polygraph Review:

- a and c
 b
 c
 c
 b and d
 False
 True
 True
- 9. False
- 10. False

AN EXPERIMENTAL STUDY OF THE ACCURACY OF POLYGRAPH TECHNIQUE IN DIAGNOSIS OF DECEPTION WITH VOLUNTEER AND CRIMINAL SUBJECTS

By

S. K. Lahri and A. K. Ganguly

Since the development of Polygraph (Lie Detector) around the 1920's in U.S.A., it has attained a place of importance as a useful scientific tool in criminal investigation. In U.S.A. inspite of the fact that the technique of polygraphy is being used extensively for the last few decades. the basic technique of detecting deception by interpreting the polygraph chart (Polygram) has occasioned to invite criticism towards its accuracy and reliability both from the Judiciary as well as from various labour unions and the public. In consideration of such opinion, Abrams (1973) made an attempt to review the available literature on polygraph to present a clear picture of the accuracy of the lie detection test results. The review indicates that research studies carried out in the area of polygraphy are in two directions: (i) in the laboratory and (ii) in actual life situations. The existence of differences is admitted in the emotional response of a volunteer subject participating in a laboratory experiment in comparison to an actual criminal whose penalty for being detected may mean prison, personal embarrassment, financial loss, etc. While one of the early successful laboratory experiments in lie detection was conducted by Benussi (1914) who reported on the pneumographic parameter (and who mentioned his simultaneous pulse recording), it was Burtt (1918 and 1921) who extended Benussi's inspiration/expiration technique and found an accuracy of 73%. Using Marston's discontinuous systolic blood pressure test Burtt obtained 91%. This brought about the combination of the recordings. Landis and Wiley (1926) using cardio-pneumo technique reported success between 50 to 57%. Influenced by such early studies, other polygraphists (Ruckmick, 1938; Summers, 1936; Baesen et al, 1948; Macnitt, 1942; Lykken, 1959; Kugelmass et al, 1967; and Davidson, 1968) also undertook laboratory research with elaborate planning and reported

Acknowledgement: Authors thanks are due to Dr. H. L. Bami, Director, Central Forensic Science Laboratory, New Delhi for his keen interest and suggestions.

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A. K. Ganguly, M.A. in Psychology, 1959; Ph.D. in Experimental Psychology, 1965; Muslim University, Aligarh. Assistant Director (Lie Detector) Central Forensic Science Laboratory, Ministry of Home Affairs, Central Bureau of Investigation, India (East Block VII, R. K. Puram, New Delhi-22). accuracy varying from 70 to 98%. Similarly, considering the application of polygraph in actual crime investigation various polygraph experts reported accuracy results between 95 to 100% (Larson, 1932; Bitterman & Marcuse, 1947; Winter, 1936; Lyon, 1936; McLaughlin, 1953; Smallwood, 1934; Bersh, 1969; Wolfle, 1941; and Cureton, 1953.) However, a most scientifically acceptable estimate has been given by Inbau & Reid (1942). <u>According to them 95% accuracy in polygraph test results can be achieved</u> with a margin of 4% inconclusive and 1% erroneous results.

Above survey evinces that accuracy of polygraph test results in the actual field is rather higher than those carried out in the Laboratory. The reason for this deviation according to Cook (1968) is due to the fact that feeling of guilt and fear of detection present in a subject of field investigation (i.e., a criminal suspect) is invariably missing in the subject of a laboratory study. For this reason perhaps, of late, studies pertaining to polygraph technique in real life situation has become an important point of investigation. In two studies concerned with actual field cases by Holmes (1958) and Horvath & Reid (1971). the objectives were to determine whether or not professional polygraph examiners, working independently of each other were able to detect deception successfully mainly from an analysis of the polygrams. The examiners were denied any other factual data, such as history of the case, test questions or subject's behaviour during the polygraph testing session. Holmes reported 75% accuracy in judgements whereas Horvath and Reid reported 87.8% accuracy. However, neither of these studies indicated how consistent the opinion would be if the same polygraph records were evaluated by the same examiner at two different points in time. To probe into this aspect Hunter and Ash (1973) conducted a study, which revealed an accuracy of 86%. In this context, it could nonetheless be pointed that if the examiners had access to the background of the case, test questions, behaviour of the subject, which they were denied of, the obtained accuracy results could have been higher.

The preceding observations reflect the accuracy of polygraph test results achieved outside India. No such study indicating the accuracy of the polygraph test results with Indian subjects (volunteers or criminals) is available, save one laboratory study by Godalaswamy Shivabassappa (1954) who used only psycho-galvano-meter (electrodermal response) to base his findings. According to this study the accuracy was only 63%. Lie Detection Division of CFSL, New Delhi has conducted polygraph examination in respect to 115 cases involving 263 persons during the last three years with very good results (Ganguly, Lahri & Bami, 1977). However, a more detailed study on the accuracy of polygraph results was felt very much wanting in India with Indian subjects. Accordingly, it was thought desirable that an investigation be carried out on actual criminal subjects as well as on volunteer subjects keeping the test material constant. The basic aim of the investigation was to study the difference in the accuracy of the polygraph technique in the diagnosis of deception with regard to volunteer and criminal subjects.

Procedure:

A sample of 80 subjects was chosen, of which 40 were suspects in crime

cases randomly selected out of those who were brought to Central Forensic Science Laboratory, New Delhi by the police. They were suspected to be involved in actual crime cases such as murder, theft, kidnapping, fraud, etc. The remaining 40 subjects who volunteered to participate in the study, were government employees at Delhi. The study was restricted to male population only.

In the conventional "Card Test" technique (Reid & Inbau, 1966) for conducting a deception test, the subject is asked to choose one out of a set of seven numbered cards (playing cards are generally used for this purpose) presented to him face down. After he has remembered the number and colour of the card, he returns it to the set without identifying it to the examiner. The cards are then shuffled and the examiner instructs the subject that during test he is to answer "no" to all the cards, including the card he has chosen. In the present study, however, the procedure was slightly modified. Instead of numbered cards or playing cards, the subject was asked to choose one out of a set of eight cards face down, bearing a numerical number in three digits with a coloured photograph of some object, such as, an animal, a fruit, or a bird, etc. The subject was also instructed not to divulge the contents of the card he had chosen, to the examiner. Specifically, following instructions were given to the subject:

- i) Choose one card out of this set and remember the numerical number and the photograph of the object on the card.
- ii) Return the card face down to the set without identifying it to the examiner.
- iii) Note down the numerical number and the name of the object on the card on a separate piece of paper and keep this paper with you till the end of the test.
- iv) The polygraphist will show each card one by one asking "Have you chosen card number with a photograph of?
- v) You have to give your reply in the negative in respect of all cards including the one chosen by you. Thus, telling a deliberate lie in one case.

Results and Discussion:

Polygrams in respect of the total population (40 volunteers and 40 suspects of crime cases) were analysed and evaluated. From Table I it may be seen that in respect of the total population accuracy achieved in correctly diagnosing the deceptive response with regard to the chosen card is 80%. However, the accuracy in the diagnosis in respect of the two-sub-groups, namely volunteers (n 40) and the suspects of crime case (n 40) was 70% and 90% respectively.

TABLE I

		Car	Cards		
		Detected	Not Detected		
1.	Total population (n 80)	64 (80%)	16 (20%)		
2.	Volunteer subjects (n 40)	28 (70%)	12 (30%)		
3.	Suspects of crime cases (n 40)	36 (90 %)	4 (10%)		

DISTRIBUTION OF JUDGEMENT WITH REGARD TO CARD TEST ON 80 SUBJECTS

The results obtained indicate an accuracy of correct judgement between 70 to 90% with an average of 80%. This confirms to a reasonable degree the results achieved by polygraphists in other countries in respect of laboratory studies. Higher percentage of correct diagnosis in respect of criminal subjects in the present study could be for the reason that in volunteers, the main syndrome of deception is a feeling of guilt, but fear of detection was not present; an argument already put forth by Cook (1968). It is, therefore, clear that use of polygraph in the hand of competent Indian experts can also achieve the same high standard and professional reliability which is available elsewhere.

References:

- Abrams, S. Polygraph Validity and Reliability: A Review. Journal of Forensic Science 18(4)(1973): 313-326.
- Baesen, H.V., Chung, C.M., and Yang, C.Y. A Lie Detector Experiment. Journal of Criminal Law and Criminology 39(1948): 532-537.

Benussi, Vittorio. Die Atmongssymptome der Loge. <u>Archiv. Fid. Ges. Psychol.</u> 31(1914): 244-274. *

Bersh, P. J. A Validation study of Polygraph Examiner Judgements. Journal of Applied Psychology 53(5)(1969): 399-403.

Bitterman, M.E. and Marcuse, F.L. Minor Studies from the Psychology Laboratory of Cornell University: Cardiovascular Responses of Innocent Persons to Criminal Interrogation. <u>American Journal of Psychology</u> (60)(1947): 407-412.

*[tr. and publ. in English, in Polygraph 4(1)(March 1975): 52-76.]

- Burtt, H. E. A Pneumograph for Inspiration-Expiration Ratios. <u>Psycho-logical</u> <u>Bulletin</u> (15)(1918): 325-328.
- Burtt, H. E. The Inspiration-Expiration Ratio During Truth and Falsehood. Journal of Experimental Psychology (9)(1)(1921): 1-22.
- Cook, R. E. Truth, Statistics and the Polygraph. <u>Police</u> (13)(2)(Nov-Dec 1968): 36-41.
- Cureton, E. E. A Consensus as to the Validity of Polygraph Procedures. <u>Tennessee Law Review</u> (22)(1953): 728-742.
- Davidson, P. O. Validity of the Guilty Knowledge Technique: The Effects of Motivation. Journal of Applied Psychology (52)(1968): 62-65.
- Ganguly, A. K., Lahri, S. K., and Bami, H. L. Polygraph (Lie Detector) -Its Application in the Investigation of Crime in India. <u>CBI Bulletin</u> (9)(1977): 1-6.
- Holmes, W. D. The Degree of Objectivity in Chart Interpretation. <u>Academy</u> <u>Lectures on Lie Detection</u>, Vol. II, Springfield, Illinois, U.S., 1958.
- Horvath, F. S. and Reid, J. E. The Reliability of Polygraph Examiner Diagnosis of Truth and Deception: Journal of Criminal Law, Criminology, and Police Science (62)(1971): 276-281.
- Hunter, F. L. and Ash, P. The Accuracy and Consistency of Polygraph Examiner's Diagnosis. Journal of Police Science and Administration (1)(3)(1973): 370-375.
- Inbau, F. E. and Reid, J. E. Lie Detection and Criminal Interrogation, Williams & Wilkins, Baltimore, Maryland.

Kugelmass, S., Lieblich, I., and Bergman, Z. The Role of 'Lying' in Psychophysiological Detection. <u>Psychophysiology</u> (3)(1967): 312-315.

- Landis, C. and Wiley, L. E. Changes in Blood Pressure and Respiration During Deception. <u>Journal of Comparative Psychology</u> (6)(1926): 1-19.
- Larson, J. A. Lying and Its Detection. University of Chicago Press, 1932.
- Lykken, D. T. The GSR in the Detection of Guilt. <u>Journal of Applied</u> Psychology (43)(1959): 385-388.
- Lyon, V. W. New Deception Tests. Journal of Genetic Psychology (48)(1936): 494-497.
- Macnitt, R. D. In Defence of the Electrodermal Response and Cardiac Amplitude as Measures of Deception. <u>Journal of Criminal Law and</u> Criminology (33)(1942): 266-275.

- McLaughlin, G. H. The Lie Detector as an Aid in Arson and Criminal Investigation. <u>Journal of Criminal Law and Criminology</u> (43)(1953): 690-694.
- Reid, J. E. and Inbau, F. E. <u>Truth and Deception</u>, Williams and Wilkins, 1966, Baltimore, Maryland.
- Ruckmick, C. A. The Truth About the Lie Detector. Journal of Applied Psychology (22)(1938): 50-58.
- Shivabassappa, P. The Detection of Lies An Indian Experiment. <u>Inter-</u> national <u>Criminal Police Review</u> (75)(1954): 38-43.
- Smallwood, C. L. "Evidence" Lie Detectors: Discussion and Proposals. Cornell Law Quarterly (29)(1934): 535-545.
- Summers, W. G. Guilt Distinguished from Complicity. <u>Psychology</u> <u>Bulletin</u> (33)(1936): 787.
- Trovillo, P. V. A History of Lie Detection. <u>Journal of Criminal Law</u>, <u>and Criminology</u> (29)(1939): 848-881 (Part I) and (30)(1939): 104-119 (Part II).
- Winter, J. E. Comparison of the Cardio-Pneumo Psychograph and Association Methods in the Detection of Lying in Cases of Theft Among College Students. Journal of Applied Psychology (20)(1936): 243-248.
- Wolfle, D. The Lie Detector: Methods for the Detection of Deception. Memorandum Prepared for the Emergency Committee on Psychology of the National Research Council, October 1941.

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By

John G. Linehan

In 1978 Lynda Carter, star of the television series "The New Adventures of Womder Woman" was named the "most beautiful woman in the world" by the International Academy of Beauty at London, England. Wonder Woman, in her mild-mannered American disguise as Diana Prince, was created as a comic book character at the outset of America's entry into World War II in the fertile imagination of Charles Moulton. If this seems to be a surprising manner to begin an article regarding polygraph then it may be even more surprising that Charles Moulton was the pen name of the lie detector pioneer, Dr. William Moulton Marston, psychologist, lawyer, lecturer, businessman, and author.

Dr. Marston, discovered of the systolic blood pressure deception test and author of "The Lie Detector Test" published in 1938, was born at Cliftondale, Massachusetts, May 9, 1893 and died, May 2, 1947. During his prolific 54 years of life he was the author of many books and contributed to a number of scientific journals. To the polygraphist he may be best remembered for his prominent role in the 1923 <u>Frye v. United States</u> decision wherein his systolic blood pressure deception test administered to Frye resulted in his opinion that Frye was innocent of the murder charge, but the test was ruled inadmissible by the court and federal reviewing court. The ruling of the court that the test did not have "general acceptance" and the ensuing stare decisis has been the biggest obstacle in attempts to gain court acceptance of the polygraph. (It may be noted that Frye was convicted and given a life sentence; however, he was released three years later when another man admitted the crime).

Dr. Marston used the discontinuous method in obtaining the systolic blood pressure of the examinee. He said an expert in his method should average five systolic blood pressure readings per minute; and the diastolic reading should not be undertaken. The systolic bp readings were then plotted on graph paper to form a blood pressure curve. The principle of test is that the blood pressure rises when the examinee is deceptive, <u>i.e.</u>, if the examinee lies to a question that poses a sufficient threat to his well-being the blood pressure record may show a sharp drop with subsequent greater rise in the blood pressure. Dr. Marston noted there are other emotional factors that can appear on the record but are interpretable to the expert in his method.

Dr. Marston also experimented with and used plethysmograph continuous blood pressure readings, psycho-galvanometer, Jung reaction - time test, Moore's shifty eye test, and the dynamometer grip test, among others. Although recognizing that the continuous blood pressure method and the instruments devised and in modern use by police and commercial examiners are best adapted for the question with a brief answer time - limited test, Dr. Marston felt that for his purposes, the dis-continuous blood pressure method was best. Instead of the brief question and answer type test, he

preferred a narrative, by the examinee with prompting questions to assist the narration, and to confine the subject to the scope of the matter in question. Too, he believed the cuff discomfort of the continuous method distorted the polygrams and reduced accuracy. He rated his dis-continuous blood pressure method to be 97% accurate. He rated a validity of 73% to his experiments using the pneumograph alone.

Dr. Marston wrote in his book Lie Detector Test that following the 1923 Frye \underline{v} . United States that his Marston Test was admitted in 1924 in the Indianapolis City Court in an assault and battery case. He wrote, "Two men and a woman were charged with battering each other in a drunken brawl. My assistant, Edward F. New, an Indianapolis attorney, made tests on two defendants while they testified. The woman claimed she had not been drinking, which the test showed was a lie. The man who took the test also lied at various points in his testimony. The Judge considered the Lie Detector findings along with other evidence and rendered judgement in accord with deception tests results. The third defendant in the Indianapolis case refused to submit to a deception test. He was found guilty, an outcome which could not have been worse, and might have been better for him had he taken the test."

In an attempt to find more information concerning this possible first admission of a lie detector test evidence into court, this writer contacted Mr. Edward F. New, prominent Indianapolis attorney and former Hamilton County Circuit Court Judge. Mr. New informed me that his father, Edward F. New, Sr., is alive and well, retired at 84 years of age and living in Florida where he is an active bowler in six bowling leagues. A letter to Mr. New, Sr., resulted in the reply set forth:

Thanks for your letter of 2/9/78. Let me give you from memory the Municipal Court misdemeanor case in which a polygraph test was admitted in evidence, the late Lloyd D. Claycombe, sitting as judge pro tem. If the late William Moulton Marston is correct in his date (Feb. 1924), you can find a report in the late evening edition of the Indianapolis News - front page - with pictures of the accused and me side by side. Note the joke: My name is under HIS picture and his name is under my picture.

I was eating lunch with Claycombe, rather by chance, at the Columbia Club. He was stumped in a case at hand as to the truth or falsity of defendant's testimony. I told him I could determine that question for him with the defendant's consent. It was agreed and we did. My specialty was the Marston systolic-blood-pressure test, using an ordinary doctor's sphygmomanometer and a bracelet stethoscope with the ear plugs in both ears - while defendant testified under oath on the witness stand. I used a letterhead sized sheet of graph paper, prepared so as to calibrate readings of subject's highest (systolic) pressure registered as we went along -I recording from left to right as the witness testified.

