

COMPARISON OF STANDARD "YES/NO" RESPONSE AND "KEYWORD" RESPONSE IN A COUNTERINTELLIGENCE-SUITABILITY POLYGRAPH EXAMINATION

By

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For decades we have been instructing polygraph subjects to answer our test questions with only a "yes" or "no" response. With this definitive "yes" or "no" response the polygraph subject is forced to unequivocally commit verbally to a position of either truth or deception. This simple, one syllable response further provides minimal disruption of the respiration pattern. This fundamental "yes" or "no" method of responding to the question stimulus has been extremely effective, but is it actually accomplishing all that it can?

What would happen if the subject was asked to repeat the *"key word" from the question along with the standard "yes" or "no"? For example,

Irrelevant Question:	Are you in <u>Ohio</u> right now?
Answer with Key Word:	" <u>Ohio</u> , yes."
Relevant Question:	Yesterday evening did you <u>give</u> any of that hashish to those men?
Answer with Key Word:	" <u>Give</u> , no."
Control Question:	Before last year, were you ever in <u>possession</u> of anything which is ille-gal?
Answer with Key Word:	"Possession, no."

Selection of the proper "key word" is important. The word from each test question that would serve as the best "key word" is sometimes debatable and will receive more comment later in the study.

It has been suggested that subjects tended to increase their responsiveness when asked to repeat the "key word" in conjunction with their "yes" or "no" response. An informal research project that supports this theory involved polygraph subjects who were required to repeat the "number" before responding "no" during a "known number" stimulation test. A stimulation test in its various forms is routinely used by many polygraph examiners in an effort to stimulate the subject by convincing the subject that deception is detectable by means of the polygraph technique. (Reid-Inbau

*Key Word: The word selected from each test question that will most adequately explain or identify to the subject the gist of what is being asked.

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1976). The informal research project required subjects to repeat the number "key word" before answering "no", <u>i.e.</u>, "<u>five</u>, no", "<u>six</u>, no", to determine its effect upon the subject's ability to respond to the known lie question. The project involved a mock crime setting and addressed itself exclusively to the stimulation test. The present study takes this technique a step farther by addressing itself to relevant issue questions in a field situation.

The psychological impact on the subject who is instructed to repeat the "key word" is twofold. First, an untruthful subject is not only denying involvement with a "no" response but it is also verbally recreating the action that is under investigation, <u>i.e.</u>, "<u>give</u>, no", "<u>possession</u>, no". During a properly conducted pre-test interview we are tacitly inviting the subject to become a "contestant" in the examination process. The introduction of the "key word" with the subject's "yes" or "no" answer increases the subject's active involvement in the testing phase and attention to the stimulus. This method would also make the use of psychological countermeasures, <u>i.e.</u>, dissociation difficult for the subject to implement.

The second important consideration is the psychological impact on the truthful subject. When the "key word" is properly presented, it should help the truthful subject focus on the main point of the question. This is particularly significant when conducting screening examinations. In screening examinations, truth and deception becomes more complex. Not only is there a multitude of relevant issues to investigate, there is also an element of the unknown. Is the deception indicated in a subject's charts the foreboding of a major espionage case, or is it merely the anxiety of an overly conscientious individual who committed a minor security violation? Whether or not the deception indicated is merely the tip of the iceberg, the screening examination will involve a great deal of additional probing to resolve the issue and reach a satisfactory conclusion. Further complicating the process are the psychological set considerations and the masking of responses.

In this study, presentation of the "key word" to the subject was accomplished as the test questions were revised. The presentation was made in a positive, logical manner that smoothly flowed as an integral part of the pre-test interview. Each subject was given the following instructions regarding the "key word":

"We have found that occasionally when people take a polygraph examination they have a tendency to try too hard. They make the test more difficult by over-thinking questions, dwelling or searching their minds. They may look for hidden meanings to questions or for things they may have forgotten. This is not necessary during a polygraph examination. The polygraph measures what you know to be true to the best of your knowledge. If there was anything significant, you would know that now. What makes the test so easy is that you know all of the questions. At this point, you know whether or not you are telling the truth. If you have anything to hide, the questions will not require any more thought.

"To make the test easier and to help you focus on what each question is specifically asking, I will repeat the 'key word' from each question after it is asked. I want you then to answer by repeating the 'key word' back to me and then your appropriate answer, 'yes' or 'no'. For example, when I read the question I will say: 'Are you in <u>Ohio</u> right now - <u>Ohio</u>?' You will respond simply: 'Ohio, yes,' etc."

To expect the subject to remember each "key word" especially in a counterintelligence/suitability test involving 14 or more questions (including irrelevant and control questions) is not only unrealistic but dangerous. False positives could occur merely from the subject struggling to recall the appropriate "key word." Consideration was given to devising a system that would have the "key word" visually appear in front of the subject during the examination. It was determined that the simpliest approach and one that could also be duplicated in any testing environment would be for the examiner to verbally repeat the "key word" at the end of each question.

Selection of the "key words" from each test question was approached with flexibility and common sense as the guide. Unfortunately, because of proprietary nature of the relevant questions asked during the counterintelligence/suitability tests, administered in the study, the specific questions and "key words" cannot be provided. Most would agree that proper question formulation is the "guts" of any sound polygraph examination. Borrowing from this premise, the selection of "key words" followed the same fundamental principles as in question formulation. As mentioned previously, the best "key word" for a given question is sometimes debatable. For example, a standard question asked during screening examinations is:

"Have you ever committed a serious crime?"