First, we take what is called a "norm-plus" reading - before any evidence in the case is taken, in order to see what the "normal" pressure is "plus" excitement of being quizzed. During

testimony, the reporter correlates my readings with the testimony in this way: When she hears me let the air out of my sphyg. after a reading, she makes a pssh! between witness' words at that time. My ears are plugged so I can't hear what is said and I don't know or care what the questions and answers are. I concentrate on one thing only! In the "norm-plus" reading, I ask the witness in a low, kindly voice, his name, address, married, children - what he does for a livelihood - just a few easy, innocent questions while I am catching his normal blood pressure under the surrounding environment. This gives me a "base" of operation. Generally, any rise of pressure ABOVE the norm-plus may be significant. A sustained rise is tell-tale. If we have a record of a typical liar, the "relief" at the end is everything - the clincher. When you tell a liar, "this is all - you're excused", his pressure goes down like letting air out of a tire! After the evidence and a chance to examine the record, I am sworn in and qualified as an "expert" in such matters, questioned and cross-examined on my opinion as to the veracity of the subject's testimony.

In re Adolphus Frye case: On appeal, it was held the expert testimony was inadmissible because there had not been sufficient research done to establish polygraph tests as an established science. Dictum was that until it could be conclusively shown to be advanced to where fingerprints stood, courts could not recognize experts as witnesses. (1) How did the court know how much research had been done without permitting an expert to testify? (2) I, myself, had over a thousand case records in my book, Deception Tests for Bench and Bar. (3) Comparing polygraph tests with fingerprints studies is fallacious. Why not make an anology to hand-writing expert testimony? See Wigmore, John. - Evidence. I conferred with him at the University of Chicago. His idea was to have a huge clock face in the courtroom in a position where the jury could see the readings as they were made - recorded electronically as the witness testified. At that time he thought it was a matter of fact for the jury to decide rather than a question of law for the judges to waste their time on - as an abstract puzzle! I should note that Wigmore didn't put much research time in on the subject when he finished his unabridged version on Evidence.

In my book, which never got off the ground, I outlined and explained about detailed techniques of all the known methods of testing deception - except truth serum and hypnotic anesthesia used to induce the subject to talk freely. I explained and illustrated with records: (1) The ancient "Association-Reaction-Time" Test. (2) The age-old "Retine" method. (3) The "Benussi Breathing" dram. (4) Marston's "Systolic-Blood-Press" way. Deception tests were born 30 years too soon. I can illustrate with a true story. In Indianapolis about 1924 I went to the Chief of Police who had been a practicing attorney before he was appointed Chief. I offered to train free, 5 policemen how to operate the known and proven methods of deception tests. What I intended to do was copy what the Berkley, California Police Department had been doing.

The well publicized theft case in Berkley had been told - how out of 22 suspects the detector picked the guilty one, who confessed, property recovered, case closed. Well, my friend the Chief didn't seem to understand what I was talking about. Nothing happened. He seemed to think I was trying to sell something. He may have been expecting me to offer him a bribe! The reason I say this in retrospect: He later went to the Pen, NOT for TAKING bribes but for failure to pay taxes on the bribes he did take! This Chief served his time, came back to Indianapolis started a saloon, gambling house, rack-track connections, call girl racket - the whole works. To my knowledge he was never raided by the police. We can assume he paid his taxes.

Earlier, I used to go around to local Bar Association meetings, County Medical Societies and sometimes joint meetings of the two. I would lecture on the Psycho-Physiology of the lie detector and explain how it works. The feature attraction at such meetings would be a Demonstration - pick a liar out of the crowd! I would have the members select two of their best liars as tailless guinea pigs. One of these two would "steal" a twenty-dollar bill belonging to me. If he could lie his way out of it he could heep the money (really). My job was to pick the guilty one and thus save face and get my money back. We would have the audience vote on which one they thought was guilty. What I was after was another simulated record. Sometimes the innocent one would get cute and try to make believe HE was the one who got the money - that way we had TWO deceivers between which to choose. No problem.

An experienced judge will tell you he can tell if a witness is lying and if he is honest he will also tell you he doesn't know just how he does it. Well, I can tell him how he does it! Picture in your mind's eye the view of a courtroom - you facing the bench - any courtroom. You see a witness chair down to the left of where the judge sits. The judge sees a profile view of the witness. He uses the old-time "Retina" method and doesn't even realize it!

As an afterthought, I might tell you I visited many penitentaries in my pioneer days with the polygraph. Picture the inmate who has claimed at all times that he is innocent. He was convicted on circumstantial evidence. Precarious eh? So that bug got to me and I spent a great deal of time in the best "Pens" around - got so I felt right at home with inmates! There must be some built-in psychology that makes us always want to root for the underdog. Damon Runyon said: "The race does not always go the swift, nor the battle to the strong, but that's the way to place your best!!"

> Respectfully Submitted, Edward F. New, LL.D.

On March 7, 1978, Dr. New forwarded the letter set forth:

MEN DETECT LIES BY READING YOUR EYES Prov. 6:13

Take care, my friend, how you use your tongue; Let it speak only truth - not lies. If lies you must try, you'll never get by, Deceit will show up in your eyes.

Professor Roger E. Bennett, Ohio University, Athens, Ohio, has done research on a lie and the tattletale eye, (my own label). He proved that in lying man "winketh with his eyes," much as indicated in Proverbs 6:13. Better stated, he has found a relationship between eye behaviour and untruthfulness; has been able to show split-second facial expression which I think he calls "micromomentaries" occuring as and when a person tells a lie. Bennett concedes that a psychopathic liar can beat the polygraph. "But" he says "he can't beat this." A videotape recorder photographs these bizarre, telltale signs. They are characterized by "rapid eye movements" simultaneously when false statements are made. Fluctuations last only one-sixteenth fraction of a second twelve times faster than the normal blinking of the eye!

The above mentioned may not have anything to do with the "Retina Test", altho it could be the same thing refined. No sophisticated cameras or gadgets are needed in using the Retina Test - just the naked eye. The naked eye looks at an angle of about 90 degrees or a profile view. I used to call it a glint a tiny, quick, bright flash of the light, darting obliquely from the liar's eye. While I was taking a blood pressure at subject's side, I had a reserved seat, close-up view of his eye behaviour and I usually made use of it.

AFTERTHOT:

Men detect lies by reading the eyes; God judges sin by reading the heart! Therefore, my friend, if falsehood you'd try, Remember the Commandment: Obey and be smart! Exodus 20.

Dr. Edward F. New

Dr. William Moulton Marston and Dr. Edward F. New truly pioneered in methods of lie detection, particularly with the blood-vascular system. It can only be speculation as to the status of polygraph today if Judge McCoy, presiding in the 1923 James Alphonzo Frye murder trial, had ruled the Marston Deception Test admissible. On the other hand, the efforts of the American Polygraph Association to constantly up-grade and maintain qualifications of polygraphists is justifiably enhanced by a <u>New York</u> <u>Times</u> editorial page item of December 1, 1938, almost 40 years ago, which cites the discerning author G. K. Chesterton in his writing about his fictional characters, Father Brown, and his detective protege, Flambeau. This <u>New York Times</u> item states: "When a judge of the Court of Appeals at Albany cites a precedent he usually does not go to source like the Father Brown Stories. Nevertheless, the court might well have done so when it refused to give standing to the lie detector as an instrument for securing legal evidence. Judge O'Brien ruled that the new machine has not won sufficient scientific recognition to be put on a par with fingerprinting, handwriting and ballistics.

Twenty-five years ago, in "The Mistake of the Machine", our old friend Flambeau was telling his good friend Father Brown about a newly invented pulsometer in the United States. It is tied to a man's wrist and registers his heart action in response to certain words. Father Brown's replies that the idea was tried out twenty years earlier still in Chicago; with results which may be summed up in a single paragraph from the original text:

"Why, look here, Mr. Usher, " said Father Brown quietly, "you said the machine couldn't make a mistake; and in one sense it didn't. But the other machine did; the machine that worked it. You assumed that the man in rags jumped at the name Lord Falconroy because he was Lord Falconroy's murderer. He jumped at the name Lord Falconroy because he is Lord Falconroy.

* * * * * *

Robert A. Hicks, Elizabeth A. Evans, Robert S. Martin & John D. Moore

In a recent and comprehensive review, Janisse (1976) considered the literature which was relevant to the relationship between pupil size and anxiety. He concluded that "... ample evidence is reported associating pupillary dilation with state anxiety; however, differences in pupil size reflecting various levels of trait anxiety have not been consistently reported." (p. 42). Of the studies cited by Janisse only two (i.e., Arima and Wilson, 1972, and Simpson & Molloy, 1971) used tests that were clearly measures of trait anxiety in attempting to demonstrate a relationship between pupil size and anxiety defined by a score on a self-report anxiety test.

Arima and Wilson reported no significant main effect between their high and low anxious groups in pupil size recorded while these subjects responded to the Stroop Color-Word Test. [Here it should be noted that they did find a significant Groups X Blocks X Lists interaction but felt that additional research was needed to explicate this result].

The obvious interpretation of Arima and Wilson's results is that these data question the existence of a relationship between trait. anxiety and pupil size. However, these results could also be interpreted as a failure of Arima and Wilson's trait anxiety manipulation. To elaborate these investigators formed extreme anxiety groups by selecting the five highest and the five lowest scores on the Taylor Manifest Anxiety Scale (TMAS) from a group of 30 graduate students at the Naval Postgraduate School who had served as subjects for this experiment. One could argue that the experienced Naval officers who are selected for enrollment in this school constitute a population that is positively skewed with respect to trait anxiety. Further, the likelihood of selected clear extremes in trait anxiety from any group of 30 students is somewhat remote. Finally, the validity of the TMAS as a measure of trait anxiety is open to question in that Khan (1970) and others (e.g., Hicks, Ostle, Notz, & Pellegrini, 1977) have shown that factor analysis of the items of the TMAS suggest a complex factor structure and certain of these factors cannot be readily interpreted as reflecting trait anxiety. Thus, Arima and Wilson's data may not constitute an adequate test of a trait anxietypupil size relationship.

Paper presented in W. S. Peavler (Chair) Pupillary Reaction as a Psychological Response System. Symposium presented at the meeting of the American Psychological Association, San Francisco, August, 1977. Authors are in the Psychology Department at San Jose State University, San Jose, California.

In their study, Simpson and Molloy (1971) found clear evidence for a trait anxiety-pupil size relationship. They reasoned that this relationship could best be demonstrated using a situation-specific measure of trait anxiety. They used a measure of audience anxiety [<u>i.e.</u>, The Audience Sensitivity Inventory] on the assumption that this test measured anxiety which would be activated in any situation which involved being evaluated by another while making a public and overt response. To form their groups they first pretested 320 students and then using these scores selected seven high scoring and seven low scoring persons to act as subjects in their experiment. They found, as they had predicted, that compared to the low anxiety group, the high anxious subjects showed significantly greater pupillary dilations throughout the performance of the experimental task.

In attempting to reconcile the difference between these two studies, we speculated that perhaps the relationship between pupil size and trait anxiety could best be demonstrated using measures of situation-specific trait anxiety. To test this hypothesis we measured the relationship between test anxiety, <u>i.e.</u>, a situation-specific trait anxiety, and pupil size.

Recent speculation as the dynamics of how test performance is effected by differential degrees of test anxiety led us to believe that test anxiety was ideally suited for our purpose. Specifically Mandler (1975), Sarason (1975), Spielberger and his colleagues (Spielberger, Anton & Bedell, 1976) and Wine (1971) have all made the point that the high test anxious individual tends to divide his attention between two sets of cues while taking a test. That is these individuals pay attention to both task relevant cues associated with the test and internally arising self-relevant cues, such as worry, that are irrelevant to the performance of the test. In contrast the low test anxious person is only attentive to task relevant cues.

In an important discussion of the relationship between attention and the pupillary response, Kahneman (1973) has suggested that the concept of mental effort be substituted for the term attention. In this book, he makes a strong case for the fact that mental effort and pupillary size are directly related. Thus using Kahneman's terminology one could speculate that high test anxious individuals expend greater levels of mental effort during the performance of a test than low test anxious individuals and these differences in mental effort should be reflected in predictable differences in pupil size. Specifically we predicted that as compared to low test anxious subjects, our high test anxious group would show greater pupillary dilation while answering questions and during the interquestion intervals.

METHOD

Subjects

First we pretested more than 600 college students using five measures of anxiety, <u>i.e.</u>, The Test Anxiety Scale (TAS) (Sarason & Ganzer, 1962), The Debilitating (AAT-) and Facilitating (AAT+) Anxiety Scales (Alpert & Haber, 1960), The Death Anxiety Scale (Templar, 1970), and a unidimensional short form of the TMAS (Hicks <u>et al.</u>, 1977). We selected as potential subjects only those individuals who met these criteria, first they had scored in either the top or bottom decile on both the TAS and the AAT- and second, to eliminate generally anxious individuals, they did not show high scores on any of the other anxiety tests. We then rank-ordered the suitable individuals and selected as subjects the five highest ($M = 21.6 \pm .55$ on the TAS and AAT- combined) and the five lowest ($M = 2.0 \pm 1.0$ on the TAS and AAT- combined) individuals who were willing to volunteer.

Procedure

We recorded the pupillary responses of our subjects using a TV pupillometer while they were taking the Information subtest of the WAIS. In recruiting our subjects, we had told them that we wanted to monitor their eye movements while they took an IQ test. We felt that the WAIS Information subtest best exemplifies the population's conceptualization of such tests. Subsequent to the administration of this test we gave additional WAIS subtests to make our story plausible should our subjects communicate with each other. [The pupillary responses to these tasks were not scored for this report]. Finally, the pupillary data were scored by persons who were naive to the conditions of the experiment.

RESULTS AND DISCUSSION

The means and standard deviations for the major pupillary response parameters are given in Table 1.

TABLE 1

Means and standard deviations for High and Low Test Anxious subjects on three pupillary parameters taken while responding to the WAIS Information Subtest

	High Anxious	Low Anxious
Duration Peak [Question] Peak [IQI]	9.4 <u>+</u> 7.3 sec. 1.69 <u>+</u> 1.03 mm. 1.27 <u>+</u> .99 mm.	6.7 <u>+</u> 2.9 sec. .47 <u>+</u> .49 mm. .12 <u>+</u> .47 mm.

Notice that for each of these measures the mean for the high test anxious group is greater than the mean of the low test anxious group. The differences between the test anxiety groups on each parameter is significant (i.e., for duration t = 3.54, $p \le .01$ with df = 215; for peak dilation during responding t = 3.86, $p \le .01$ with df = 216; and

for peak dilation during the interquestion interval $\underline{t} = 10.56$, $p \lt .01$ with df = 209). We did not plot any pupillary change curves overtime because in using the Information subtest of the WAIS duration of responding (as can be seen in Table 1) was allowed to vary.

Clearly the results given in Table 1 support our predictions. That is the high test anxious group showed greater pupillary dilation both while responding to the questions and during the interquestion interval. Further, given the limits of our sample size, the differences between these groups appear to be restricted to the aforementioned periods. That is an inspection of the data revealed no differences in resting level prior to the start of the questionning, during the inter task rest periods or after the entire series of WAIS subjects had been administered. To use Kahneman's terminology, high test anxious individuals appear to expend greater mental effort during the actual performance of the test. Thus these results are congruent with the notion that Wine (1971) and others (e.g., Mandler, 1975; Sarason, 1975; Spielberger et al., 1976) have advanced that the high test anxious individual is, during testing, attentive to both task relevant cues and self relevant cues, while the low test anxious person is attentive only to task relevant cues. Of interest is this regard is the fact that the most pronounced difference in pupil size between our two groups occurred during the interquestion interval. Inspection of these data suggest that in addition to greater maximum dilations, the high anxious group seemed to show a different pattern of response. That is these subjects showed a sustained high level of pupillary dilation while the low test anxious group generally seemed to return to baseline or showed a pupillary constriction after responding. [However, these "trends" are highly tentative and require verification.] Together the interquestion interval data suggest to us that perhaps high test anxious individuals tend to perseverate on a question after responding to it and thus create for themselves, a proactive interference effect which is disruptive to subsequent performance. Future research should check for this possibility.

When our results are considered together with those of Simpson and Molloy's (1971), there is support for the speculation that there is a positive correlation between pupil size and scores on situation specific measures of trait anxiety. Certainly two positive findings are not sufficient to establish the validity of this hypothesis, however, these results do indicate a clear direction that future anxiety-pupil size research might take. With regard to this relationship we noted in our data an observation that may be of importance to pupillometric theory. There has been speculation (Janisse, 1976) as to whether high anxiety should be associated with pupillary dilation or constriction. In examining our data, we found that low test anxious group constricted during a significantly (i.e., t = 2.58, p < .05 with df = 9) greater number of questions $(M = 12.4 \pm 5.6)$ than did the high stress anxious group $(M = 12.4 \pm 5.6)$ 4.0 = 4.7). These constrictions occurred most frequently after incorrect responses. While this is not a unique observation (see e.g., Simpson & Molloy, 1971) it does constitute a response pattern that is not readily explained by the Bidirectional Hypothesis and thus should be investigated further.

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Finally these data suggest that with further study, pupillometry may prove to be an effective adjunct to the treatment of test anxiety, in that it may be the case that pupil size can be used as an involuntary measure of the effectiveness of treatment.

References

- Albert, R., & Haber, R. N. Anxiety in academic achievement situation. Journal of Abnormal and Social Psychology, 1960, 61, 207-215.
- Arima, J. K. & Wilson, G. E. Situational stress, anxiety, and the pupillary response. <u>Proceedings of the 80th Annual Convention of</u> the <u>American Psychological Association</u>, 1972, 7, 269-270.

Hicks, R. A., Ostle, J. R., Notz, J. R. & Pellegrini, R. J. A unidimensional short form of the TMAS. <u>Journal of Personality Assessment</u>, 1977. In Press.

Janisse, M. P. The relationship between pupil size and anxiety: A review. In I. G. Sarason & C. D. Spielberger [Eds.] <u>Stress</u> and <u>Anxiety</u>, Vol. 3. Washington, D. C.: Hemisphere, 1976, 27-48.

Kahneman, D. Attention and effort. New York: Prentice-Hall, 1973.

- Khan, S.B. Dimensions of manifest anxiety and their relationship to college achievement. <u>Journal of Consulting and Clinical Psychology</u>, 1970, 35, 223-228.
- Mandler, G. Mind and Emotion. New York: Wiley, 1975.
- Sarason, I. G. Test anxiety, attention and the general problem of anxiety. In C. D. Spielberger & I. G. Sarason [Eds.] <u>Stress</u> and <u>Anxiety</u>, Vol. 1. Washington, D. C.: Hemisphere, 1975, 165-187.
- Sarason, I. G. & Ganzer, V. J. Anxiety, reinforcement and experimental instructions in a free verbal situation. <u>Journal of Abnormal and</u> <u>Social Psychology</u>, 1962, 65, 300-307.
- Simpson, H. M. & Molloy, F. M. Effects of audience anxiety on pupil size. <u>Psychophysiology</u>, 1971, 8, 491-496.
- Spielberger, C. D., Anton, W. D. & Bedell, J. The nature and treatment of test anxiety. In M. Zuckerman & C. D. Spielberger [Eds.] Emotions and Anxiety New Concepts, Methods, and Applications. Hillsdale, N.J.: Erlbaum, 1976, 317-345.
- Templer, D. I. The construction and validation of a death anxiety scale. Journal of General Psychology, 1970, 82, 165-177.
- Wine, J. Test anxiety and direction of attention. <u>Psychological</u> <u>Bulletin</u>, 1971, 76, 92-104.

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LOUISIANA MAY USE POLYGRAPH EVIDENCE IN NON-JURY TRIALS, TEXT OF OPINION

State v. Catanese, First District Court, Caddo Parish, Louisiana, No. 102, 951-A (1978).

OPINION ON MOTION

Our task here is to rule on the defense Motion to allow the defense to attempt to introduce in evidence the results of a polygraph examination administered to the defendant. The issue is not whether this particular test will be allowed.

It will be recalled that our jurisprudence flatly precludes the use of a polygraph result in evidence. Therefore, any party attempting to introduce a polygraph result will meet an insurmountable objection. The purpose of the Motion upon which this hearing is had is to determine if the defense can show the method to be so significantly reliable and valid as to overcome the anticipated objection. To do so would not automatically admit the result in this case but would then allow mover to proceed to lay a foundation for the admissibility of that result.

In our following discussion, the term reliability deals with whether competent examiners will be likely to agree on the result of the same test. Validity deals with whether the agreed result is actually true.

We have had the privilege of hearing two well qualified witnesses for the defense, Mr. Raymond Weir and Mr. Walter Atwood, who have had extensive experience with the device. We are well satisfied with the reliability of the polygraph. Defense Exhibit 8, along with the testimony of these witnesses, clearly shows that there is substantial agreement among competent polygraph operators on any one examination.

The difficulty, it seems to us, (not withstanding the Louisiana jurisprudence, particularly <u>State v.</u> <u>Corbin</u>, 285 So 2d, 1973 and its concern relative to the invasion of the province of the jury) is validity. These two witnesses, both of whom have been intimately involved with the security of our country and who impressed us considerably, are well convinced of the validity of the method. But as Mr. Weir pointed out, it is virtually impossible to demonstrate the validity of the polygraph under test conditions. The essence of the polygraph is that there be not only a meaningful area of inquiry, but that the inquiry pose some threat to the subject's well-being. This is the main criticism of the "set-up" tests, such as where the party to be examined both steals, and then lies, on cue. Such tests pose no threat to the well being of the examined.

However, it is clear from the testimony of the defendant's experts that these control tests, even when the subject is not threatened, are significantly valid, but perhaps not of a level to be accepted in court. Considering the underlying assumptions of the device (to be discussed shortly), it logically follows that the result of a threatening test (which might mean the defendant's incarceration) can only be even more valid. To prove the polygraph valid beyond all doubt, it is necessary to take actual subjects who are under the stress of some threatening situation and somehow to determine whether the result found by the polygraph operator is truth. The evaluation of the validity of that result, whether by attorneys of law analyzing case files, by investigators checking the story of the examined, or by juries trying the facts involved, is unfortunately only possible by subjective analysis. Obviously, the evaluation of any result found by the polygraph is also subjective. However, this evaluation has the added advantage of interpreting the objective findings the device renders, which findings have a significant scientific basis.

The polygraph is designed to record responses (at least three or more) of the autonomic nervous system. There are five principle assumptions involved. They are:

- 1. That this autonomic system is not normally under the control of the subject;
- 2. That if there is a degree of control, such is difficult in the examination environment;
- 3. If attempts to control the autonomic system are used, it should be obvious to the examiner, either by observation or analysis;
- 4. The autonomic nervous system is triggered by a threat to the well being of the examined; and
- 5. An examination concerning a meaningful subject is expected to trigger the autonomic system.

Considering the previously discussed difficulty of objectively evaluating polygraph results, the only other method of resolving the validity of polygraph is to determine whether the five assumptions just mentioned are correct. We are convinced by the testimony of Mr. Weir and Mr. Atwood, as well as Dr. Philip Jobe, Ph.D., Associate Professor of Pharmacology at LSU-S Medical School, that these assumptions are sufficiently valid for the polygraph to have probative value in a court of law.

Mr. Weir and Mr. Atwood both state that the polygraph examination is at least as valuable and as certain as fingerprint examination. While our experience would not cause us to completely agree, we have, likewise, been concerned both as a prosecutor and as a jurist with what seemed to us to be a subjective match, usually when dealing with prints having points of comparison in the 8-10 range, particularly where the print is a partial, or is smudged. We believe that a polygraph result in the hands of a competent examiner is as valid as many of the court accepted forensic results but not as valid as others. Surely handwriting comparison is as subjective, if not more so, than the polygraph. With respect to medical evaluations (usually received in civil cases) resulting from EEGs, EKGs, and myelograms, we are convinced the polygraph is comparatively more valid. The search for the truth is the whole purpose of the justice system, criminal or civil. The difficulty in locating this great clear light is, in our judgement, at the heart of most of the difficulties currently suffered by the justice system. On almost any given date in our court we will have two witnesses testifying to opposite facts. A competent polygraph examination should materially aid a judge in determining what is true. It is not perfect, but it is excellent. It is shown to be 95% reliable (D-8). In our judgment, from all the evidence, it is substantially as valid. Though perhaps no jurist is capable of accurately assigning a percentage equivalent to the concept of "proof beyond a reasonable doubt", surely this is in the vicinity of the range we expect.

We are mindful of the testimony of Dr. Marouner and Dr. L'Herisson offered by the State. Both of these doctors are competent psychiatrists and have rendered excellent assistance to this Court previously. Both, however, willingly indicated a lack of experience with the device, and neither seemed to have current experience with testing of the autonomic system except for Dr. L'Herisson's knowledge of the use of bio-feedback in treating certain patients.

We note that Dr. L'Herisson and Dr. Mauroner had differences of opinion on the usefulness of the polygraph. Dr. L'Herisson thought it a useful tool and recognized a significant scientific basis for that usefulness. Dr. Mauroner did not. These two psychiatrists were concerned with the testing of persons having amnesia, personality disorders, retardation, drug use, temporal lobe epilepsy, isolation of effect, as well as persons who are pathological liars or who have learned antisocial behavior (i.e., the individual who believes that it is no crime to steal from his employer because his pay is insufficient).

These areas of psychiatric concern are all dealt with satisfactorily, in our judgment, by Mr. Weir and Dr. Jobe. Their testimony, as well as cross-examination of the psychiatrists, has convinced us that almost all, if not all, of the problems are recognizable during a competent pre-test interview or at the failure of the testee to respond to control questions, giving either an aborted or invalid test by definition. Contrasting the experience with the autonomic nervous system of the highly qualified Dr. Jobe with the testimony of the psychiatrists convinces us that persons who are psychotic, have temporal lobe epilepsy, amnesia, or isolation of effect should reflect same at a proper pre-test interview. We believe persons under acute drug influence will likely be noted also at the interview. If not, they should give a flat response to control questions, as will the significantly retarded, and an individual who has learned responses by way of bio-feedback or hypnosis. The testimony further indicates that the psychopathic liar or the individual who has learned antisocial behavior will be caught by the control question or will respond to the stress of potential incarceration which could result from test failure.

Obviously there are a number of sophisticated areas covered briefly in this discussion, and we can foresee that there may be certain circumstances where a false response might be passed by an examiner. From the testimony we have heard, only Dr. L'Harisson's references to temporal lobe epilepsy and isolation of effect (and then only in the rare instances of each where there are no other symptoms) cause us real concern. The evidence indicates such circumstances should be quite rare.

As we shall discuss subsequently, we believe proper standards for the admissibility of the polygraph will severely limit such circumstances to an insignificant level overall. Also, requiring the testee to be available for psychiatric evaluation at the motion of the other side after the mover has shown by <u>sufficient</u> foundation that there is psychiatric or mental abnormality or unusual mental control in the testee would be a means to limit even further the potential for a witness's abnormal ability or mental condition to render an invalid result.

While we are interested in Dr. L'Harisson's concern about potential false positives as a result of the experience of one of his patients, we are unwilling to generalize as a result of that incident. We believe that there are other potential explanations for the conduct of that patient. The testimony of Messrs. Weir and Atwood has convinced us that a proper test, if it should err, will do so in favor of the testee.

We believe a jurist, having in mind the strengths and limitations of the device, can compare the result of such a test to the other evidence in the case, keeping in mind the quality of the examiner and the test, and be materially aided in his search for the truth. Therefore, we are well satisfied that a polygraph examination in the hands of a competent examiner is sufficiently valid to be of probative value in a court of law.

Our finding raises several questions, some or all of which we recognize are not necessarily germane to this inquiry. The first is whether a polygraph result should be allowed in a jury trial or only before a judge alone. Many jurisdictions, including our own, have held the allowance of a polygraph result invades the province of the jury is that it allows someone other than the jury to determine the final question at issue. The feeling is that the "metal box" has such a mystique that a jury would be stampeded by the mere fact of its use and would not have sufficient sophistication to understand the uses and limitations of the device. We have a great faith in the jury system, and we believe that competent counsel could be relied upon to educate a jury as to the uses and limitations of the polygraph. We wonder if the use of the polygraph is any more of an invasion of the function of the jury than the use of fingerprints or other scientific evidence. However, we do admit to concern during the early stages of the use of the device in evidence. We are mindful of State v. Corbin infra as well as the recent pronouncement in State v. Governor, 331 So. 2d 443 (1976). This jurisdiction is to the effect that there is the probability that the current mystique surrounding the device will create prejudicial results before a jury. We, therefore, only feel comfortable currently accepting a polygraph result in a "judge only" trial, such as the case at bar.

The next question is whether the test should be allowed only upon joint stipulation of counsel. Apparently a few jurisdictions allow the use of the polygraph under these circumstances. We see no logical basis for such a holding. If the polygraph is valid and probative, then
allowing its use only when there is advance agreement by stipulation between the state and the defense prior to the test is illogical.

The allowance of the test before a judge alone, a position with which we are not entirely comfortable as previously indicated, works to the disadvantage of the state. Obviously where the state has a previous test in its favor and the defendant does not waive the jury, the state will not be able to introduce that test. On the other hand, if the defendant has a favorable test, it may induce him to waive a trial by jury, a practical result which also causes some discomfort.

Also, would a defendant have to take the stand for his test to be offered by the state? Obviously, the problem is not within the scope of this inquiry, and cannot be treated here. But we believe the state of the jurisprudence with respect to statements of defendants offers sufficient guidance.

A greater problem from a practical standpoint may occur where one side or the other wants to offer a test corroborating one or more witnesses, including the defendant. There is some basic statutory law in the jurisdiction with respect thereto (R.S. 15:484 et seq). But we can envision the probably necessity for legislature elaboration if this decision is upheld.

We must state that we make this decision with some trepidation in the light of the previous Louisiana jurisprudence with respect to the polygraph. Considering this uniform jurisprudence we wonder if our result is not impertinent. We are buttressed in our holding by the manner in which this cause reached us.

We are reminded that we originally authorized the hearing during the summer term simply to allow the defendant to "make a record". We felt, considering language in recent cases, that the Supreme Court might want to re-examine its position in this area. When this matter came on for hearing, another judge of the court overruled us (properly so in the light of the jurisprudence ... and a situation we had advised defendant's counsel to anticipate). But upon the taking of writs, the Supreme Court accepted same and then ordered this hearing. Absent these circumstances, we would have felt obligated, irrespective of our personal opinion of the evidence here, to allow the defendant to make his record and to overrule the use of the polygraph. However, considering the posture of the cause, we believe we should respond candidly to the evidence. We have obviously so done.

While our hearing in this cause has convinced us of the validity of the polygraph, we are also satisfied from the testimony that the results of such an examination should be admitted only after considerable care.

We, therefore, establish the following eleven points as necessary prerequisites for a sufficient foundation to allow the result of the polygraph examination in this case into evidence:

- 1. <u>A competent examiner</u>. Obviously, this is the heart of the examination. We believe the examiner should be trained to use and analyze the results of a polygraph; that he be current in the field; that he have a baccalaurate degree or the judge be satisfied that he has equivalent experience and literacy, a working knowledge of psychology; at least two years experience in administering tests with the device, the ability to recognize a defective machine, and furthermore, that his integrity be above reproach. While we would exercise extreme care in this area, surely these standards are no more than we would want from an expert in any field.
- 2. A calibrated machine.
- 3. <u>A subject relaxed to the extent that the test is valid</u>. Unfortunately this phrase seems to fall back upon itself for a definition. We must simply be convinced that the subject was sufficiently still and relaxed under the stress of the examination to allow definitive reactions.
- 4. A competent pre-test interview. Emphasis must be on the individual's current medical circumstances to include the psychiatric with no real problems indicated as well as a full explanation of the machine, its functions, and a review of the questions to be asked.
- 5. <u>A meaningful area of inquiry involved</u>. The subject matter must be significant to the person examined.
- 6. <u>One question, at least, that threatens the well-being of</u> <u>the subject</u> and precludes the rationalization of the answer. The questions going to the heart of the matter must be worded in such a way as to eliminate possible rationalization by the subject.
- 7. At least one control question in the technique. A question establishing a significant reaction level.
- 8. Short Answers (preferably "yes" or "no").
- 9. A low-key, quiet approach by the examiner throughout.
- 10. At least two charts with proper labeling and responses to include technical notations as to machine settings, devices used, locations of devices on the subject, identity of the points of question on the chart and point of response. Significant proper attempts to resolve apparent positive responses to meaningful questions are necessary. These responses are to be valid throughout. There can be no unresolved responses to the question such that one question has received a positive reaction on two occasions, but not on two others; or positive on three and negative on two, etc. As the witnesses

explained, where there is an indication of response to a question on the first occasion, then a second chart is essential to be certain that a response to that question is received on the second occasion. If no response is received on the second chart, then the question is asked a third time. If no response is received again, then the question is determined to be without response. If response is received on this occasion, then proper attempts to resolve the response are to be made and the question asked still again. Thus, it must be apparent from the charts that there is no unresolved area of inquiry, such that the number of responses and non-responses to the same question are not of the same general frequency. However, a positive and then two consecutive negatives are considered negative and vice versa.

11. The charts made available to the other side sufficiently in advance of the trial. Obviously, this for analysis by any experts they may wish, who may testify if they can be qualified under Point 1. Also, we would allow the other side to request a psychiatric evaluation of the testee if they can lay a sufficient foundation to indicate the potentiality that the test was influenced by the testee's mental condition or state of mind, either willfully or inadvertently. As previously discussed, we believe there are slim possibilities in this regard, and we would be critical in evaluating a motion to test the subject.

We believe that if these criteria are met before the admission of the polygraph examination, the test will have sufficient probative value and be sufficiently valid to assist us or whoever may be trial judge in this cause in the resolution of the issues. Of course, we have the responsibility to evaluate the test in the same fashion that we would evaluate any other scientific evidence, including the strength of the responses and the competence of the examiner as compared with the other evidence in the case.

We, therefore, sustain the Motion at issue and authorize the defense to attempt to lay a foundation in conformity with the standards herein expressed at the appropriate time in the trial of the case, which trial is to occur before a judge alone as a result of defendant's previous waiver of trial by jury.

FRED C. SEXTON, JR., JUDGE

March 7, 1978.

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BIOFEEDBACK-CONDITIONED GALVANIC SKIN RESPONSE AND HYPNOTIC SUPPRESSION OF AROUSAL: A PILOT STUDY OF THEIR RELATION TO DECEPTION

By

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Since early civilization man has tried to separate reality from fantasy, fact from speculation, and truth from deception. Shakespeare¹ wrote, "Time's glory is to calm contending kings, to unmask falsehood and bring truth to light. ..."

Early efforts combined folklore with superstition. Trial by ordeal rested upon the belief that God would intervene with a sign or miracle to determine the question at issue between two contending parties. This belief is almost universally found in primitive races and is typically tested with an established rite or ritual. Thus one who could carry redhot iron, or plunge his hand into boiling water, or sink when thrown into water was thought to have right on his side.² Later it was also thought that drugs could unlock withheld truths; the most ancient of all drugs used for this purpose was alcohol. The Romans coined a proverb. "In Vino Veritas." Within the past 150 years several drugs have at one time or another been erroneously used and referred to as "truth serums." Hashish, cocaine, mescaline, scopolamine, and amytal were but a few.³ Their use rapidly diminished, in part by their recognized unreliability and in part with the advent of apparatus that measured physiologic responses. It was generally thought then, as it is now, that these measurements when interpreted properly could make a distinction between truth and deception.