At first glance, most people would select "crime" as the "key word", <u>i.e.</u>, "<u>crime</u>, no." However, the word "crime" encompasses jaywalking to homicide. Since the purpose of the "key word" is to identify to attack subject the gist of the question, the word "serious" was selected. The adjective "serious" focuses the subject's attention and helps keeputheeqdestion in perspective rather than allowing the subject's mind to wanderwite(strivet incidents in the past.

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Another example, involving the issue of adult homosesQubtotic distribution of adult homosesQubtotic distribution during some screening examples is the "key word" reporse,

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Because juvenile homosexual activity isredotriofsconcernesse swantqato direct the subject's attention to adult homosexuabractvivitylo findrefore the adjective adult would be the best selectricorpyasqtheed" inditis also avoids having the subject repeat auther word, viteass thomosexuadint that the subject might find emotionally provoking. The best "key word", however, is not necessarily always the Hadder prive adjective. One question from the study involved the issue of guilty knowledge, e.g., the relevant question:

were randomly assigned to one of two groups. The solution of two groups. The solution of two groups. The solution of the solut

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In this situation, rather than use "know" as the "key word" and have the subject confusingly respond "know-no", the word "knowledge" was used as the "key word" and repeated at the end of the question, <u>i.e.</u>, "knowledgeno". Consider an earlier example,

"Yesterday evening, did you give any of that hashish to those men?"

When the crime occurred (yesterday) is not the major issue. Who received the hashish (men) is not a major issue. Both would be unsatisfactory "key words". What was given (hashish) is a major issue and might be an acceptable "key word". However, in this case the action verb "give" identifies exactly what is at issue and most descriptively recreates what occurred.

These principles apply in the selection of "key words" for the control questions and known truth questions as well. Consider the control question from the earlier example,

"Before last year, were you ever in possession of anything which is illegal?"

For the sake of discussion, the issue is "possession". Therefore, the only logical "key word" in this instance would be "possession."

"Key word" selection for known truth questions becomes quite obvious and does not require much thought. For example,

"Is you first name <u>Steve</u>?" Answer: "<u>Steve</u>, yes." "Are you now in San Francisco?"

Answer: "San Francisco, yes."

This study compares the utility of the standard "yes/no" response and the "key word" response during the administration of screening examinations. The utility of these two alternative technique approaches is compared within the context of the Relevant/Irrelevant Technique as currently taught at the Department of Defense Polygraph Institute. Although it is appropriate to compare the validity of the standard "yes/no" response with the "key word" reponse, it is not possible to independently verify the truthfulness of an examinee's answers to each question in a field setting. Therefore, utility of the standard "yes/no" response with the "key word" response was assessed in terms of information developed, total test minutes, chart clarity, and case resolution. The study is particularly significant because other polygraph screening programs throughout the federal government are presently in developmental stages.

METHOD

One hundred and twenty subjects of official polygraph examinations were randomly assigned to one of two groups. Group 1 was tested using the Relevant/Irrelevant Technique with the standard "yes/no" response by each subject. Group 2 was also tested using the Relevant/Irrelevant Technique

but with the "key word" response by each subject. Each polygraph examination consisted of several series of charts with the particular technique. A series consisted of counterintelligence and suitability relevant questions. An example of this test is listed in Table 1. However, in actual practice the mix, sequence, and number of questions asked in a chart varies considerably. The technique employed is somewhat similar to that described on page 97 in Weaver and Garwood (1985). Inter-question interval (time between a subject's answer and the presentation of the next relevant question) was 10-15 seconds. The design of the study was as follows:

	Counterintelligence	Suitability		
	<u>Relevant Questions</u>	<u>Relevant Questions</u>		
Group 1 - "yes/no" response	n = 60	n = 60		
Group 2 - "key word" response	n = 60	n = 60		

The author and two other certified polygraph examiners conducted all of the examinations included in this study. The three polygraph examiners involved in this study each have over 10 years of polygraph experience. All of these examinations were initial phase tests. No reexaminations were included in the study.

TABLE 1 RELEVANT - IRRELEVANT COUNTERINTELLIGENCE/SUITABILITY PHASE (EXAMPLE)

Position (Flexible)	<u>Type of Question</u>
1	Irrelevant
2	Irrelevant
3	Relevant
4	Relevant
5	Relevant
6	Irrelevant
7	Relevant
8	Relevant
9	Irrelevant
10	Relevant
11	Relevant
12	Relevant
13	Irrelevant
14	Relevant
15	Relevant
16	Irrelevant

All examinations were administered using a Lafayette Ambassador Polygraph Instrument (Model #761-636) which monitored relative change in thoracic and abdominal respiratory patterns, electrodermal activity, and cardiovascular activity.

Table II lists the data collected on each subject. The examiner made

a decision of no significant reactions (NSR), significant physiological reactions (SPR), or inconclusive (INC) for the counterintelligence/suitability series. Other data from each series included whether any information and whether potentially disqualifying information was developed during the pretest and after the first charts, test minutes (measured from the time the relevant questions were introduced to the end of the discussion about the questions), chart clarity, number of charts and whether there was no interrogation, mild interrogation, or strong interrogation. Mild interrogation was defined as general questioning about the erratic and inconsistant nature of responses. Strong interrogation was defined as specific questioning and confrontation on a specific issue.

In regard to chart clarity, it is defined as an examiner's subjective judgement on a scale of one to seven concerning his overall evaluation of the charts. Seven signifies the clearest charts and one signifies the poorest charts. If the charts are moderately clear, a four is appropriate.