In 1895 Lombroso⁴ attempted to judge the veracity of statements made by criminal suspects through the use of the "hydro sphygmograph," a machine which measured blood pressure and pulse changes. Later, in 1914, Benussi⁵ experimented with a pneumatic chest tube to record changes in respiration and concluded he could distinguish when a subject lied by examining the length of inspiration divided by the length of expiration. This finding and Lombroso's much earlier observation were eventually combined into one apparatus in 1921 by an American police officer, John A. Larson⁶. He called the machine a polygraph. By 1926 Leonard Keeler, a

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The views expressed herein are those of the authors and do not reflect the views of the United States Air Force or the Department of Defense.

junior collaborator of Larson, had added galvanic skin response to the Larson machine, which recorded the blood pressure, pulse, and respiration.⁷

During the past 50 years polygraph interrogation has become a burgeoning industry; its use ranges from criminal interrogation to a preemployment screening device. Conservative estimates count several million polygraph examinations yearly by approximately 3000 professional polygraphers.⁸

In view of such widespread use, the consequences of which are typically quite serious, accuracy of this procedure becomes a crucial consideration. It is generally held that lying is accompanied by specific physiologic or behavioral alterations, or both. The most common physiologic alterations measured have been respiration, relative blood pressure, and galvanic skin response. While laymen may refer to the polygraph as a lie detector, it is nonetheless no more than a recording device of psychophysiologic responses. In looking at an examiner's ability to identify physiologic responses via the polygraph, Edel and Jacoby⁹ found a 95% overall agreement among ten experienced examiners who worked independently on 40 polygraph interview cases involving 2530 separate questions. It is an impressive figure but, as the authors point out, identification of the presence or absence of specific physiologic reactions is not equivalent to consistency in interpretation and conclusions.

In addressing the problem of the validity and reliability of the polygraph. Abrams¹⁰, in an extensive review of the literature in 1972. concluded: "The findings of this review indicate that the polygraph approach is a valid and reliable method for detecting deception." In terms of raw figures, comparison of studies are difficult, if not impossible. The variables in experimental design, settings, and operations almost preclude a meaningful comparison. Nonetheless, the literature reflects studies such as that of Summers¹¹, who reported 98 to 99% accuracy in his laboratory work with the polygraph. Reported accuracy in that range is not unusual, and according to Orlansky¹² in a 1962 review, accuracy reporting below 75% is rare. Validity and reliability, despite the optimistic reports of commercial operators, are very much in dispute. The American Civil Liberties Union in a report filed with the Committee on Government Operations (U.S. House of Representatives)13, reviewed polygraph testing in considerable depth. They write, "A number of recent expert studies have concluded that the polygraph has little, if any, scientific validity."

Whatever accuracy a particular polygraph operator might have, we were curious to see if that accuracy could be significantly diminished through training and subsequent modification of the responses measured by the polygraph.

Of the many indicators used to measure autonomic activity, the galvanic skin response (GSR) is thought by many to be one of the most sensitive measurements and is considered superior to other variables 4-18. It is not without its critics, particularly among field personnel, some of whom regard its effectiveness as inadequate 5,19. In the laboratory setting, however, it appeared to be at least as accurate, if not more accurate, than other physiologic sensors; this observation motivated us to work with this indicator.

Experimental Design

Biofeedback is a general term used to describe the feedback of physiological information via some measuring device to a subject. The subject may then use this information as a reinforcer to change a desired feature. One example has been the use of an electromyograph to feedback skeletal muscle tension to a subject who then controls the muscle tension. This electromyographic feedback is useful in treating tension headaches and torticollis and in the rehabilitation of muscles. Recently, biofeedback has expanded to include the training of autonomic or visceral functioning. Authors have reported control of heart rate²⁰, electrodermal activity (GSR)²¹, gastric acid secretion in ulcer patients²², and blood pressure²³. In principle, if a physiological response is directly and efficiently measurable, it is possible to change and control that response.

Visceral learning or training via biofeedback has been described by Shapiro and Schwartz²⁴ as a feedback-operant model. That is, the reinforcer (reward) serves to strengthen the response that follows. This model has three main goals: (1) the development of increased awareness of the relevant internal physiologic functions or events via the measuring device; (2) the establishment of control over those functions or events, and (3) the transfer or generalization of that control from the training site to other areas of the patient's life. Because this model has been used to control GSR we felt it would be possible to teach a subject to control his arousal sufficiently to deceive a polygraph operator and not be detected.

There is substantial evidence in the literature to indicate that hypnosis or hypnotic suggestion can also exercise extensive control over the autonomic nervous system. Deabler et al^{25} conducted a study using relaxation and hypnosis to lower high blood pressure. Vasomotor control, another autonomic function, has been reported numerous times in the literature and shows that hypnotic suggestion can substantially influence blood shunting and hemostasis. Dubin and Shapiro²⁶ demonstrated the use of hypnosis to facilitate dental extraction and hemostasis in a hemophilic patient.

Garver²⁷ has reported several case studies of hypnotic training to control arousal level in increasing human performance and used the following method to train his subjects to control their arousal level hypnotically. An arousal level from one to ten is established for the subject. Zero is set as the lowest possible arousal level, similar to a deeply relaxed state or even a sleep state. The subject is then taken numerically and experimentally through the next mine arousal levels, experiencing the sensations and experiences associated with each level. Once the subject under hypnosis is able to associate the arousal state with the appropriate numerical designator and is able to control his arousal levels, the next step is to use the posthypnotic suggestion that the subject will be able to recognize, as most of us can, where he is on the arousal state. The individual can usually quite accurately describe, on a scale of one to ten, how he feels, using five as the numerical designator for his own

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personal optimal arousal level. If the individual feels that he is too excited or "psyched up" he perceives himself as being at seven or eight, in which case he begins to count repeatedly, "seven, seven, seven, six, six, six, five, five, five." During this time, he experiences the sensation of lowering his arousal level. Too often the general suggestion, "I must calm myself down or relax," may send the individual toward the opposite direction. Using the numerical designators as posthypnotic cues to his unconscious mind, the individual is able to eliminate conscious interference and screening of the suggestion for arousal level change.

Garver's work²⁷ indicates that quite often arousal level control is simply a matter of conditioning the autonomic nervous system and substituting productive patterns for unproductive ones. The implication of this type of autonomic nervous system control is clear for this study where autonomic responses are the physiological indexes used in the polygraph examination.

Method

Subjects

Thirty subjects, 19 males and 11 females, volunteered for the experiment. These subjects had no previous biofeedback or relaxation training. Their average age was 31.3 years, and they had an average of 16 years of education.

Apparatus

The polygraph used was a Stoelting three-channel Emotional Stress Monitor, Model #22600, which measured blood pressure, heart rate, respirations, and GSR. The responses were recorded on a strip chart, with both blood pressure and heart rate read from one channel while respiration and GSR were interpreted from separate channels. The biofeedback trainer was Biofeedback Technology Inc. Model 701 (BFT 701), which measures GSR. The response was fed back to the subject visually via a meter and audibly by a variable tone.

Procedure

A pretest baseline consisting of three trials per subject was established for each of the 30 subjects.

The subject was seated in the test room and given an introductory explanation of the polygraph and its functions by the operator. The subject was then prepared for the three trials by being attached to the polygraph. A blood pressure cuff was placed on one arm; GSR electrodes were placed on two fingers; and a pneumograph bellows was attached around the subject's thorax. In each trial, the subject was presented with four 76 by 127-mm (3 by 5-in.) index cards. In the first trial a neutral number, and in the other two trials a neutral color or letter, was written on the index card. The subject was asked to choose one of the four cards and maintain possession of the chosen card during the trial. The subject was instructed to answer no to each of the choices presented when asked if he chose that card, thus forcing the subject to deceive the examiner. During the subject's answer, his physiological response was recorded on the polygraph. Ten responses were elicited, but the first three choices and the last three choices were not among cards given the subject. This allowed the initial physiological arousal during each trial to decrease and not contaminate the results as well as provide a comparative baseline. The last three bogus choices allowed the polygraph examiner a period of decreased arousal by which to judge the other responses.

After the three trials the polygraph examiner reviewed the physiological responses and called on which "no" response the subject had deceived him. He was allowed to make a "no call," which meant that the response was not clear enough to detect deception. The examiner was then scored on the number of "hits" or "misses" he made in detecting deception. A hit meant he had accurately detected deception and a miss meant he did not detect the deception.

After the pretest the subjects who were least successful in deceiving the examiner were selected for the biofeedback group. Hypnosis and control groups were then selected. During the training period for the hypnosis and biofeedback groups the control group received no training.

The seven subjects in the hypnosis group received specific training that taught the subjects to use autohypnotic suggestion designed to distort the physiological indexes measured by the polygraph. The autohypnotic suggestion was aimed at manipulating the arousal level autogenously to maintain a calm state throughout the examination or to elevate the arousal level at will to produce false indexes. This training was accomplished by each subject for the same period of time allotted to the biofeedback group and the control group.

The ten subjects in the biofeedback group received training aimed at teaching them to control their arousal by controlling their GSR. They received 30 min. of training three times a week. On the days the subjects did not receive training they were asked to listen to a 15-min. tape that contained a relaxation exercise. During the training periods they were fed back their GSR via the BFT 701 GSR trainer. The goals of this training were first, to teach the subject to decrease his arousal and second, to teach him control sufficient to have him increase his GSR at will. The time of training was four weeks.

After the training period a test was done on all three groups. This test was exactly like the pretest except a different set of neutral numbers, colors, and letters were used. The polygraph operator was unaware of which group each subject was in, and he was not given feedback as to whether he hit or missed on any trial. Again, the operator was allowed to "no call" with insufficient data. Hits and misses were scored in the same manner as the pretest.

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Results

An analysis of variance was done with performance on the polygraph (hit, miss, or no call) as the dependent variable and group (control, hypnosis, and biofeedback), target (number, letter, and color), and mode used to call (respirations, GSR, and blood pressure plus heart rate) as independent variables. In addition, age, sex, and education were analyzed. The analysis of variance run for the experimental condition indicated one significant main effect. Results were statistically significant only when a subject was identified by group assignment, that is, control, hypnosis, or biofeedback (f = 4.82, P < 0.05; see Table 1). Effects of target or method of call were not significant and neither were two-way interactions (Table 2). Further, age, education, and gender were not significantly related to performance on the polygraph (Table 1).

TABLE]	
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Results	of	general	linear	model	analysi	ĻS
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	Source	P ^a	R	R ^b	f	df	Restricted Model for Comparison
1.	Group	2	0.33739	0.11383	4.82°	2.75	Op
2.	Target	$\tilde{2}$	0.07276	0.00529	0.20	2.75	0
3.	Method	6	0.21151	0.04474	0.55	6,71	0
4.	Group + target	4	0.34515	0.11913	2.47	4,73	0
5.	Group + method	Ļ.	0.41636	0.17335	1.81	8,69	0
6.	Target + method	6	0.21968	0.04826	0.44	8,69	0
7.	Group x target	8	0.40535	0.16431	0.95	4,70	4
8.	Group x method	20	0.54012	0.29173	0.61	16,58	5
9. 10.	Target x method Age + education	20	0.24001	0.05760	0.01	16,58	6
	+ sex	3	0.09190	0.00844	0.21	3,74	0

^aNumber of independent predictors in model (that is, total number minus 1).

^bO is overall mean (that is, no effect).

^cP **<** 0.05.

After the pretest run subjects for biofeedback were selected on the basis of their having been correctly identified more frequently by the polygraph operator during their deception, whereas both the control and hypnosis groups had subjects who were capable of deceiving the polygraph operator prior to any training. This method of selection resulted in a skewing of the sample because of the nonrandom selection of the biofeed-back group. While the control group and the hypnosis group showed no difference in their pretest performance, the biofeedback group had a statistically greater number of correctly identified "deceivers" ($x^2 = 7.32$; p < 0.05).

Both the hypnosis and biofeedback groups had more females than the control group, and the hypnosis group was older and less educated than the control group. Biofeedback participants were younger and more educated than the controls. Despite significant differences of the hypnosis and biofeedback groups when compared to the control group, none of the back-ground variables depicted in Table 3 were significant in fooling the operator.

TABLE 2

Correlations between groups and methods

Method	Control	Hypnosis	Biofeedback
Respirations GSR Blood pressure plus heart rate Respirations + GSR	0.04 0.12 0.04 0.06	0.10 -0.02 -0.09 0.02	-0.13 -0.10 0.04 -0.08
Respirations + blood pressure plus heart rate GSR + blood pressure plus heart rate Respirations + GSR + blood pressure plus heart rate	-0.06 -0.03 -0.11	0.04 -0.04 0.11	0.03 0.06 0.01

TABLE 3

Correlations between groups and background variables

Variable	Control	Hypnosis	Biofeedback
Age	-0.07	0.37 ^a	-0.25 ^a
Education	0.12	-0.49 ^a	0.29 ^a
Sex (l = female)	0.09	0.36 ^a	0.41 ^a

^aP **<** 0.05.

Table 4 compares pretest and final results. The tests differed only in terms of training given to two of the three groups. Both the hypnosis and the biofeedback group were successful in fooling the polygraph operator after training. The increase in misses by the operator following training by the two groups was statistically significant at the following levels: hypnosis, $x^2 = 25.22$ and P \lt 0.001; and biofeedback, $x^2 = 21.33$ and P \lt 0.001. Pretest and final test analysis of the control group did not differ at a significant level. Because of nonrandom assignment of subjects no conclusions may be made concerning the effectiveness of hypnosis versus biofeedback as a means of deceiving a polygraph operator. Members of the hypnosis and biofeedback groups differed significantly in

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the pretest ($x^2 = 7.32$, P < 0.05) because of method of selection. This experimental bias precluded final test comparison regarding which group performed better.

Comparisons between pretest and final test resultsGroupComparisonControlnot significantHypnosis $x^2 = 25.22; P \lt 0.001$ Biofeedback $x^2 = 21.33; P \lt 0.001$

TABLE	4
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As a final note, we are not prepared on the basis of a single pilot study to extrapolate from the laboratory to a field condition. The variables are many. What we suggest is that some of the sensors traditionally used to measure deception can be brought under volitional control by subjects with adequate time and rather simple training.

Summary

In this study of biofeedback-conditioned suppression of galvanic skin response and hypnotic suppression of an arousal state and the relationship of these two techniques to the detection of deception by the polygraph, 30 subjects were given a series of card tests with an experienced polygraph operator identifying which number, letter, or color a subject had selected. Seven subjects were then trained with autohypnosis, 10 subjects were trained with biofeedback, and 13 subjects received no training. After 17 of the 30 subjects were trained, all 30 subjects were retested with the same protocol as the first test. The 17 trained subjects were able to deceive the operator and remain undetected at a statistically significant level while the ability on the part of the control group showed no significant change.

Acknowledgements

We wish to express our appreciation to personnel at Ft. Sam Houston Field Office, Third Region, U.S. Army, Criminal Investigation Command, Ft. Sam Houston, Tex.; Hendrick Ruck, occupational survey analyst, and Captain David S. Vaughan, USAF, chief, Test Research Section, at the USAF Occupational Measurements Center, Lackland AFB, Tex.; and MSgt. Emory Wyatt of the Adult Outpatient Mental Health Clinic, Department of Mental Health, Wilford Hall USAF Medical Center, Lackland AFB, Tex.

References

1. Hubler, E., Ed., <u>Shakespeare's Songs and Poems</u>. McGraw-Hill, New York, 1959, p. 473.

- 2. Holdsworth, W., History of English Law, Methuen, London, 1966, p. 310.
- 3. Robin, J., Police Drugs, Philosophical Library, New York, 1956.
- 4. Lombroso, C., <u>L'Homme Criminal</u>, Vol. 2, 1895, pp. 336-346.
- 5. Benussi, V., "Die Atmungssymptome der Luge," <u>Archiv fur Gesamte</u> <u>Psychologie</u>, Vol. 31, 1914, pp. 244-273.
- 6. Reid, J. and Inbau, F., <u>Truth and Deception: The Polygraph</u> (<u>Lie De-</u> <u>tector</u>) <u>Technique</u>, Williams & Wilkins, Baltimore, 1966.
- 7. Keeler, L., "A Method for Detecting Deception," <u>American Journal of</u> <u>Police Science</u>, Vol. 1, 1930, pp. 38-51.
- 8. Lykken, D., "Psychology and the Lie Detector Industry," <u>American</u> <u>Psychologist</u>, Oct. 1974, p. 725.
- 9. Edel, E. and Jacoby, J., "Examiner Reliability for Polygraph Chart Analysis: Identification of Physiologic Responses," <u>Journal of Applied</u> <u>Psychology</u>, Vol. 65, No. 5, 1975, pp. 632-634.
- 10. Abrams, S., "Polygraph Validity and Reliability: A Review," Journal of Forensic Sciences, Vol. 18, No. 4, Oct. 1973, pp. 313-326.
- 11. Summers, W., "Science Can Get the Confession," Fordham Law Review, Vol. 8, 1939, pp. 335-354.
- 12. Orlansky, J., "An Assessment of Lie Detection Capability," Technical Report 62-16, Institute of Defense Analysis, Research and Engineering Support Div., Springfield, Va., July 1964.
- 13. The Use of Polygraphs and Similar Devices by Federal Agencies, U.S. Government Printing Office, Washington, D. C., 1974, p. 36.
- 14. Ellson, D., Davis, R., Saltzman, I., and Burke, C., "A Report of Research on Detection of Deception," Office of Naval Research Contract N6 ONR-18011, prepared by Indiana University, Bloomington, 1952.
- Kubis, J., "Studies in Lie Detection: Computer Feasibility Considerations," Technical Report 62-205 under Air Force Systems Command Contract AF30 (602)-2270, Project 5534, prepared by Fordham University, New York, 1962.
- 16. Kugelmass, S. and Lieblich, I., "Effects of Realistic Stress and Procedural Interference in Experimental Lie Detection," <u>Journal of</u> <u>Applied Psychology</u>, Vol. 50, 1966, pp. 211-216.
- 17. Thackray, R. and Orne, M., "A Comparison of Physiological Indices in Detection of Deception," Psychophysiology, Vol. 4, 1968, pp. 329-339.
- Violante, R. and Ross, S. "Research in Interrogation Procedures," Report 707-65, Office of Naval Research, Defense Documentation Center No. AD-467624, Stanford Research Institute, Menlo Park, Calif., Oct. 1964.
- 19. Orne, R., Thackray, R., and Poskewitz, D., "On the Detection of Deception," in <u>Handbook of Psychophysiology</u>, N. Greefield and R. Steinback, Eds., Holt, Rinehart and Winston, New York, 1972, pp. 743-785.

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- 20. Wells, D. T., "Large Magnitude Voluntary Heart Rate Changes," Psychophysiology, Vol. 10, No. 3, 1973, pp. 160-269.
- Klinge, V., "Effects of Exteroceptive Feedback and Instructions on Control of Spontaneous Galvanic Skin Response," <u>Psychophysiology</u>, Vol. 9, 1972, pp. 305-317.
- 22. Welgan, P. R., "Learned Control of Gastric Acid Secretion in Ulcer Patients," <u>Psychosomatic Medicine</u>, Vol. 36, No. 5., 1974, pp. 411-419.
- 23. Blanchard, E. B., "Clinical Applications of Biofeedback Training," Archives of General Psychiatry, Vol. 30, May 1974, pp. 573-589.
- 24. Shapiro, D. and Schwartz, G., "Biofeedback and Visceral Learning: Clinical Application," <u>Seminars in Psychiatry</u>, Vol. 4, 1972, pp. 171-184.
- 25. Deabler, H. L., Dillenkoffer, R. L., and Elder, S. T., "The Use of Relaxation and Hypnosis in Lowering High Blood Pressure, " The <u>American Journal of Clinical Hypnosis</u>, Vol. 16, 1973, pp. 75-83.
- 26. Dublin, L. L. and Shapiro, S. S., "Use of Hypnosis to Facillitate Dental Extraction and Hemostasis in a Classic Hemophiliac with High Antibody Titer to Factor VIII," <u>The American Journal of Clinical</u> Hypnosis, Vol. 17, 1974, pp. 79-83.
- 27. Garver, R. B., "The Enhancement of Human Performance with Hypnosis Through Neuromotor Facilitation and Control of Arousal Level," <u>The American Journal of Clinical Hypnosis</u>, Vol. 19, No. 3., Jan. 1977, pp. 177-181.

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By

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Use of the lie detector depends on the assumption that there is a distinctive pattern of physiological response which accompanies lying and which can be distinguished from that which accompanies truth telling. Most modern lie detector operators expect lying to produce a greater amplitude of physiological response, although others have asserted that certain qualitative differences are characteristic (e.g., Marston, 1938, p. 52; Summers, 1939). Claims of high validities for these methods do not find support in properly conducted empirical study. The most extensive research thus far reported (Ellson, Davis, Saltman, & Burke, 1952), which employed a total of 13 response variables and careful multivariate statistical analysis, achieved only 73% correct classification, against a chance expectancy of 25%.

Use of physiological measurements to detect not lying, but the presence of "guilty knowledge," requires only the more reasonable assumption that a guilty person will show some involuntary physiological response $(\underline{e.g.}, GSR)$ to stimuli related to remembered details of his crime. If the crime is such that the investigator can discover a number of factual details with which only the guilty person should be familiar, then the guilty knowledge method can be used. The guilty knowledge items are interspersed with other similar but irrelevant items in a stimulus list. The S is told that E is going to mention a number of items and that, if he is guilty, he will recognize some of these as being related to the crime in question. The items may be stated in question form, in which case the S may or may not be required to answer.

A guilty S, knowing which items are relevant and which are not, would be expected to respond differently to the relevant than to the irrelevant items. Usually, he would be expected to give larger responses to the relevant items, although it should be pointed out that any consistent difference in the responses to the two classes of stimuli is evidence of guilt. Thus, an S who manages by self-stimulation to produce large GSRs to the irrelevant items is betrayed by the fact that his responses to the relevant items are consistently smaller.

*Richard Rose, George Skaff, and Joe Ylitalo conducted this experiment.

Reprinted from The Journal of Applied Psychology, Vol. 43, No. 6, 1959, pp. 385-388.

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Method

Ss used in this experiment were 49 male college students who were assigned at random to four groups. Those in Group I (13 Ss) were required to enact two mock crimes in sequence, a "murder" and a "theft." For the Murder enactment, S was taken to the second floor of the building and required to knock on the door of one of the offices. The door was opened by an assistant who, after some preliminary conversation, invited S to play a hand of poker, which was thereupon dealt out, the assistant getting the better hand. Remarking that S now owed him a hundred dollars, the assistant then walked over to stand looking out the window. Taking a weapon from his pocket, S went through the motions of killing the assistant, hid the weapon in a drawer of the desk, and left the office.

In the Theft enactment, S had to idle near the doorway of a different office until the occupant, a woman, left it to go into the washroom. S then hurriedly entered and riffled through the desk calendar until he found a page on which his own name had been entered. He erased the name and then searched through the desk until he found the article (<u>e.g.</u>, a watch) which he had been instructed to "steal." Leaving the office, he hid the stolen property in a locker in the hallway.

As already mentioned, Ss in Group I enacted both of these mock crimes, in random sequence. Those in Group 2 enacted only the Murder, those in Group 3 only the Theft, and those in Group 4 were exposed to neither of the crimes. The next step was for S to be turned over to another E for interrogation. E was not informed to which group S belonged. S was seated in the interrogation room, GSR electrodes attached to his dominant hand, shocking electrodes to his other hand, a blindfold put over his eyes and a pair of headphones adjusted to his ears. E was located with the apparatus in an adjoining room and spoke to S via a microphone.

Each S was told that he was to be questioned in relation to two crimes. He was instructed to listen to each question but not to reply to any of them. He was told that each question consisted of several parts and that if, at the end of any question, **F** felt that the physiological response (GSR) indicated guilt, then S would be given an electric shock. The shock was then demonstrated, most Ss finding it to be quite unpleasant (the shock was the discharge of a 2-mfd. Capacitor, charged to 300 v., through 3/8inch in diameter electrodes on the fingerprint area of the first and third fi ngers). In fact, irrespective of the particular S's response, the shock was always given following the completion of the GSR to the last part of Questions 2, 3, and 5 of the Murder list and Questions 1, 3, and 4 of the Theft list. (The purpose of the shock was merely to increase S's general anxiety level and increase to some extent his motivation not to give a guilty record and this to create a situation resembling a little more that of real criminal interrogation.)

Both interrogation lists were standard and each consisted of six multiple-choice-type questions. E first read the question and then read each of the short alternative answers, allowing sufficient time after each for GSR activity to dissipate. One alternative for each question was relevant for a given S. Two of the six Murder questions were as follows:

(1) If you are the murderer, you will know that there was an unusual object present in the murder room. Was it (a) a record, (b) an easel (c) a candy box (d) a chess set?; (2) The murderer hid the weapon in one of the drawers of a desk. Which drawer was it? Was it the (a) upper left (b) lower right (c) upper right (d) middle (e) lower left?

Two of the six Theft questions were as follows:

If you are the thief, you will know where the desk was located in the office in which the theft occurred. Was it (a) on the left (b) in front (c) on the right?; (2) The thief hid what he had stolen. Where did he hide it? Was it (a) in the men's room (b) on the coat rack (c) in the office (d) on the window sill (e) in the locker?

The number of alternatives averaged 4.67 in the Murder list and 5.0 in the Theft list. Questions 2, 3, and 6 in the Murder list and 2, 3, 4, and 6 in the Theft list were "double-blind," that is, the relevant or guilty alternative was varied at random from S to S so that E did not know which was which. Questions were always given in the same order within a list but whether the Murder or Theft list was given first was determined at random.

Scoring was simple, a priori, and objective. An S's GSRs to the several alternatives in a given question were ranked in order of amplitude. If his largest response was to the relevant alternative, he was given a score of 2 on that question. If his second largest response was to the relevant alternative, he was given a score of 1. Thus, a perfect Innocent score was o and a perfect Guilty score was 12, for both lists.

Results

If all scores of 6 or less are classified "innocent" and all those over six "guilty," then four Ss from Group 1 and one from Group 2 would be misclassified as to group, a total of 5 misses out of 49, or 89.8% hits. Considering the two crimes separately, there were 50 interrogations of Guilty Ss (the 24 Ss from Groups 2 and 3 plus the 13 Ss from Group 1 who were Guilty of both crimes), and 48 interrogations of Innocent Ss (the 24 Ss from Groups 2 and 3 plus the 12 Ss from Group 4 who were Innocent of both crimes). Forty-four of the 50 interrogations of Guilty Ss resulted in scores of 7 or higher, all of the 48 interrogations of Innocent Ss gave scores of 6 or lower, a total of 93.9% correct classification.

Discussion

It should be emphasized that these results by no means represent the upper limit of validity that could be achieved with the simple and objective guilty knowledge technique. On the other hand, one must consider whether results from such a laboratory study can safely be extrapolated to the real life criminal interrogation situation. Some of the points that might be raised in this connection are discussed below.

1. All Ss in the real life situation would be more emotionally involved in the outcome. The use of electric shock in the experiment was intended to make the situations somewhat more comparable in this respect, but certainly an important difference still remained. However, because of the nature of the guilty knowledge method, an increase in general emotional reactivity in either an innocent or a guilty S does not in itself affect the validity of the test. As long as S is able to comprehend the situation and to respond more intensely to a question having some special significance for him than he does to most of the questions, the method is not compromised in its ability to differentiate innocence from guilt.

2. The Ss in this experiment were not particularly sophisticated concerning the method being used and were not strongly motivated, if guilty, to try to defeat the test. There is no way in which an S, once he has perceived a stimulus, can inhibit what would be his normal GSR to that stimulus. However, it is possible to try to defeat the guilty knowledge type of test by producing intentional or artificial responses to the nonsignificant stimuli so as to reduce the relative size of the involuntary guilty response and so confuse the record. Artificial GSRs can be produced in various ways by a sophisticated S. However, because the GSR is peculiar in that it does not produce any proprioceptive stimulation, it is not possible for a subject to know whether his attempt to produce a deliberate response has been successful and it is certainly impossible for him to deliberately produce responses of controlled sizes. Still, it remains to be experimentally determined to what extent a sophisticated, motivated S can confuse in this way a guilty knowledge record. A second experiment is in progress which is concerned with this problem.

3. The Ss in this experiment were college students and hardly representative of the average run of criminal suspects; perhaps a proportion of the latter would not respond "normally" in such a test. Again, a final answer to the question suggested can only be provided by an appropriate experiment. The literature of lie detection does include references to the problem of the nonreacting S. However, in contrast to lie detection procedures, the guilty knowledge method, which uses each Ss as his own control, does not require that the responses of the guilty S be comparable in any way to those of the innocent, but merely that the guilty S respond differently to some of the items than he does to others - something which the innocent S cannot consistently do. It is interesting to note in this connection that one of the Ss in Group I was a Hungarian expatriate who, while engaged in underground activities several years earlier, had been arrested and subjected to intensive interrogation by Russian secret police. Although he had been successful then in maintaining his forged identity and in convincing the MVD that he was ignorant of any underground activities, he was easily identified by the guilty knowledge test as being guilty of both murder and theft!

4. The Ss in this experiment spent only a few minutes in the mock crime situations and therefore had little opportunity to note the details of the situation which was used for the guilty knowledge test. It was no surprise to find that many Ss who were guilty of the murder, for example, reported after the interrogation that they had not noticed the map on the wall of the Murder room, or the chess set on the bookcase, or etc. Real life crime situations would obviously vary enormously among themselves in this respect. A suspect who is accused of having robbed a series of liquor stores can safely be assumed to know, if he is guilty, a number of things which an inocent person would not, such as the locations and appearances of the stores, the amounts taken, the appearance of the various victims, certain striking features about what was said or done during the robberies, and so on. On the other hand, the question at issue might be which one of a group of armed thieves fired a fatal shot. In such a case, the guilty individual would not be expected to possess any guilty knowledge not shared by his confederates and/or the other suspects, and the present method would not be of any use. (Obviously, each suspect might be expected to give a larger response to the name of the guilty one than to the other names, his own excluded. Such consistency would, if found, rather clearly identify the guilty individual. However, such a method cannot have the certainty of the guilty knowledge technique.)

It seems reasonable to suppose that many real life crimes would lend themselves to the use of the guilty knowledge technique, keeping in mind that trivial and seemingly irrelevant details are as useful as interrogation stimuli as are the more obivous facts, such as the weapon used, the article stolen, etc., which might be passed on to innocent suspects by the newspapers or the arresting officers and thereby made useless for this purpose. It also seems reasonable that, in such cases, the guilty person might be expected to have a wider range of guilty knowledge than was induced in the subjects of the present experiment.

5. Since only about 15 min. of interrogation time and only six questions were used in the interrogation for each of the mock crimes, it can be assumed that a higher validity could easily be achieved by a longer interrogation, using questions more than once and using a greater variety of questions. With only six questions and the simple scoring system used here, about one S in 50 might be classified guilty though actually innocent, due to chance fluctuations. The probability of such false-positive misclassification decreases rapidly as the number of questions is increased. Thus, with only 10 questions, having five alternatives each, less than 3.28% of innocent Ss will show guilty responses on more than four questions and less than 0.64% on more than five. (These figures assume that the questions are well enough constructed so that the probability of an innocent S reacting most strongly to the relevant alternative is about equal to that for the mean of the other alternatives).

6. The scoring system used in this experiment was simple and did not involve any attempt to defend against the possibility of S making deliberate responses in order to defeat the test. The guilty knowledge method does not require one to assume that the guilty S will tend to give larger reactions to the relevant items, although the present scoring system did require this result. All that need be assumed is that the guilty S will react differently to the relevant items, as a group, than he does to the irrelevant alternatives. The only way in which an S can behave consistently differently with respect to the set of relevant alternatives than he does to the others is by having some way of distinguishing these alternatives from the rest, <u>i.e.</u>, by having the guilty knowledge which declares him to be guilty in fact. In a situation where active attempts by a sophisticated S to defeat the test are to be expected, then a more subtle scoring system than the one used above should yield a higher validity.

Summary

Forty-nine male college students, after random assortment into four groups, were required to enact one, both, or neither of two mock crimes. All were then given a guilty knowledge test, employing the GSR, which used six standard questions relating to each of the two crimes. A simple, objective, and a priori scoring system was used to determine guilt. Fortyfour or 89.8% of the Ss were assigned to their correct group, against a chance expectancy of 25%. Considering the crimes separately, all Ss innocent of a crime were correctly classified, while 44 of 50 interrogations of Guilty Ss gave guilty classifications, a total of 93.9% correct classification against a chance expectancy of 50%.

Lie detection, requiring unreasonable assumptions about the consistency of physiological response patterns, has not been shown by acceptable research to have the high validity claimed for it and which is necessary for its useful application. Detection of guilty knowledge, while less widely applicable, is a more reasonable, objective, and generally defensible technique and is demonstrably capable of very high validity in those situations where it can be used.

Ellson, D.G., Davis, R.C., Saltzman, I.J., Burke, C.J. A report of research on detection of deception. Contract Noonr-18011 with Office of Naval Research, 1952. Marston, W. M. <u>The lie detector test</u>. New York: Smith, 1938. Summers, W.G. Science can get the confession, <u>Fordham Law Rev</u>., 5, 335-354.

USE OF VOICE CHANGES IN THE DETECTION OF DECEPTION

By

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It has long been known that short-term physiological changes occurring in persons can be highly accurate in determining whether that person is telling the truth or not, provided that the proper physiological parameters are monitored under adequately controlled conditions. This finding has been supported in both experimental laboratory studies and in examinations of criminal suspects. The most frequently used parameters include the Skin Resistence Response, respiration, and cardiovascular activity, but numerous other parameters can also be used (Barland & Raskin, 1973; Orne, Thackray, & Paskewitz, 1972). Recently, a new technique has been developed which is believed to detect short-term physiological changes that occur in the voice when a person is under stress, as when he is lying.

The use of the voice to assess short-term changes in the level of stress of an individual would offer a number of advantages over current psychophysiological monitoring methodology. Because no sensor need be attached to the subject, there would be no discomfort to the subject. The subject would be free to move around and would not necessarily be aware that he was being monitored. This would reduce the amount of situational stress which may confound the interpretation of certain types of studies. Use of the voice to measure stress would also permit the acquisition of data, under certain circumstances, by an observer remote in distance or remote in time. The Soviets have monitored voice stress levels of cosmonauts during space flights (Simonov & Frolov, 1973), O'Toole (1973) used voice stress analysis in an investigation of the assassination of President Kennedy.

This paper describes the results of two experiments assessing the validity of voice stress analysis for the detection of deception. The first experiment was a low-stress experiment of detection of deception in a controlled, laboratory situation. The second experiment was of criminal suspects undergoing polygraph examinations in which their verbal answers to the test questions were tape recorded. The latter situation was thus a high-stress one in which the results of the voice analysis were compared with the autonomic responses recorded by the polygraph.

Experiment 1 - - Low Stress

Sixteen students (14 male, 2 female) taking an undergraduate psychology course in the detection of deception at the University of Utah volunteered

Paper presented at the 86th meeting of the Acoustical Society of America, Los Angeles, October 31, 1973. The research reported in this paper was conducted when the author was a graduate student in the Dept. of Psychology, University of Utah. Portions of this research were supported by a grant from the University of Utah Research Committee. Retyped in October 1977, incorporating slight changes. Address requests for reprints to: Gordon H. Barland, Ph.D., Barland & Associates, 565 East 4500 South, Salt Lake City, Utah 84107. for this study. The subject ($\underline{S}s$) appeared one at a time and were asked to choose one of five numbers ranging from 31 through 35. They were then instructed to write their choice on a 3 x 5 inch card and to pin the card up facing them so that they could see the number plainly, but the experimenter (\underline{E}) could not. At no time during the testing and decision-making portions of the experiment did the \underline{E} know what number had been chosen by the \underline{S} .

The <u>S</u> was then given a routine peak of tension test (Barland & Raskin, 1973) to determine what number he had picked. The <u>S</u> was told that he would be asked nine questions concerning the number he had written on the card, and he was to answer all questions "no." The questions were: "Regarding the number that you wrote on that card, it it the number 29?" "Is it the number 30?", and so on, in sequence, through 37. The first two and last two numbers were inserted in order to absorb the initial orienting response and to serve as anchors for the peak.