The following tabulation was performed on the data:

TABLE 2 TABULATION OF 120 CASES

	(60 CASES) YES/NO	(60 CASES) Key Word		
<u>RESULTS</u> : *	<u>NSR SPR INC</u>	NSR SPR INC		
	53 4 3	55 1 4		
CHART CLARITY:	5.73 (Scale of 1 to 7)	5.02 (Scale of 1 to 7)		
AVG. TEST TIME:	89.73 minutes	83.3 minutes		
AVG. # OF CHARTS:	2.78	2.75		
INTERROGATION:	<u>NONE MILD STRONG</u> 48 6 6	NONE MILD STRONG		

^{*} In regard to results, reports from counterintelligence/suitability polygraph examinations are not reported as "deception indicated," "DI," "no deception indicated," or "NDI." Instead, the reports are "NSR" for "no significant physiological reactions" and "SPR" for "consistent significant physiological reactions to the questions ...". "INC" means inconclusive. An SPR report will actually read, "There are consistent significant physiological reactions to the question(s) ... There are no significant physiological reactions to the other relevant questions."

TABLE 2 (Cont.)

		(60 CASES) YES/NO		(60 CASES) Key Word
INFORMATION OBTAINED BEFORE CHARTS:	COUNTER- INTELLI- GENCE	SUITABILITY	COUNTER- INTELLI- GENCE	SUITABILITY
	0	20 Admission to one issue 10 Admission to two issue 5 Admission to three is- sues.	as O e. es. es.	24 Admissions to one issue. 11 Admissions to two issues. 3 Admissions to three is- sues.
	25 Provid cant info to charts	ed no signifi- rmation prior •	22 Prov cant in to char	ided no signifi- formation prior ts.
INFORMATION OBTAINED AFTER CHARTS:	COUNTER- INTELL- GENCE	SUITABILITY	COUNTER- INTELL- GENCE	SUITABILITY
	0	3 Admissions to one issue l Admission to two issue	. O	4 Admissions to one issue.

DISCUSSION

This study has evaluated the utility of the standard "Yes/No" response and "Key Word" response in the context of counterintelligence/suitability screening examinations. Results demonstrate that the standard "Yes/No" response and the "Key Word" response produce similar numbers of NSR, SPR, and INC conclusions. The standard "Yes/No" response and "Key Word" response are similarly successful in developing information. The technique did not influence ease of interpretation of polygraph charts. The average number of charts necessary to reach a determination were nearly identical. Although more pretest time was taken in presenting "key word" instructions, the overall time for these two types of interviews did not differ significantly.

Surprisingly, most Subjects were able to easily grasp the "Key Word" concept and follow test instructions properly. In only seven cases did the Subject or examiner attribute procedural difficulties to the "Key Word" technique. In five of these cases, the Subject expressed confusion with this method and had some difficulty following instructions. In the other two cases, an erratic breathing pattern was attributed to the Subject responding with the "Key Word." However, as previously indicated this did not seem to effect chart clarity or results. The similarity in the results of the two techniques is neither encouraging nor discouraging. What it suggests is that the fundamental "yes or no" method of responding to the question stimulus does not necessarily have to be the only way the Subject can be directed to answer questions during the test. A more valid approach to determine the effectiveness of the "Key Word" technique may be in specific issue testing. The "key word" technique may also prove to be a useful anticountermeasure to dissociation. At the minimum, the "Key Word" response should be given consideration as an alternative in approaching reexaminations when the examiner suspects the Subject to be unstimulated or having difficulty focusing on what is relevant. Further research into alternative technique approaches is suggested by the results of this study.

TABLE III WORKSHEET

Examiner Subject Number Age Sex Type Case (circle) Applicant Contractor Group Assignment (circle) No Repeat Repeat NSR SPR INC Decision (circle) Information obtained Prior to Charts on the Following Relevant Areas (circle) 1 2 3 5 7 8 9 10 Δ 6 Information obtained After Charts on Following Relevant Areas (circle) 5 1 4 6 7 8 2 3 9 10 Chart Clarity 7 1 2 3 4 5 6 Charts Charts Verv Very Clear Unclear Interrogation (circle) None Mild Strong Test Time (compute from start to end of Minutes test POT Test Techniques Used R-I MGQT (Number of Charts)

Remarks

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Tommie E. Adkins, M.A.

An important part of law enforcement operations involves the use of The amount of time, effort and money invested in informant informants. operations continues to grow every year. U.S. government expenses for undercover operations, specifically, payments for informants and bribes, increased from \$1 million in 1977 to \$12.5 million in 1984.[1] There is another cost associated with informant operations that also must be considered, the safety of law enforcement personnel. Each year, law enforcement personnel are injured or killed while performing informant operations. Sometimes, the informant deliberately sets up his handler or he may provide false information that inadvertently leads to casualties. As polygraph examiners, we can help limit some of these problems by ascertaining whether or not the information provided by the informant is accurate. One general statement we can make about informants is that they will lie to us. Some lie for personal gain, others at the direction of someone else and other simply improvise details because we are pushing them too hard for information they really cannot provide. The polygraph examination can separate the truthful information from the false so that we can better channel and protect our resources.

When attempting to assess the accuracy of the informant's information, all tools at our disposal should be used. If possible, we want to avoid having to accept at face value information concerning criminal activity from someone who is probably also a criminal. The polygraph can be of great assistance in this area. If time permits and other investigative methods are available to either confirm or refute the information, they should also be used. We should avoid making the polygraph examination the sole source of confirmatory information just as we would avoid relying completely on any other investigative procedure. The polygraph examination can also be used as a means of controlling an informant. If he knows that he may be examined, he may be reluctant to provide false information.