Previous research has shown that the more emotionally involved a S is with his lie, the more easily it is detected (Gustafson & Orne, 1963). Therefore, in order to increase the emotional involvement of the S, he was asked after the first trial if he would like to try the test again, this time with a 50¢ wager. It was explained that, when the tape recording was analyzed, if the analyst was correctly able to identify the number which the S had written on the card, the S would pay E 50¢. The analyst would also make a second guess. If the second guess was correct, neither the S nor the E would pay any money. However, if the S had picked any of the three remaining, unguess numbers, then the E would pay the S 50¢. Fifteen of the 16 Ss accepted this wager. All 16 Ss were then asked the same questions again, in the same sequence. Following the second trial, all Ss were "psyched up" by the E in order to further increase their emotional involvement. This was done by questioning the S's sense of morality concerning the ethics of lying. The questions were then asked a third time, this time in reverse sequence. The reason for reversing the sequence was to better differentiate the point of deception in those cases where the S may have responded ambiguously on the first two trials.

After the third trial the <u>S</u> identified his numbered card by signing it. The <u>S</u> put it into an opaque envelope, sealed it, and gave it to a neutral <u>E</u> who served as scorekeeper. As the analyst made his decisions as to which number the <u>S</u> had picked, he gave his first and second choices to the scorekeeper who compared them with the number the <u>S</u> had actually picked.

The Ss answers were recorded on an Uher 4000 Report-IC monophonic tape recorder at $7\frac{1}{2}$ ips by means of a Realistic carboid lavalier microphone, model MC-1000, worn by the S. After the S had been dismissed, the tape was played back through a Psychological Stress Evaluator, model PSE-1, in order to convert the audio signal to a visual chart for analysis. Three analyses were made of each trial: a Mode I analysis at a tape playback speed of $7\frac{1}{2}$ ips and Mode III and Mode IV analyses at a tape playback speed of 1-7/8 ips. No Mode II analysis was made because this mode is seldom used by most PSE users. There were thus 9 PSE charts available on each S (3 modes x 3 trials) at the time the <u>E</u> made the decision as to which number a <u>S</u> had written on the card. Table 1 lists the numbers chosen by each <u>S</u> and the two guesses made by the <u>E</u> for each <u>S</u>. The asterisks indicate the hits made by the <u>E</u>.

			-'		
			Numbers pi	cked by	
<u>S</u>	<u>s</u>	<u>E</u> (lst	choice)	E (2nd	choice)
l	32	33		34	
2	32	33		35	
3	32	35		32*	
4	33	31		32	
5	32	34		31	
6	31	33		35	
7	31	35		34	
8	31	35		33	
9	34	31.		33	
10	33	32		31	
11	34	33		35	
12	35	33		31	
13	31	34		31*	
14	32	32*		33	
15	33	31		35	
16	35	33		34	

TABLE 1

Actual numbers selected by Ss and E, low-stress experiment

* hits by E

The results were unimpressive. In a situation where the lie is restricted to one of only five possibilities, with an N of 16, chance detection would be 3.2 hits (20%). However, after analysis of the voice, the analyst made only one correct decision on his first choice (6.25%). Chi square analysis (Siegel, 1956) indicated that this result was not significantly below chance (p > .10). Combining first and second guesses for each S, the analyst was right three times (18.75%) where chance would be 6.4 (40%). Chi square analyses of the frequencies of all three sets of numbers in Table 1 indicated no significant bias in the numbers chosen by the <u>Ss</u> and <u>E</u> (p > .30). In arriving at a decision, the <u>E</u> analyzed the 9 PSE charts both individually and collectively, as illustrated by the matrix from Subject 14 in Table 2. This type of matrix was used because it could provide information concerning the most accurate PSE mode and the most effective type of psychological precursor for optimum detection: situational stress only, a wager, or verbal psyching. <u>S</u> 14 was the one subject whose lie was correctly detected on the analyst's first guess. Inspection of the matrix in Table 2 shows that the decision was relatively easy to make. Several of the matrix squares have two choices listed. This procedure was used by the E to help him make the final decision based upon the individual charts.

	Score	Matrix,	Subject	14, 10	ow-stress	experiment	
PSE		Chart	1	Chart	2 (Chart 3	Overall
Mode	I	32 or	34	32	3	2 or 21.	32
Mode	III	33 or	35	33		32	33
Mode	IV	35 or	32	32 or	34	32	32
Overa	11	32		32		32	32 or 33

TABLE 2

However, with most <u>Ss</u>, there was remarkably little consistency in stress patterns from one trial to the next, nor even among the three modes within a single trial. A more typical matrix is shown in Table 3.

	Score	Maurix,	Subject	O, IOW-SUPESS	expermient	
PSE		Chart	1	Chart 2	Chart 3	Overall
Mode .	I	33 or	35	35 or 31	34 or 32	35
Mode 3	III	35 or	32	31 or 33	33	33
Mode 3	IV	35 or	33	33	33 or 31	33
Overa	11	35		31	33	33 or 35 ^a

TABLE 3 Score Matrix, Subject 6, low-stress experiment

^aThe number Subject 6 had actually lied about was number 31.

It is easy to hypothesize that inconsistencies from one trial to another could be caused by changes in the <u>S</u>'s psychological set. There was relatively little stress involved in his lie, so his attention was not steadfastly focused upon his lie throughout the experiment. However, the reason for the lack of consistency from one mode to the next within a single trial is disturbing. Several technical differences between the various modes may have contributed to this inconsistency. Mode I differs from

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Mode III in two major operational respects. First, the tape playback speed differs when using the two modes. This results in different frequencies being fed into the PSE. Second, it is customary to keep the playback volume constant during Mode I analysis, but to vary the playback volume during a Mode III analysis in order to obtain the optimum amplitude of waveform for visual inspection. Thus, Mode I is more sensitive to variations in the level of loudness of the speaker's voice than is the Mode III analysis. Mode IV differs from the other modes in that the low volume portion of the signal is enhanced and the high volume portion of the signal is suppressed, resulting in a more even visual pattern. Because of the different form of the pattern, it may be that criteria of stress used with Mode III do not fu lly apply to Mode IV though the manufacturer's hypothesis concerning the physiological basis of the technique implies that Mode III and IV stress criteria should be the same.

Because of the very small number of hits, it was impossible to find any significant difference in accuracy between the three modes. Each mode, evaluated independently of the other modes, was correct one time out of 16 based upon the analyst's first guess. Likewise, there was no significant difference between the three trials with each <u>S</u>, based upon a global evaluation of all three components on each trial. As is shown in Table 4, the analyst had two hits when he evaluated the first trial by it itself, five hits when he evaluated the second trial by itself, and two hits when he evaluated the third trial alone. Because of the inconsistencies from one trial to the next, he had only one hit when he looked at all three trials together. Normally, the more data the analyst has available, the more accurate his decisions tend to be. In this case the opposite was true.

Table 4 also shows the number of hits when each PSE mode was evaluated separately on each trial. It can be seen that if the analyst had based his decision solely upon Mode III on the second trial, he would have been right 6 times out of 16, which approaches significance using a normal approximation to the binomial mode (16, 1/5, (p<.10). One more hit would have been significant. It would be incorrect to attach any importance to the near-significance of this one matrix square, for with sixteen squares one would expect at least one square to show this level of significance by chance alone.

Number of	f Hits with 1	Each Mode on E	ach Trial, low-	stress experi	Iment
PSE	Trial 1	Trial 2	Trial 3	Overall	Total
Mode I	1	4	2	1	8
Mode III	2	6	2	ll	11
Mode IV	4	2	3	1	10
Combined	2	5	2	1	
Total	9	17	9	4	29

TABLE 4

Thus, on the low-stress laboratory experiment, no significant findings were obtained. This finding was unexpected in view of the findings of a previous, high-stress experiment, reported here as Experiment 2.

Experiment 2 - - High Stress

Fourteen criminal suspects undergoing polygraph examinations were utilized for the high stress study. The criminal suspects were being examined as part of a major research study of the detection of deception being conducted at the University of Utah. The criminal suspects were referred for examination by various police departments, prosecutors, and defense attorneys in Utah and Nevada. The subjects ranged in age from 18 to 37 with a mean of 27.9. There were 12 male and 2 female suspects. The incidents of which they were suspected included murder (2), rape (1), rape victim (1), grand larceny (2), sale of illegal drugs (4), forgery (1), reckless driving (1), armed robbery (1), and improper police conduct(1). The educational level ranged from 8 to 15 years with a mean of 11.4 years of formal education. All suspects were examined on field-model Keeler or Stoelting polygraphs which recorded respiration, the Skin Resistance Response, and cardiovascular activity by means of occlusion plethysmography. The verbal answers to the test questions were simultaneously recorded for later analysis by the same equipment used in Experiment 1.

All suspects were administered the federal government's modification of the zone comparison polygraph test. This test consists of a series of at least 10 questions of which three are relevant questions pertaining to the incident under investigation, and three are control questions, designed to cause the innocent person to respond. The response to each relevant question is compared to the response to its adjacent control question, and the pair of responses is given a numerical score ranging from a +3 to a -3. If the two responses are of about equal magnitude or are nonexistant, the pair of questions is scored O. A plus indicates that the person responded more to the control question than to the relevant: a minus indicates the opposite. The value of 1, 2, or 3 indicates the degree of inequality between the two responses. This evaluation is made for each component (respiration, Skin Resistance Response, and cardiovascular activity) on each pair of questions. The list of ten questions is repeated for a minimum of at least three trials. The zone comparison test takes about three hours to administer and is described in detail elsewhere (Barland & Raskin, 1973).

All of the scores on the polygraph from one suspect were summed. If the total score was +6 or higher, it was concluded that the suspect told the truth; if it was between + or -5, inclusive, the result was inconclusive; if it was -6 or lower, it was concluded that the suspect lied on the test. The numerical scoring system has been found to be both valid and reliable, and has been described more fully elsewhere (Barland, 1972a, 1972b).

The polygraph examiner concluded that all 14 suspects had lied when they denied involvement in the crime. No inconclusive polygraph examinations were included in the sample. There is thus good reason to believe that all of the suspects had been under a high degree of stress when they answered the relevant questions. Although the examiner's decision was completely confirm in 6 of the cases and there is no reason to believe that any of the decision were wrong, the issue of whether the polygraph examiner's decisions were all correct is not important. The important thing is that the suspects had shown a stronger physiological arousal, as measured by the polygraph, when they answered the relevant questions than they did when they answered the control questions. Since it has long been established that the polygraph is highly effective in measuring short-term psychological stress in lie detection situations, the question explored in this study is the extent to which autonomic changes recorded by the polygraph will be reflected by changes in the voice.

Approximately one week after each polygraph examination, the tape recording was analyzed on the PSE-1. Two analyses were made: Mode 1 at $7\frac{1}{2}$ ips and Mode III at either 1-7/8 or 15/16th ips, depending upon the type of pattern obtained. The two sets of PSE charts were then numerically scored in the same manner as the polygraph charts had been: each pair of control and relevant questions was rated on a 7-point scale ranging from +3 to -3, and all of the individual scores thus obtained were summed. Because the voice is a single physiological parameter in contrast to the three measured by the polygraph, the cut-off points between inconclusives and decisions were modified. With the voice, a score of +3 or higher resulted in a conclusion that the suspect had told the truth; between + or -2, inclusive, was inconclusive; and with a score of -3 or lower it was concluded that the suspect had lied on the test.

Using the cut-off points of + or - 3 in order to make a definite conclusion, 6 of the 14 PSE analyses were inconclusive. Of the 8 decisions that were made, all agreed with the decisions made on the basis of the polygraph. Using a normal approximation to the binomial model, $(8, \frac{1}{2})$, it was found that this was significant (p .01).

Because each polygraph parameter was scored individually at the time the polygraph charts were evaluated, it is possible to list the raw scores for each of the 3 polygraph measures plus the voice. These scores are shown in Table 5.

By taking the total polygraph score as being the criterion it is possible to rank the four physiological parameters in the order of their agreement with the total polygraph score. Since the voice analysis was completed some time after the polygraph examination, the voice score did not contribute to the polygraph score. A rank of 1 indicates that the parameter was the most effective one with that particular individual; a rank of 4 indicates that it was the least helpful. Table 6 shows the ranks for each component with each suspect. Brackets around a rank indicate that that component disagreed with the total polygraph score, <u>i.e.</u>, had that component been used alone in the absence of the other components, the examiner would have made a different decision.

When the ranks were averaged for each component over all 14 suspects, it was found that the Skin Resistance Response was the most effective

Scores of	each individu	al comp	onent on each cru	ninal suspect
Subject	Respiration	SRR	Cardiovascular	Voice
1	0	-9	-2	-4
2	0	-2	6	-3
3	0	 6	-1	-10
4	0	-12	+3	- 5
5	-13	8	+1	-2
6	-1	-3	-2	4
7	0	8	-6	4
8	-4	-15	+4	-2
9	-16	-5	-1	-1
10	+1	-7	0	+1
11	6	-3	+1	-4
12	-11	-13	0	0
13	- 5	-16	- 5	-4
14	-4	-11	0	-1.

TABLE 5

single component with a mean rank of 2.46, followed by respiration and the cardio with mean ranks of 2.71 and 2.89, respectively.

The selection of a cut-off point of + or - 3 before making a definite decision when using a single component is somewhat arbitrary. One could argue that such a large inconclusive region is unduly conservative, that any non-zero score could be sufficient to make a decision when necessary. Table 7 shows the number of errors and the number of inconclusives for each individual component when the boundaries of the inconclusive region are decreased to scores of zero. It is immediately obvious that the Skin Resistance Response was by far the strongest single parameter, and that the cardiovascular measure was of very little help; it never reached statistical significance. This latter finding was unexpected, since previous research was found cardiovascular responses to be of use (Barland, 1972a; Kugelmass & Lieblich, 1966; Violante and Ross, 1964). The lack of significance here probably resulted from the small sample size.

Because numerical evaluations were made of all responses, it is of interest not only to examine the ranks of the various parameters, but also the correlation between them. The Pearson product-moment correlation between the PSE scores and the composite polygraph scores was -.359, which was not significant.

In view of the fact that the PSE analyses in this study had all been made after the polygraph examinations had been completed, it is possible

TABLE 6

Individual Components Ranked for

			-	
Subject	Respiration	SRR	Cardiovascular	Voice
1	4 ^a	1	3	2
2	4	3	1	2
3	4	2	3	1
4	3	1	(4) ^b	2
5	l	2	(4)	3
6	4	2	3	l
7	4	1	2	3
8	2	1	(4)	3
9	l	2	3.5	3.5
10	(3.5)	l	2	(3.5)
11	1	3	(4)	2
12	2	1	3.5	3.5
13	2.5	1	2.5	4
1.4	2	l	4	3
Mean Ranks	2.71	1.57	2.89	2.46

Effectiveness on each Criminal Suspect

^aRank of 1 = most effective component, 4 = least effective component

^bBracketed ranks indicate disagreement between that component and the total polygraph score.

that the knowledge of the polygraph outcome influenced the interpretation of the PSE charts. Previous research at our laboratory indicates that this is not a significant source of bias when the charts are being evalueted numerically (Barland, 1972b). However, to serve as a check on this possibility the PSE charts were interpreted completely in the blind by one of the inventors of the PSE. The blind evaluator did not know what questions had been asked or what each case involved. He was merely informed as to which were the relevant questions and which were the control questions. Since he was not familiar with the numerical evaluation technique, he made dichotomous decisions of "deceptive" vs "not deceptive." He was instructed that he could make a third choice of "inconclusive", but he preferred to make a definite decision in every case.

The blind evaluator made 11 decisions of "deceptive" and 3 decisions of "not deceptive" (i.e., 3 disagreements with the polygraph). Use of the binomial model $(14, \frac{1}{2})$ found this to be significant at the .05 level. In

TABLE 7

Numbers of Inconclusive and Errors for each Physiological

Parameter at varying cut-off points for the Inconclusive Region

of t	he inconclusive region	Respiration		SRR		Cardiovascular		Voice	
		No. Incl.	No. Errors	No. Incl.	No. Errors	No. Incl.	No. Errors	No. Incl.	No. Erro:
	0	5	1 * ^a	0	0 ***	3	3 n.s.	1.	 1 **
+	1	7	0 **	0	0 ***	7	2 n.s.	4	0 **
+	2	7	0 **	l) ***	9	2 n.s.	6	0 **

Inclusive Boundaries	
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* p < .05
** p < .01
*** p < .01
*** p < .001
n.s. not significant

two of the three cases where the blind PSE evaluation disagreed with the polygraph, my own evaluation of the PSE charts had resulted in a decision of inconclusive. Thus in the 8 cases where both of us had made decisions based upon the voice alone, there was only one disagreement. This was significant at the .05 level using the binomial model $(8, \frac{1}{2})$.

It should be noted that in this high-stress study, the voice data were obtained simultaneously with the polygraph data. Thus, the test was structured around the polygraph technique. The suspects' replies were either "yes" or "no" rather than explanatory, and there were pauses of about 20 seconds between each of the replies. Moreover, the Subjects experienced some degree of discomfort from the blood pressure cuff as the polygraph examination proceeded. This could be expected to induce a certain amount of stress into the testing situation which, by increasing the base level of stress, would tend to mask the responses caused by lying. It would be reasonable to hypothesize that the efficiency of voice analysis in a lie detection situation would be higher in a situation structured around the yoice technique.

The results of the high-stress study shows that reliable changes occur in the voice which are correlates of short-term psychological stress evidenced by changes in the autonomic nervous system. Yet no significant results were obtained in the low stress study. This suggests the hypothesis that a certain amount of stress must be reached within an individual before reliable stress-related changes occur in the voice.

The difference in the level of stress between these two studies

reported here is not the only difference between the two experiments. The two Subject populations were very different in a number of ways: age, education, socio-economic status, number of arrests, IQ, etc. Another difference was the testing methodology used. In the low stress experiment a peak of tension was used, whereas in the high stress experiment a control question test was used. A final difference was that the subjects in the low-stress experiment were instructed to try hard to beat the test and to keep their voice the same each time in order not to give it away in their voice. Previous research has indicated that the harder a Subject tries to beat the test, the easier his lies are detected (Gustafson and Orne, 1963, Lykken, 1960). Perhaps the voice, unlike autonomic indices, is more amenable to voluntary control. However, recent unpublished work by Worth (personal communication, 1973) supports the view that the level of stress experienced by the subject is an important factor affecting the accuracy of voice analysis in a lie detection situation. This hypothesis will be investigated further.