Who are these informants to whom we could administer polygraph examinations? We receive a great deal of information on a daily basis and anyone providing this information could be considered an informant. However, it is neither desirable nor practical to administer a polygraph examination to everyone who provides us with information. Therefore, we must determine what informants are examined and what variables are used in making the decision to administer a polygraph examination to an informant.

Informants may be placed in two major categories, the one time informant and the informant who provides information on a recurring basis. The one time informant is someone who has information concerning criminal activity that he is willing to provide, but he has never provided information in the past and is not expected to possess such information in the

The author is a federal examiner, an instructor at the Defense Polygraph Institute, and a member of the APA. For reprints write to the author at the Defense Polygraph Institute, Ft. McClellan, Alabama 36205. future. Usually, these people are merely ordinary citizens who witness a crime or are victims of a crime. As a general rule, they would not be examined. However, there are circumstances under which it may be prudent to examine such individuals. A one time informant may provide information which appears to be important, but cannot be verified by any other means. In order to use the information, expensive, both in terms of dollars and manpower, investigative methods will have to be used. If the informant is the sole source of the information, confirmation by other means could compromise him and place him and/or the investigation in jeopardy. This type of informant could be the spouse or a close associate of the perpetrator. A one time informant may provide serious information which must be immediately verified because of time constraints. An example would be an informant who provides information concerning a bomb, or a terrorist attack. An informant may also provide information that, if wrong, could be embarrassing to the department or agency involved when further investigated. The information could be about important political or community leaders or government or civic organizations. This does not mean that matters of this type should not be pursued; only that we should sometimes be cautious. This list is not designed to be all inclusive, but only provides examples about how a polygraph examination could be useful when dealing with a one time informant.

When examining the one time informant, we are primarily interested in assessing the information provided by the informant. The informant can only be examined concerning what he actually knows and what he has himself perceived. The informant can be examined concerning what someone else has told him; however, no opinion concerning the veracity of the original information can be rendered. The following questions are designed to show that what the informant reported actually happened. I cannot stress too strongly that you can only verify what the informant actually saw or heard.

Did you see (a person or material) at Bob's house?

Did you hear Bob say _____?

Did Bob tell you _____?

Did you smell marijuana smoke at Bob's house?

A by-product of using the above questions to determine the veracity of information is also to determine the origin of the information. Informants often try to pass off rumors and hearsay information as original information based on their observations. The information may or may not be true; however, if the informant is not the original source, the accuracy of the information becomes more suspect. The informant may also try to attribute firsthand information to someone other than his source. He may be trying to conceal his source or provide information concerning a target he knows is of interest. Therefore, there may be reasons to specifically determine how an informant acquired the information he reports.

Informants who provide information on a recurring basis fall into a broad spectrum. They may be individuals who have been investigated concerning their motivation, placement and access, have been formally recruited, receive regular salaries or production payments and are working

under your control at one end of the spectrum to the individual who occasionally provides information and may receive small sums of money at the other end. They may all be referred to as recruited informants. All of the reasons for examining the one time informant apply to the recruited informant. However, there are considerations other than merely assessing the veracity of the informant. The following question areas should be considered.

The informant's placement and access determine whether or not he actually has the ability to get inside the target and obtain the desired information once he is there. This area is normally covered with a potential informant whose placement and access have not otherwise been verified. You cannot directly ask the informant whether or not he can provide the information because this calls for a conclusion on his part. You can only ask him questions concerning his relationship to the target and then you have to make a decision concerning the probability of his success. The following types of questions can give you an idea concerning the informant's placement and access.

Do you live with Bob? Is Bob your brother? Were you alone in Bob's office last night? Did Bob allow you to use his car last night? Did Bob show you his books last night?

After performing some department or agency directed activity, it is desirable to verify that the informant did what you told him to do, when you told him to do it and how you told him to do it. If the informant knows that he will be checked in this manner, it gives the handler additional control over the informant. If the informant deviates from his instructions while working the target, this could later create problems in obtaining a conviction or cause embarrassment. If you have entrusted the informant with official funds, questions concerning the disposition of those funds can help protect your investment and prevent the informant from ripping you off. The questions are designed to tell you whether or not the informant actually followed instructions. The questions should zero in on what you actually must know, not what is "nice to know" information. "Nice to know" information could be defined as information that is not absolutely necessary for the completion of the investigation, but information that would make you feel more comfortable if it were confirmed or refuted. There also is a danger in asking questions which are too general. There may be certain unimportant activities that occur during a mission that the informant just does not want to tell you about and lies about it. On his way to accomplish his tasks, he may have stopped and placed a bet with his bookie. Since this is a criminal activity, he may lie if you ask whether or not he went directly to the target. This could cause an inconclusive or deceptive outcome because of an area you may not be concerned about and make it impossible to form an opinion concerning the area of primary inter-This type of examination is essentially a confirmatory test. Yes est. answers to relevant questions are acceptable and often preferable. They are direct and avoid convoluting the question so as to obtain a no answer.

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Questions of the following type can give you the answers that you need.

Did you go to Bob's house last night? Did you buy ______ from Bob? Did you give Bob all of that money? Did you keep any of that money? Did you open that envelope? Did you tell Bob ?

In addition to the specific instructions an informant receives concerning a mission, he also works under general instructions concerning his activities as an informant. The fact that he works alone and without the immediate supervision of his handler gives him the opportunity to disregard these general instructions and cheat the department or agency which employs him. He may even be selling his information to more than one organization. Inappropriate activity on the part of the informant can cause embarrassment to or criticism of your department or agency. The informant's activities often have a great influence on the results of an investigation. The informant may create criminal situations for the sole purpose of selling you the information. Informants who are reimbursed for their expenses are generally paid without the benefit of receipts or any other supporting documents. If these expenses become unreasonable, a polygraph examination can be used as a check. Informants also have the opportunity to handle evidence with very loose control procedures. The only proof that the evidence was properly handled may be the informant's word. This can be especially serious when working drug investigations. An active informant, who buys drugs on a regular basis, has an ideal opportunity to skim off some of the evidence for his own use or sale. It is not possible to list all of the unacceptable behavior in which an informant could engage. These comments are designed to get you to think about what you might need to cover in a polygraph examination. Some questions would be as follows.

Have you provided that information concerning Bob to any other police agency?

Did you suggest that store be held up last night?

Did you know that store was going to be held up last night when you got into that car?

Did you keep any of those drugs?

Did you bring any of those drugs to that house?

Did you pay for everyone's meal last night?

Security is probably the most important area that should be verified during informant operations. This bears directly on the safety of both the informant and the handler. As an investigator, the handler understands and respects the danger involved in any type of police operation. However,

despite any security training the informant might have received, he often jeopardizes himself and the operation by his actions. If the informant has told anyone about his relationship with your department or agency, a dangerous situation exists. Furthermore, it is important to verify whether or not the informant was directed by anyone or any organization to contact your department or agency to volunteer his services. This type of informant could place both operations and lives in danger. A polygraph examination can be used to determine if any of these situations exist. An informant can only be asked what he has done himself. A question concerning someone else's knowledge of his relationship with the investigative agency is improper. He can only be held responsible for his own actions. Obtaining adverse information concerning a security question does not automatically disqualify an informant from continued utilization. However, it does tell us what we have to do to salvage an operation and what additional security training we need to give this informant. Questions of the following type will satisfy your needs in this area.

Have you told anyone that you are an informant?

Have you told anyone that you work with ?

Have you told anyone that you provide information to _____?

Were you directed by anyone to volunteer to be an informant?

Did you tell anyone what you did with that (evidence)?

Did you tell anyone where you got that money?

As an informant operation develops, other areas requiring resolution will probably present themselves. By sticking to the basic tenets of test question formulation and targeting of question areas, most matters can be resolved.

There are a number of technical matters to be considered concerning polygraph examinations of informants. Items such as when, how often, where and how they are examined need to be carefully considered. A well planned program regarding the examination of informants can make the polygraph an aid instead of a burden which may eventually become resented. The technical considerations apply somewhat differently to the one time informant and the recruited informant. The technical aspects of examining informants will be discussed with the recruited informant in mind. However, with the exception of periodic examinations, the informant may become a recruited informant.

The question of when an informant should be examined is more complex than it would initially seem because it also implies how often an informant should be examined. Routine examinations of a recruited informant should not be conducted so often or in such a manner so as to make the process meaningless. Therefore, examinations should be conducted only when absolutely necessary and only questions to which you must have the answers should be asked. "Nice to know" information does not fit into this definition. Avoid the idea of, "Since you've got him hooked up, go ahead and ask." Once the examination begins and the informant is deceptive to an area in which you were really not interested, it is probably too late to then decide that the question was not important. The final decision of when and how often an informant should be examined rests with the command structure of your department or agency. It could be decided to examine all informants on a periodic basis without regard to informant production, the quality of the information or the level at which the informant is operating. Or the decision could be delegated to the handler and the informant would be examined at the handler's discretion. The following are times when it could be beneficial to examine an informant.

Either immediately prior to or following the informant's employment, he may be examined for security purposes and to verify his placement and access. At this stage in his development as an informant, we are primarily interested in two things: can he cover the target and provide us with useful information and is there anything about this informant which could put us or the informant in jeopardy? Depending on established priorities, we may also want to discover personal information that would create handling problems such as sexual persuasion or criminal activity and, if necessary, verify the informant's identity. These secondary items should be approached cautiously at this stage of the relationship. If we start digging too deeply, we may scare the informant off. If other means are available to discover this information, they should be used.

When an informant provides significant information or is directed to perform some type of activity, depending on the importance, we may want to confirm his information or his actions. Informants may be examined when it is felt their information must be acted on, but first confirmed. When anything occurs which could affect the safety of department or agency personnel, grounds to conduct a polygraph examination exist. Mere contact with the target is generally not justification for an examination. Also, in the case of a highly productive informant who produces significant information several times a year, an examination after each event may become counterproductive. Frequent examinations can make them meaningless, can be perceived by the informant to mean that you have no trust in him and can cause an informant to withhold important information to avoid an examination. Past performance of a productive informant can be used to provide indicators concerning the probability of his truthfulness.

Your department or agency may decide that it is necessary to examine informants on a periodic basis for security purposes. If done prudently, this type of examination can be a useful handling tool. If undesirable conduct is discovered, steps can be taken to correct the situation or terminate the informant. If the informant knows that he will be examined periodically, it may deter the undesired conduct. If possible, the periodic examination can be administered at the same time as an examination concerning a significant event. Periodic examinations are where the "nice to know" questions often appear. When periodic examinations are allowed to become a routine drill, they are then often scheduled with very little thought as to what is needed. As a result, the goal becomes merely going through the motions of having the examination conducted, not to verify essential information.

The question of the location of the examination when examining a criminal suspect or a witness hardly ever comes up. However, when dealing with an informant, security considerations can impact upon the location of the examination. It may or may not be wise to bring an informant to a police station or your office to conduct an examination. Polygraph examinations can be conducted in a variety of locations.