References

- Barland, G.H. An experimental study of field techniques in lie detection. Unpublished Masters thesis, University of Utah, 1972. Available from the author. (a)
- 2. Barland, G.H. The reliability of polygraph chart evaluations. <u>Polygraph</u> 1972, <u>1</u>, 192-206. To be published in N. Ansley (Ed.), <u>Legal Admissibility</u> of the Polygraph, Springfield, Ill.: C. C. Thomas, in press. (b)
- 3. Barland, G.H. & Raskin, D.C. Detection of deception. In W. F. Prokasy and D.C. Raskin (Eds), <u>Electrodermal activity in psychological research</u>. New York: Academic Press, 1973, 417-477.
- 4. Gustafson, L.A. & Orne, M.T. Effects of heightened motivation on the detection of deception. Journal of applied psychology, 1963, <u>47</u>, 408-411.
- 5. Kubis, J.F. Department of Psychology, Fordham University, Bronx, New York. Personal communication, 1973.
- 6. Kugelmass, S. & Lieblich, I. The effects of realistic stress and procedural interference in experimental lie detection. <u>Journal of applied</u> psychology, 1966, <u>50</u>, 211-216.
- 7. Lykken, D.T. The validity of the guilty knowledge technique: The effects of faking. Journal of applied psychology, 1960, 44, 258-262.
- 8. Orne, M.T., Thackray, R.I., & Paskewitz, D.A. On the detection of deception: A model for the study of the physiological effects of psychological stimuli. In N. Greenfield & R. Sternbach (Eds)., <u>Handbook of</u> psychophysiology. New York: Holt, Rinehart & Winston, 1972, 743-785.
- 9. O'Toole, G. Assassination tapes. <u>Penthouse</u>, 1973, <u>4</u>(11), 44-47, 112-114, 124, 126.
- 10. Simonov, P.V. & Frolov, M.V. Utilization of human voice for estimation of man's emotional stress and state of attention. <u>Aerospace Medicine</u>, 1973, <u>44</u>, 256-258.
- 11. Violante, R. & Ross, S.A. Research in interrogation procedures. Office

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of Naval Research, Report 707-65, filed with Defense Documentation Center, AD 467 624, October, 1964.

12. Worth, J.W. Department of Psychology, Washington and Lee University, Lexington, Virginia. Personal communication, August, 1973.

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OHIO SUPREME COURT ADMITS STIPULATED POLYGRAPH EVIDENCE - TEXT OF OPINION

State of Ohio, Appellee, v. Souel, Appellant.

[Cite as State v. Souel (1978), 53 Ohio St. 2d 123.]

- Criminal law Evidence Polygraph examination results Admissibility in evidence — Requisite conditions.
- The results of a polygraphic examination are admissible in evidence in a criminal trial for purposes of corroboration or impeachment, provided that the following conditions are observed:
- (1) The prosecuting attorney, defendant and his counsel must sign a written stipulation providing for defendant's submission to the test and for the subsequent admission at trial of the graphs and the examiner's opinion thereon on behalf of either defendant or the state.
- (2) Notwithstanding the stipulation, the admissibility of the test results is subject to the discretion of the trial judge, and if the trial judge is not convinced that the examiner is qualified or that the test was conducted under proper conditions he may refuse to accept such evidence.
- (3) If the graphs and examiner's opinion are offered in evidence the opposing party shall have the right to cross-examine the examiner respecting:
 - (a) the examiner's qualifications and training;
 - (b) the conditions under which the test was administered;
 - (c) the limitations of and possibilities for error in the technique of polygraphic interrogation; and,
 - (d) at the discretion of the trial judge, any other matter deemed pertinent to the inquiry.
- (4) If such evidence is admitted the trial judge should instruct the jury to the effect that the examiner's testimony does not tend to prove or disprove any element of the crime with which a defendant is charged, and that it is for the jurors to determine what weight and effect such testimony should be given.

(No. 77-486 - Decided February 22, 1978.)

Statement of the Case.

Certified by the Court of Appeals for Franklin County.

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On May 1, 1975, Ralph Allan Steinman was robbed and murdered. There were apparently no clues as to the perpetrator(s) of these crimes until February 1976, when appellant, Gene Souel, who was being held in Franklin County jail on an unrelated charge, offered to supply the police with information relative to certain homicides. After questioning individuals named by appellant in the course of three separate interviews the investigating police officers began to suspect that Souel was implicated in the crimes which he described.

On March 5, 1976, the Franklin County Grand Jury returned a two-count indictment charging appellant with the aggravated murder, and a death penalty specification, and the aggravated robbery of Ralph Steinman. Appellant entered a plea of not guilty to both charges, and thereafter expressed the desire to undergo a polygraph examination. Accordingly, a detailed, written stipulation was entered into by all parties,¹ and on May 6, 1976, a polygraph examination was administered to appellant at the Columbus headquarters of the Ohio State Highway Patrol.

Prior to the date set for trial, appellant moved to suppress the results of the polygraph examination. The trial court overruled this motion, noting that the test had been conducted solely at appellant's request, and the cause came on for hearing before a jury on May 12, 1976.

At trial, the examining pathologist, Dr. Von Ham, testified that the victim's death occurred between midnight and 2:00 A.M. on May 1, 1975, and resulted from two severe skull fractures caused by blows from a blunt instrument. The state also presented, as witnesses, two individuals whom appellant had accused of involvement in the homicide. Cap Anderson stated that sometime after 11:00 P.M. on the evening of April 30, 1975, he observed appellant entering an automobile which contained an alleged female impersonator and a man with a beard, later identified as the victim. Anderson testified that appellant returned 20 to 30 minutes later and offered to buy Anderson a drink, claiming that he had some money because he had just "busted a honky in the head." Artrela Hill, Anderson's girlfriend, testified that she observed appellant in the early morning hours of May 1, 1975, counting a sum of money, and that appellant attempted to sell Anderson a gold Timex watch. She stated further that at this time appellant related that he had just knocked off a trick, that the trick had fought back, and that appellant had hit the trick on the head with a pipe.

Over the objection of defense counsel the polygraph examiner, Sergeant Richard Wilcox of the Ohio State Highway Patrol, was called as a witness. Wilcox testified to his extensive training and experience as a polygraph examiner, and explained at length how the test had been administered to appellant.² Wilcox then expressed the opinion that appellant was deceptive in response to the following four questions: "Do you know for sure who murdered Ralph Steinman?" "Did you murder Ralph Steinman?" "Did you strike Ralph Steinman on the head with a blunt object?" "Did you participate in the Ralph Steinman murder?" Defense counsel thereafter subjected Wilcox to an intensive cross-examination respecting his qualifications and training as a polygraph examiner, the conditions under which the test had been administered to appellant, and the various possibilities for error in the technique of polygraphic interrogation. The defense consisted solely of testimony by appellant, Souel denied robbing or murdering the victim, but admitted, on cross-examination, that he had given the police three conflicting stories in the course of the three separate interviews. Although a police officer testified that Souel had drawn an accurate diagram of the scene of the crime, which diagram was admitted in evidence, appellant denied having done so. Souel claimed that he merely elaborated upon information which had been suggested to him by the police, and he persisted in his allegation that Anderson was the perpetrator of the crimes.

The case was submitted to the jury after the court delivered instructions, including one to the effect that the opinion of the polygraph examiner was not to be deemed conclusive on any point, but rather should be considered and weighed along with all the evidence presented during the trial. They jury returned verdicts of guilty to the lesser included offenses of involuntary manslaughter and robbery, and appellant was sentenced to prison terms of from 7 to 25 years on the manslaughter conviction and from 5 to 15 years on the robbery conviction, with the two terms to run consecutively.

On appeal to the Court of Appeals appellant's principal arguments centered about the admission in evidence of the polygraph examination results. In affirming the convictions below the appellate court held as follows:

" * * * [W]e believe that the preponderance of expert opinion in this field indicates that the test, if conducted by a qualified operator under fair conditions, has substantial probative value in the determination of the question of whether the subject test [sic] is lying or is deceptive, based upon the physiological responses of the examinee during the testing period."

On April 26, 1977, the Court of Appeals for Franklin County found its pronounced judgment to be in conflict with the judgment of the Court of Appeals for Montgomery County in <u>State v. Hill</u> (1963), 40 Ohio App.2d 16, and therefore certified the record of the case to this court for review and final determination, pursuant to Section 3(B)(4) of Article IV of the Ohio Constitution.

Mr. George C. Smith, prosecuting attorney, and Mr. Alan C. Travis, for appellee.

Mr. Myron Schwartz, for appellant.

Opinion per Celebrezze, J.

CELEBREZZE, J. The appellate court below certified the following question for final determination by this court:

"Whether the results of a polygraph examination are admissible into evidence when the defendant, prior to the examination, consents by written stipulation to the admissibility thereof, but withdraws his consent after the results of the test are known but prior to introduction of the testimony at trial." For the reasons hereinafter set for we resolve this question in the affirmative.

The decisions of other jurisdictions relative to this precise issue have not been consistent or uniform. Basically, there are three views on this subject.³ One line of authority holds that the results of a polygraph test are almost always inadmissible, regardless of whether the test is taken pursuant to a stipulation. See, e.g., Pulakis v. State (Alaska, 1970), 476 P.2d 474; State v. Corbin (La. 1973), 285 So.2d 234. Other courts, applying principles of estoppel, have held that once an individual has stipulated to the admissibility of polygraph examination results it would be unreasonable to allow him to prevent their introduction solely because the results appear to be unfavorable. See, e.g., State v. McNamara (1960), 252 Iowa 19, 104 N.W.2d 568; State v. Fields (Mo. 1968), 434 S.W. 2d 507. A third view, and the one which this court endorses, is that where a polygraphic examination is administered pursuant to a stipulation entered into by the parties, the results thereof are admissible in evidence in a criminal trial, but only when certain safeguards have been observed. Examination of the leading decision in this line of authority discloses the qualifications which this court deems to be essential.

In State v. Valdez (1962), 91 Ariz. 274, 371 P.2d 894, the defendant appealed his conviction for possession of narcotics. At trial a polygraph examiner had testified, over objection, as to the results of an examination (unfavorable to defendant) conducted pursuant to a written stipulation. In the course of its review the Supreme Court of Arizona discussed several earlier cases involving the admissibility of lie detector evidence, and noted the considerable improvements in instrumentation and technique since the first such decision was rendered in Frye v. United States (1923), 54 App. D.C. 46, 293 F. 1013.⁴ The court expressed its opinion that although the polygraph had not as yet been perfected, or risen to the status of "general acceptance," the standard for admissiblity proposed in Frye, supra, the device was "developed to a state in which its results are probative enough to warrant admissibility upon stipulation." Valdez, at page 283. The Arizona high court therefore held that polygraphic evidence was admissible in evidence in criminal trials, provided that the following qualifications were met:

"(1) That the county attorney, defendant and his counsel all sign a written stipulation providing for defendant's submission to the test and for the subsequent admission at trial of the graphs and the examiner's opinion thereon on behalf of either defendant or the state.

"(2) That notwithstanding the stipulation the admissibility of the test results is subject to the discretion of the trial judge, <u>i.e.</u>, if the trial judge is not convinced that the examiner is qualified or that the test was conducted under proper conditions he may refuse to accept such evidence.

"(3) That if the graphs and examiner's opinion are offered in evidence the opposing party shall have the right to cross-examine the examiner respecting: "a. the examiner's qualifications and training;

"b. the conditions under which the test was administered;

"c. the limitations of and possibilities for error in the technique of polygraphic interrogation; and

"d. at the discretion of the trial judge, any other matter deemed pertinent to the inquiry.

"(4) That if such evidence is admitted the trial judge should instruct the jury that the examiner's testimony does not tend to prove or disprove any element of the crime with which a defendant is charged but at most tends only to indicate that at the time of the examination defendant was not telling the truth. Further, the jury members should be instructed that is is for them to determine what corroborative weight and effect such testimony should be given." Valdez, at pages 283-284.

This qualified approach to acceptance of polygraphic test results as evidence has been approved in other jurisdictions, several of which have adopted the guidelines set out in <u>Valdez</u>, <u>supra</u>. See <u>State v</u>. <u>Galloway</u> (Iowa, 1969), 167 N.W.2d 89; <u>State v</u>. <u>Lassley</u> (1976), 218 Kan. 758, 545 P.2d 383; <u>State v</u>. <u>McDavitt</u> (1972), 62 N.J. 36, 297 A. 2d 849; <u>State v</u>. <u>Steele</u> (1975), 27 N.C. App. 496, 219 S.E. 2d 540; <u>State v</u>. <u>Ross</u> (1972), 7 Wash. App. 62, 497 P.2d 1343; <u>State v</u>. <u>Stanislawski</u> (1974), 62 Wis. 2d 730, 216 N.W. 2d 8; <u>Cullin v</u>. <u>State</u> (Wyo. 1977), 565 P.2d 445.

We adopt the <u>Valdez</u> qualifications because these requisities respond to the major objections to the admission of polygraph evidence. The requirement of mutual agreement to a written stipulation, and the supervisory power of the trial judge, will insure control over what is generally recognized as the single most important variable affecting the accuracy of the polygraph test results, <u>viz</u>. the polygraph examiner. See Note, 48 N. Y. U. L. Rev. 339 (1973). In addition, the opportunity for cross-examination of the operator by opposing counsel and the delivery of a limiting instruction by the trial court will help to prevent encroachment upon the jury function by undue reliance on this expert testimony.

Despite the ongoing controversy concerning the degree of accuracy of the polygraph device,⁵ it is our opinion that observance of the <u>Valdez</u> qualifications establishes a proper foundation for the admission of polygraph test results, and that these results have probative value in the determination of whether the examinee has been deceptive during interrogation. We note with approval the sentiments expressed by the Supreme Court of Wyoming in <u>Cullin v. State</u>, <u>supra</u>, a very recent decision on the precise issue sub judice, wherein the following appears at page 458:

"We see no reason why the polygraph expert should be treated in any more restrictive manner than other experts. That the polygraph deals with mind and body reactions should not subject it to exclusion from consideration any more than other testimony of a scientific nature. We have long utilized the expertise of psychiatrists and psychologists to furnish advice
and assistance to the jury to explore the mysteries of the mind with respect to mental illness as a defense. Medical doctors are regularly called upon to testify as to the intricate workings of the body in sensitive questions of a complex physical condition or cause of death. It is the normal obligation of the trial judge to protect the jurors from exposure to evidence which might mislead them, regardless of whatever kind of scientific evidence is under scrutiny. The device of cross-examination soon smokes out the inept, the unlearned, the inadequate self-styled expert."

In the cause at bar we find that the requisite conditions for admissibility of polygraph evidence were met. There was substantial evidence tending to indicate that appellant committed the offenses for which he was convicted, and the polygraph evidence was thus merely corroborative. Under these circumstances we hold that the trial court did not err in admitting in evidence the polygraph test results and the expert opinion relative thereto.

According, the judgment of the Court of Appeals is hereby affirmed.

Judgement affirmed.

Herbert, W. Brown, Sweeney and Locher, JJ, concur. O'Neill, C.J., and P. Brown, J., dissent.

Footnotes:

^LThe stipulation signed by appellant, his counsel and the assistant prosecuting attorney reads as follows:

"By agreement among the defendant, the defendant's counsel, and counsel for the State of Ohio, certain understandings and stipulations have been reached and entered into by said parties, as hereafter follows:

"1. The defendant will submit to an examination process utilizing in part, a device commonly known as a 'polygraph' or 'lie detector,' which examination process may involve a series of interviews and tests employing such device;

"2. Counsel for the State of Ohio shall arrange all necessary appointments for such examination process hereinafter referred to as 'Polygraph Testing' or, simply, 'testing';

"3. Counsel for the State of Ohio shall designate the person who will administer and conduct the testing of the defendant, such person to be selected from those persons employed by the Ohio State Patrol as prope rly trained, experienced and qualified to conduct such testing;

"4. Such person designated by counsel for the State of Ohio shall be permitted if called as a witness by the State of Ohio or the Defendant, to testify at trial of this cause as an 'expert' regarding all aspects of the test administered, and such testimony shall be offered and received as evidence in the trial of this cause without objections of any kind by any party to this agreement except as to the weight of evidence it is to be given. EXCEPTION: Should any person administering such test pursuant to this Entry determine the results of such test to be 'inconclusive' as to deception, or lack thereof, on the part of the defendant, then such 'inconclusive' test shall not be the subject of any testimony whatsoever and this entire 'Entry of Stipulation of Use of Polygraph Test' shall be set aside and held for naught;

"5. The defendant and his counsel are under obligation to disclose prior to any testing, any known condition which might affect the reliability of testing pursuant to this Entry; for example, the concealment of medication used by the defendant shall be regarded as a willful breach of this Entry and shall be dealt with as provided in paragraph 9 of this Entry;

"6. The person chosen to administer the testing may refuse to administer the test if, in the judgment of such person the defendant is not deemed a proper subject for examination at the time of examination ($\underline{e} \cdot \underline{g} \cdot$, the defendant is or appears to be under the influence of a drug which might distort test results); in such situation, the person chosen to administer the examination process may determine whether reasonable delay of examination would permit a reliable rest [sic test] to be given and may conduct said test at the appropriate time. If, in the judgment of the person chosen to administer the examination process, the defendant can, through no fault of his own, never be reliably tested, this Entry shall be set aside and held for naught;

"7. Prior to signing this Entry and agreeing thereby to submit to 'Polygraph Testing,' the defendant has been fully advised of his constitutional and statutory rights, and by signing this Entry, he knowingly, intelligently, and voluntarily waives his right to remain silent and his right to seek advice of counsel during any stage of the administration of the polygraph test procedure. Admissions or other inculpatory statements made by the defendant during 'testing' shall be admissible and may be testified to during the trial of this cause.