When the situation permits, your department or agency polygraph facility is the ideal situation. The examiner is in his own surroundings, everything he needs is there and polygraph suites are normally designed to accommodate observers by means of observation or monitoring devides. The handler should be present to observe because he knows and has a relationship with the informant. His knowledge and relationship can be used to help resolve issues when problems arise during an examination. However, the handler should not be in the actual examination room with the examiner. The examiner must be in control of the examination. If a handler is present, the informant may defer to him rather than the examiner or he may try to play the handler and the examiner against each other. This can be especially detrimental of the informant is deceptive and the handler does not support the examiner 100 percent.

If a department or an agency has its own permanent safe site, essentially the same accommodations as the official polygraph suite can be installed. If proper precautions are used to avoid compromising the safe site, this system can greatly enhance security.

Hotel and motel rooms can be used to conduct examinations. Since the average hotel room is not designed to be a polygraph suite, care must be taken in selecting appropriate rooms. There must be room for the examiner to work. A room, which is completely filled with a bed is not acceptable. If you spend the night prior to the examination in the room, make sure the maid makes up the room first thing, before the polygraph examination is scheduled. This presents a more professional appearance and precludes interruptions by the maid during the examination. There must be a stable chair with wide arms or some other means of supporting the informant's There should be a desk or a table on which to place the instrument arms. and a chair for the examiner. There should also be a bathroom. Unless the polygraph instrument is battery operated, there must be an appropriate electrical outlet. Many modern hotels are furnished in a modular fashion with all of the electrical items built in and no plugs exposed. The shaver plugs in the bathrooms are often designed to carry only light loads and cannot be used to operate the polygraph instrument. This is a safety feature in case someone drops an electrical appliance into a sink full of water. Temperature and lighting must be appropriate. The handler must be available incase he is needed; therefore, two rooms will have to be rented. The ideal situation is to rent a suite that has a living room and a separate bedroom. In this configuration, the living room will probably contain an arm chair for the informant, a chair and a desk or coffee table for the examiner and enough room to work. The handler can wait in the bedroom and be readily available. Over a period of time, the examiner can compile a list of suitable hotels from which the handler can select.

Although not a usual practice, a van or a trailer could be modified as an examination facility. This provides a facility that is under your control, as in a safe site, but with added mobility so that the examination can be conducted at any appropriate location. With a vehicle, the chances of an examination site being compromised are slight. The appearance of the vehicle can be changed with very little expense or trouble when compared to securing permanent safe sites or vehicles can be leased as needed.

How an informant is examined entails not only the format used, but also the approach. Although the informant may be a criminal, during the examination, he is not a suspect and should not be treated as such. Remember, as an examiner, you will spend only a few hours with the informant; whereas the handler must work with him all of the time. The conduct of the examiner can create serious handling problems for the handler. Following an examination, the handler should not have to reconvince the informant to work for your department or agency. Conversely, the examiner should not be used as a threat by the handler as this can cause difficulties during the examination. The examiner must treat the informant firmly and leave no doubt that if the informant answers truthfully the examiner will know it, but if he lies, the examiner will detect this and obtain the truth. The informant should be given logical reasons for the questions asked. The examiner should approach the informant as someone who is trying to prove the informant is truthful, not as someone looking for a liar. The following types of tests can be used and each has its own advantages and disadvantages.

Probable-lie control question (PLCQ) tests are the tests most widely used by federal and police examiners. PLCQ tests give us definitive and reliable results. A problem associated with PLCQ tests is that they are generally designed to test one specific area. When testing an informant, it is usually necessary to test multiple areas. Depending on your agency or department rules, you will have to run multiple tests or mix targets on the same test. When conducting an initial examination or an occasional examination of an informant, PLCQ tests work very well. However, after multiple examinations, it becomes very difficult to set proper PLCQs. Many people eventually recognize what they are. If the informant is not confronted with his deceptive responses to the PLCQs following the examination, he may begin to doubt that the polygraph works. This doubt can make detecting deception at the relevant questions very difficult. If he is confronted by his deceptive responses to the PLCQs and, after being told the PLCQs are important, if no adverse action is taken, he may begin to believe that anything he does is alright. This may cause all questions, including relevant questions, to lose their intensity and the test simply may not work. The theory is that fear of detection drives the polygraph If there is no fear of detection, the informant may not properly test. respond. A final problem rests with formulating the PLCQs. The informant has agreed to supply us with information concerning a specific area. However, in order to formulate a proper PLCQ, we must ask him about entirely different areas to which he will probably lie. The informant may feel that this is too great an intrusion into his private life. Formulating PLCQs can also anger someone who is trying to be cooperative, but is placed in a situation where they are forced to lie. In extreme cases, if not done very carefully, the formulation of PLCQs can even cause the informant to terminate the relationship.

The Relevant/Irrelevant (R/I) test does away with the problems associated with the formulation of PLCQs. Since the examination deals only with the issues in question and non-threatening irrelevant questions, this type of examination may be more acceptable to the informant. A problem with the R/I test is that most polygraph schools emphasize PLCQ techniques. Although many polygraph examiners may have been exposed to R/I testing, they may not feel comfortable with it. Police and federal examiners who do primarily specific criminal cases are probably more accustomed to using PLCQ

techniques. Another criticism of the R/I technique is that the lack of control questions makes it more difficult to guard against countermeasures which suppress responses. However, this can be considered to be a tradeoff since there is nowhere on the charts to use countermeasures by inducing responses to a particular question. As in all polygraph testing, the examiner should use a technique or format with which he is comfortable or in which he has confidence.

The Directed-Lie Control Question (DLCQ) test is a test that was developed by a federal agency which has an informant testing program. The test was designed for the specific purpose of testing informants and screening. It was recognized that this type of testing covered issues which were numerous, nebulous and non-emotional to the NDI person. Numerous refers to the fact that during informant testing, multiple issues are normally covered. The questions are not always as clear and to the point as in specific testing because we are often asking questions concerning activities which have taken place over an extended period of time. A1 though the examiner tries to make the guestions specific, he may not always be successful. Furthermore, the questions do not contain the same emotional content as do questions concerning a specific criminal offense. For that reason, the fear exists that PLCQs which include real criminal offenses may override the relevant questions. Therefore, DLCQs were developed to overcome these problems with informant and screening examinations. To formulate a DLCQ, the informant is told that you are going to ask him a question which you want him to answer truthfully with a yes or a no, without providing any details. An example would be, "Have you ever stolen anything?" The examiner must insure that the informant is thinking of a specific incident and not answering yes merely because he believes that he probably has stolen something. Do not allow the informant to make admissions to the DLCQs. The informant is then told that during the examination, he is to deliberately lie when he hears the question concerning stealing. He is to answer all relevant and irrelevant questions truthfully. The DLCQ solves the problem of having to delve into areas of questions against which relevant questions can be compared. DLCQs were designed to be used with a variation of the MCGQ (Reid Technique). Multiple targets may be covered in the same test. There is no major relevant question. Mixed series may be used as needed. The DLCQ Technique was not designed to be used during specific criminal testing; traditional techniques should be used during these cases.

Research has been conducted concerning the effectiveness of polygraph examinations in informant operations. Twenty individuals who had been used as informants by police agencies were examined. All true information had been verified by subsequent investigation. Nine informants told completely truthful stories, four told completely false stories and seven told stories with both true and false elements. The results were that all completely true and completely false stories were correctly identified. The stories containing both true and false information were correctly identified as such; however, in three examinations a total of four errors were made when attempting to deterine which of the 34 elements of the mixed stories were true or false. It should be noted that no post-test interrogation or additional testing was allowed to clarify these three examinations. Out of 106 relevant questions asked of the 20 informants, 102 responses were incorrectly identified as truthful or untruthful and four responses were incorrectly identified.[2]

The purpose of this article was to identify various problems encountered in informant testing and to offer some suggestons. There are a number of other additional problems which also bear some discussion. Supervisors and handlers normally have only their feelings to use when forming opinions about an informant. Naturally, these feelings are based on experience; however, there is always the possibility that the feelings are wrong. Therefore, because of the polygraph's high accuracy rate, the polygraph examination is often given too much weight in the decision making process, often to the exclusion of all other operational testing. At all stages of the operation, it must be stressed that the polygraph is only an aid in the conduct of informant operations and is not designed to answer all questions. The most serious problem is that an adversary relationship often evolves between the examiner and the handler. The handler may feel that the examiner is an outsider interfering with his operation; while the examiner may feel that the handler is not seeking or is disregarding any information that might create problems concerning the continued utilization of the informant. This kind of attitude cannot be allowed to persist, and usually it is up to the examiner to put an end to this kind of thinking. The examiner can do this by always expressing the attitude that he is there to help and that he is just as interested in seeing the operation be successful as the handler. Whether the informant is deceptive or non-deceptive is not the issue, but the fact that the examiner is working to support the operation and protect the handler. The examiner should never indicate that the handler erred or missed important information. The handler was doing the best he could with the tools at his disposal. Furthermore, it is much easier to second quess the handler's work than to do his job. If these thoughts are kept in mind, a professional and mutually benefiting relationship can develop between the examiner and the handler.

Polygraph use during informant operations serves a number of useful functions, particularly in the decision making process. However, the most important function is security. The results of an examination may save the life of a colleague and a friend.

Footnotes:

[1] Subcommittee on Civil and Constitutional Rights of House Committee on the Judiciary, 98th Congress, 2d Session, FBI Undercover Operations 1, 12-13 (Comm.Print 1984), as cited in Weyrauch, W.O., "Gestapo Informants: Facts and Theory of Undercover Operations." <u>Columbia Journal of Trans-</u> national Law 24(3)(1986): 555-556.

[2] Blum, R.H. and Osterloh, W. "The Polygraph Examination as a Means of Detecting Truth and Falsehood in Stories Presented by Police Informants." Journal of Criminal Law, Criminology and Police Science 59(1) (1968): 133-137.

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THE HORIZONTAL SCORING SYSTEM

Bу

Nathan J. Gordon and Philip M. Cochetti

Abstract

Horizontal scoring is a new method for analyzing charts, which organizes reactions in sequence from the strongest to the weakest, in each channel, on each chart. It gives the largest number to the strongest reaction, and gives numbers in descending order to other reactions, until the weakest is reached which receives a value of one. Cumulative totals for all of the control questions are compared with cumulative totals for all of the relevant questions on all the charts. Cut off scores are based on empirical evidence from six years of experience.

Introduction

In 1963, Backster developed a numerical scoring system where values ranging from a +3 to a -3 were assigned to each independent physiological tracing at each relevant question position. Scoring is based upon the examiner's perception of differences between the relevant question reaction and a control question reaction selected by the examiner for comparison purposes. (Backster, 1969a)

Backster's intricate set of rules and guidelines for the assignment of numerical values were simplified and summarized by Weaver(1980). Basic guidelines for three common systems, including Backster, are as follows:

 A plus(+) value is assigned when the physiological responses are greater to the adjacent control question selected for comparison to the relevant question being analyzed.

A minus(-) value is assigned when the physiological responses are greater to the relevant question being analyzed than to the adjacent control question selected for comparison.

A zero(0) value is assigned when the physiological responses to the relevant and control questions selected for comparison are of no apparent difference.