"8. No testimony or other evidence concerning polygraph test or tests of the defendant shall be received at any stage of the trial of this cause unless such test or test[s] had been conducted pursuant to this or any subsequent Entry.

"9. It is further understood by all parties that upon signing this Entry of Stipulation of Use of Polygraph Test, permitting the results of such test to be introduced into evidence, all parties and their successors in interest (i.e. such other counsel as the State of Ohio or the defendant may retain or employ or be represented by for the trial of this cause) shall be mutually bound to the terms of said Entry. The willful refusal of any party to submit to or comply with any provision of this Entry shall be the proper subject of evidence and testimony to be adduced during the case in the trial of this cause, and may, further, in the Court's discretion,

be punishable by additionally appropriate civil and/or criminal contempt remedies and procedures; except that the State of Ohio or the defendant may withdraw from this agreement as herein agreed at any time prior to the commencement of the test procedure in which event this Entry shall be set aside and held for naught;

"10. It is further understood, in keeping with normal testing procedure, that the polygraph examiner will hold in confidence any admissions or statements made by the defendant which pertain to matters not under investigation."

²As is ordinarily the case, the polygraph machine operated by Sergeant Wilcox consisted of a cardiograph, which registers pulse rate, a sphygmograph, which measures blood pressure, a pneumograph, which measures respiration, and a galvanometer, which measure electrodermal responses. The theory underlying the employment of the polygraph device for lie detection is that the act of lying causes a conscious conflict in the mind of the examinee, producing an emotion of fear or anxiety, which in turn causes the autonomic nervous system to respond involuntarily, as manifested by fluctuations in pulse rate, blood pressure, respiration and perspiration. For further discussion of the relationship between deceptive conduct and physiological responses thereto see, generally, Reid & Inbau, Truth and Deception: The Polygraph ("Lie Detector") Technique 1-5 (1966); and Skolnick, Scientific Theory and Scientific Evidence: An Analysis of Lie Detection, 70 Yale L. J. 694 (1961).

³A small minority of jurisdictions will admit or recognize the possibility of admitting, polygraph test results in the absence of a stipulation between the parties. The subject must voluntarily agree to take the test, since the United States Supreme Court has held that polygraph evidence is "essentially testimonial" (<u>Schmerber v. California</u> [1966], 384 U.S. 757, 764). However, there is no corresponding necessity that the prosecutor stipulate to the admissibility of the results at trial. A defendant who wishes to take a polygraph examination and admit the results will be permitted to do so, subject only to broad discretion in the trial judge to disallow the evidence in a particular case if the test was improperly conducted. See <u>United States v. Ridling</u> (E.D. Mich. 1972), 350 F. Supp. 90; <u>Commonwealth v. A Juvenile</u> (1974), 365 Mass. 421, 313 N.E.2d 120; <u>State v. Dorsey</u>, (1975), 88 N.M. 184, 539 P.2d 204.

⁴In holding that the forerunner of the polygraph had not yet achieved general recognition and acceptance among psychologists and physiologists so as to support the admission in evidence of expert testimony relative thereto, the court in <u>Frye v. United States</u> (1923), 54 App. D.C. 46, 293 F. 1013, stated, at page 1014:

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"* * * Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."

This standard for admissibility of polygraph evidence has not gone unchallenged, and some commentators contend that normal evidentiary requirements should be substituted for the artificially high test first established in <u>Frye</u>. See, e.g., Kaplan, The Lie Detector: An Analysis of Its Place in the Law of Evidence, 10 Wayne L. Rev. 381, 402-407 (1964). With regard to the <u>Frye</u> decision, Professor McCormick has made the following comments:

"* * * 'General scientific acceptance' is a proper condition for taking judicial notice of scientific facts, but not a criterion for the admissibility of scientific evidence. Any relevant conclusions which are supported by a qualified expert witness [footnote omitted] should be received unless there are other reasons for exclusion. Particularly, probative value may be overborne by the familiar dangers of prejudicing or misleading the jury, and undue consumption of time. [Footnote omitted.] If the courts used this approach, instead of repeating a supposed requirement of 'general acceptance' not elsewhere imposed, they would arrive at a practical way of utilizing the results of scientific advances." McCormick on Evidence (2d Ed. 1972) 491, Section 203.

As to the judicial reluctance to accept polygraph evidence in the more than five decades since <u>Frye</u> was decided. Professor McCormick concludes at pages 506-507, as follows:

"In the numerous opinions and the large commentary, the principles underlying the test, the qualifications and procedures of the polygraph operator, and the considerable statistics developed concerning the technique, have been subjected to a more searching and critical analysis than that accorded to any other form of evidence considered in this chapter. [Footnote omitted.] Neither the concessions of critics that its accuracy in the detection of insincerity is of the order of 70 percent or more, [footnote omitted.] nor the widespread use of and reliance upon it in police investigation, business, industry, and government, [footnote omitted] nor the persistent efforts of trial courts to make some use of the evidence. [footnote omitted] have made any inroads on that position.

"As suggested in a previous section, the explanation can scarcely be found in any serious contention that even the opinion of a qualified expert in the field throws no light on the question of whether relevant statements made by a party or witness were sincere or not. The exclusion seems to rest more upon a judicial estimate of the weight that the trier of fact will give to the opinion, and a demand that the opinion be almost infallible because the trier will think it so. [Footnote omitted.] "The one avenue of admissibility that has not been completed closed is that of stipulation by the parties. From an early case, [footnote omitted] allowing the use of the test evidence on this basis, there has developed a growing minority view that the results may be received if the parties enter into an adequate stipulation to that effect. [Footnote omitted.] The experience gained in this way, especially on the question whether triers are actually unable to evaluate this type of evidence, may make possible a more informed conclusion on the larger question of general admissibility of polygraph results."

⁵For estimates of accuracy see F. Horvath and J. Reid, The Reliability of Polygraph Examiner Diagnosis of Truth and Deception, 62 Journal of Criminal Law, Criminology and Police Science 276, 278-279 (1971) (91.4 percent accurate for examiners with more than one year's experience); R. Pfaff, The Polygraph: An Invaluable Judicial Aid, 50 A. B. A. J. 1130, 1132 (1964) (96 percent accurate, 3 percent inconclusive, 1 percent maximum known error); L. Burkey, The Case Against the Polygraph, 51 A. B. A. J. 855, 856 (1965) (70 percent accurate).

* * * * * *

TECHNICAL NOTES

CALIBRATION PROCEDURE FOR THE ALL ELECTRIC STOELTING POLYSCRIBE

By

Ronald E. Decker

- 1. Neutralize controls.
 - a. All sensitivity controls to "O".
 - b. All centering controls to counterclockwise position.
 - c. AC power switch off.
 - d. Pressure roller lever in "up" position.
 - e. Pneumo and cardio vents open.
 - f. Sphygmomanometer dial zero.
 - g. Pinch clamp open.
 - h. Pump bulb release valve closed.
 - i. Mode selector switches to appropriate position.
- 2. Sensitivity checks for upper and lower pneumo.
 - a. Mode switch at pneumo position.
 - b. Vent open.
 - c. Fasten chest assembly around a solid object extend 1 inch and fasten.
 - d. Close vent.
 - e. Turn sensitivity control to "max" or "100".
 - f. Center pen on base line.
 - g. Depress test switch, causing approximately 1/8 inch upward excursion (hold for 5 sec.).
 - h. Expand chest assembly approximately 1/8 to 1/4 inch.
 - i. Pen should move upward approximately 3/4 inch.
 - j. Pen should not return to base line within two minutes.
- 3. Sensitivity check for cardiosphygmograph.
 - a. Mode switch in cardio position.
 - b. Close vent and inflate system to 60 mm Hg.
 - c. Turn sensitivity to "20".
 - d. Center pen on base line.
 - e. Depress test switch this should cause approximately 1 cm upward excursion of pen (hold for 5 sec.).

- f. Squeeze cuff sufficiently to cause 2 mm Hg. rise on sphygmomanometer.
- g. Pen should rise approximately 3/4 inch.
- h. Pen should not fall more than 1/4 inch in 10 min.
- 4. GSR.
 - a. Disconnect or short finger electrode assembly.
 - b. Mode switch to "MAN".
 - c. Turn sensitivity to "max" or "100".
 - d. Center pen on base line.
 - e. Depress "IK" pip switch pen should rise approximately 1 inch.
 - f. Mode switch to "auto".
 - g. Depress "IK" pip switch pen should rise approximately 1 inch and return to base line.

* * * * * *

James Hassett's A Primer of Psychophysiology

San Francisco: W. H. Freeman & Co., 1978, 215 pp., indexed, illus.

A REVIEW

By

Gordon H. Barland

Having long been ignored by the scientific community, the polygraph field is being increasingly recognized as worthy of serious scientific interest.

Until 1972, scientists had contented themselves with publishing isolated articles of individual experiments. Then in 1972, Orne, Thackray & Paskewitz published a chapter on the detection of deception in the <u>Handbook of Psychophysiology</u>, in which they indicated that the detection of deception is a basic paradigm for research in psychophysiology. The next year, Barland & Raskin published a chapter in <u>Electrodermal Activity in Psychological Research</u>, in which they suggested that this area was of legitimate scientific interest and should not be ignored. Now, Hassett has written a book for students of psychophysiology in which he devotes a chapter to "two of the most important current applications of psychophysiological knowledge and methodology" (page 127), lie detection and biofeedback. This is certain to stimulate future research in lie detection by those now entering careers in psychophysiology.

Hassett's review of lie detection is reasonably objective and straight forward in the facts that he presents and articles that he mentions. Unfortunately, it is discolored by a bias often seen among those scientists who have not been trained in field techniques. For example, on page 130 he writes, "the polygrapher tells his victim" Also in his brief comments on possible countermeasures, he appears to be instructing or encouraging the reader: "Whenever you want to produce a response, merely try to multiply two long numbers in your head or think angry or sexy thoughts. If you can appear to maintain your concentration throughout, this should work for most people." His wording detracts from the objectivity that should be expected of a scientist. Finally, he concludes the lie detection portion of that chapter with the quotation from a book review of Barthel's A Death in Canaan, "(a) chilling ... exposure of the Connecticut State Police's dependence upon and mindless faith in these damned machines." Fortunately, more than one person has been inspired to conduct research to prove lie detection wrong, only to wind up supporting it.

This bias can be attributed, at least in part, to a misunderstanding of how a polygraph examination is conducted. He describes the pretest interview as being largely an interrogation. He states that in a murder case, a control question might deal with the use of drugs, commenting that "the theory here is that the innocent person will react equally to all questions accusing him of anything illegal ..." Hassett thus seems to be describing how polygraph examinations were conducted several decades ago. It most certainly does not describe the scientific approach used with criminal suspects by the mainstream of the polygraph profession today. It is therefore no wonder that he concludes that "most professionals prefer to make global judgements based on all the evidence available and from the conduct of the suspect during the interview rather than strictly from his physiological responses. Thus, the whole procedure can be seen as one more method of police interrogation rather than as a strictly physiological test." (p. 131)

The value of Hassett's book for the polygraph field lies not with his review of lie detection, but rather with a number of other chapters dealing with various aspects of psychophysiology of vital importance of the detection of deception. Chapter 2, "Mind and Body," deals with the organization of the nervous system and discusses both the central nervous system and the autonomic nervous system, followed by a discussion of emotion and arousal. In a truly excellent chapter devoted to the sweat glands, Hassett imparts a wealth of detailed information in a highly readable and enjoyable manner. The description in another chapter of Aldini Galvani's attempts to bring the dead back to life by restoring their "animal electricity" is fascinating and will be enjoyed by every reader. The chapters on the cardiovascular system, the respiratory system, and psychophysiology in perspective will also be of interest to polygraph examiners. Other chapters on the eyes, muscles, and brain are well written and informative, though of only marginal interest to most examiners.

Until now, the Sternbach book has been the only psychophysiology text suitable for use at polygraph schools. Regretably, at least one school refuses to use that because Sternbach co-authored an anti-polygraph article some time ago. The present text by Hassett should thus be acceptable to all polygraph schools. It has one other advantage over Sternbach's book: it is paperback and is therefore less expensive. Because the two books have different purposes and cover somewhat different areas, those schools already employing the Sternbach book should consider using both books as texts. However, for the majority of schools, which are not using either book, Hassett's book would be an excellent text which is more appropriate as physiology text because a much greater proportion of the book is directly relevant to the student examiner. This book also makes an excellent review for examiners who are facing their licensing examinations or otherwise wish to review psychology and psychophysiology.

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Robert Gordon's Forensic Psychology

Arizona: Lawyers & Judges Publ. Co. 1975, 133 pp.

A REVIEW

By

George Lassen, Ph.D.*

A simplistic text that will alert many members of the legal profession to aspects of psychology relevant to the legal process. Topics explored include attorney-client rapport, jury selection, understanding the function and behavior of judges and how evidence is perceived. There is a deliberate attempt to sensitize the attorney to the probably psychological needs of his client as well as identify the multiple psycho-social factors that contribute to the attitudes and behaviors of participants in the trial process with especial emphsis on the subjective idiosyncratic elements that affect an individual's judgment. Unfortunately, much of the psychological research that is cited tends to be from the 1960's or earlier, and was not done within the context of the judicial process. Instead, the author has interpreted studies in learning and social psychology in a manner which suggests their valid applicability to forensic work. A reading of this text will no doubt result in "great expectations" of expertise from the psychological consultant. I doubt that most of my colleagues will be able to maintain the image of excellence that the author has cast about himself.

* * * * * *

Ehrstine and Mack's <u>Profitability Through Loss Control</u> Cincinnati: Anderson Publishing Co.,

A REVIEW

By

Marcus H. Ford**

<u>Profitability Through Loss Control</u> by Ehrstine and Mack is an introductory handbook for bankers and bank loss prevention personnel regarding security controls for financial institutions. The need for loss control is established in the introduction by enumerating some of the problems to be met and defended against. Also, the Bank Protection Act of 1968 is outlined here. The authors have divided the book into three sections: Protection Planning, Protection of Assets, and Protection During Crises.

^{*}Dr. Lassen is a Professor, Department of Psychology, University of Baltimore.

^{**}Mr. Ford is Second Vice President and Director of Loss Prevention, The Omaha National Bank.

In the Protection Planning section, guidelines are given and explained regarding the employee hiring process; they examine the pros and cons of a contract guard force versus an in-house staff; and follow with a discussion of alarm systems and surveillance equipment. This book is quite helpful in pinpointing the advantages and disadvantages of both a police department and central station alarm termination. The same format is used as regards surveillance systems including operation cost factors.

In the second section, Protection of Assets, the authors have covered everything from check abuse and misuse to the numerous fraudulent schemes used by con artists to swindle financial institutions. This section can be particularly helpful to all size banks with its many practical suggestions for thwarting the "ballpoint bandits". Constant alertness, common sense procedures, and familiarization with the many devious techniques are stressed here.

Protection During Crises could be considered the most important portion of the book inasmuch as it deals with protection of human life. Procedures to follow during and after a robbery, kidnap/extortion, and bomb threats are detailed and explained. The authors have given particular attention to these threats and the many facets that such situations present. The instructions given for dealing with these crimes are well worth the reading.

I believe this book has something to offer Bank Security Officers in institutions both large and small. It can serve as an excellent reference and training tool for not only the "rookie" Security Officer but the veteran as well.

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Polygraph 1978, 07(2)

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POLYGRAPH REVIEW

By

Bobby J. Daily

How would you score on a licensing examination? Are you sufficiently upto-date about such subjects as psychology, physiology, instrumentation, test question construction, chart interpretation, interview techniques, etc? Are you prepared to undergo direct and cross-examination on polygraph subjects in court? A score of 9 or 10 is excellent, 7 or 8 is good, and below 7 may indicate some review is warranted. (Answers on page 88.)

- 1. The sympathetic division of the autonomic nervous system will cause which of the following?
 - a. Heart rate will increase and eye pupils will dilate.
 - b. Salivary glands will secrete copiously and sweat gland action will decrease.
 - c. Systemic blood pressure and blood sugar will both increase.
 - d. Coronary blood vessels and eye pupils will both constrict.
- 2. The autonomic nervous system DOES NOT innervate which of the following?
 - a. Smooth muscles
 - b. Skeletal muscles
 - c. Cardiac muscles
 - d. Glands
- 3. Which of the following patterns is likely to occur if the subject hyperventilates during the test?
 - a. Extra systoles occur in the cardio tracing.
 - b. Blood pressure goes up and remains high.
 - c. Cyclical changes occur in the cardio tracing.
 - d. Significant decrease in the pulse rate.
- 4. When the examiner encounters the hyperthyroid factor, he should consider that it may cause:
 - a. numerous extra systoles.
 - b. a slow pulse rate.
 - c. a fast pulse rate.
 - d. an erratic tracing.
- 5. The heart chambers are called:
 - a. Medulla and cerebrum.
 - b. Right and left atria.
 - c. Axons and ganglion.
 - d. Right and left ventricles.

- 6. (T) (F) The autonomic nervous system is a sensory system.
- 7. (T) (F) The action of the parasympathetic nervous system is usually to decrease activity.
- 8. (T) (F) Respiration is controlled by the medulla.
- 9. (T) (F) The aorta goes from the heart to the lungs.
- 10. (T) (F) The blood pressure cuff, when applied to the upper arm, is centered over the radial artery.

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ABSTRACT

Widacki, Jan. "Wartosc Diagnostyczna Badania Poligraficznego i jej Znaczenie Kryminalistyczne." ("Accuracy of Diagnosis of the Polygraph Examination"). Krakow: Nakladem Uniwersytetu Jagiellonskiego, 1977, 135 pp. 10 figures.

After a general review of the world literature on the polygraph, Widacki describes a unique experiment in which he compares the polygraph with other forms of conventionally used evidence, eyewitness identification later matched against photographs, fingerprint identification, and handwriting identification. The best method in the experiment, conducted under laboratory controls, proved to be the polygraph, because it left the fewest unsolved cases and had the largest number of correct answers. Although the fingerprint examiner made no mistakes, and therefore was slightly more accurate, there were many cases which he could not call at all. The other methods were both less accurate and less useful.

[Text in Polish.]

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