2. A point of value of 0, +/-1, +/-2, or +/-3 is assigned to each tracing based on the perceived difference between the relevant question being analyzed and the adjacent control question selected for comparison. If there is no difference a (0) is assigned. If there is a small, but

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noticeable difference a (+/-1) is assigned. If there is a large and clear difference a (+/-2) is assigned. If there is a very distinct and magnitud-inal difference a (+/-3) is assigned.

3. Numerical scores from each tracing of each polygraph chart are totalled after the completion of the examination. If the total score accumulated is greater than a minimum (+) or (-) cut-off point established, then a definitive determination regarding truthfulness (+) or deception (-) can be rendered. This cut-off point varies depending on the numerical scoring system used. If the total score accumulated is not greater than the minimal cut-off, the examination must be considered inconclusive.

Backster's introduction of the numerical scoring system was an improvement over previous methods of evaluation and it gradually became accepted by those in the polygraph profession who use control question technique.

In 1978, researchers at the University of Utah concluded that numerical scoring of polygraph charts produced higher rates of accuracy than any other method of chart interpretation. (Raskin)

Since this original method of numerical evaluation developed by Backster, additional scoring systems and methods of evaluating polygraph charts have emerged. The United States Army Military Police School (USAMPS) and the University of Utah have modified the Backster scoring system, as well as, his "You Phase" test question structure. All three systems utilize test structures which employ bracketed or exclusive control questions, (control questions which do not include the time span of the matter under investigation). Each control question is immediately followed by a relevant question concerning the same topic. A minimum of two charts are administered before a determination can be made in Backster, three charts in the other systems. In the Backster "You" phase test, you reposition the relevant questions from chart to chart so they can be analyzed next to different control questions. In Utah, you rotate the control questions. In USAMPS, questions are not rotated.

When the total score is a +6 or greater, the Army and Utah scoring systems conclude truthfulness. If the total of these scores are a -6 or greater they conclude deception. Any score between -5 and +5 is considered inconclusive. The Army and Utah use a $\pm/-6$ cut-off regardless of the number of relevant questions asked on each chart, or number of charts administered.

Backster, however, does take into consideration the number of relevant questions asked on a test and the number of charts administered. Backster also utilizes different numerical cut-offs. Backster requires a +/-9 or greater, for a conclusion of truth or deception to be made on a test consisting of two relevant questions when two charts are administered. He increases the cut-off to a +/-13 for an examination consisting of two relevant questions, when three charts are administered.*

^{*}Note: Backster has changed his scoring rules, and his cut-off scores several times during the past 24 years. In 1985, he required that the cutoff for (+)truthful be only 50% of the cut-off(-) score for deception. In the example above, the cut-off is -13 and +7.[Ed.]

In addition to the difference of the cut-off ranges, there is also a distinction among all three systems in how they select the control question to compare with the relevant question.

Backster selects the control question on either side of the relevant question that shows the least reaction, unless one of these two control question reactions is so great (at least three times greater than the relevant question reaction) that it can not be ignored. The decision of which control reaction to utilize is made for each parameter. For example, in Figure 1, Backster would compare the pneumo of relevant question #33 to the pneumo of control question #46. This selection would be made because neither control question pneumo (#46 or #47) is three times greater than the pneumo reaction of relevant question #33. Therefore, Backster would utilize the adjacent control question with the least reaction (Question #46). Following this logic, the GSR reaction of relevant question #33 would be compared to the GSR reaction of control question #46, while the cardio of relevant question #33 would be compared to the cardio of control question #47. When the Backster method is compared to the Army method in which the relevant question is compared to the strongest reaction to an adjacent control question, the Backster method appears to be biased toward a deceptive outcome, and the Army method biased to a truthful outcome. Neither system allows for a middle ground.



Figure 1 Backster Control Question Selection

In figure 2, USAMPS would compare the pneumo reaction of relevant question #33 to the adjacent control question with the greatest reaction. In this case, control question #47 would be selected. The GSR of relevant question #33 would be compared to the GSR in control question #47 while the cardio would be compared to control question #46.



Figure 2 USAMPS Control Question Selection

The Utah system compares the relevant question reaction with the control question reaction that preceeded it, eliminating the possible bias factors inherent in the Backster and Army systems with an arbitrary rule.

Figure 3 illustrates the Utah system, which compares the reactions to relevant question #33 with the reactions to the preceeding control question, #46. In the first chart, control question #46 is compared to relevant question #33, and control question #47 to relevant question #35. On chart two, relevant questions #33 and #35 are reversed so that control question #46 is compared to relevant question #46 is compared to relevant question #47.



Figure 3 Utah Control Question Selection

In addition to the subjectivity in determining which control question to utilize for comparison, and whether the difference between the comparisons is worthy of a score ranging from +3 to a -3, there are difference between the three systems in determining what constitutes a reaction.

In 1981, after teaching the different numerical scoring systems as presented in the excellent article by Weaver, we began observing noticeable differences in the numerical evaluation performed by students on identical charts. This was attributed to the student's subjectivity in assigning a +3 or a -3 to reaction differences and to the method they employed (Backster, Military or Utah) in the selection of the control question.

Our search to determine which method was superior led us to the invention of the Horizontal Scoring System. In the Horizontal Scoring System, the examiner compares the reactions to all of the control and relevant questions taking place on a chart in each individual parameter. For example, the examiner first compares all control and relevant questions in the pneumo, the GSR, then the cardio. The examiner then places the individual parameter reactions into a heirarchy from greatest to minimum reaction. Although there is still some subjectivity in what constitutes a reaction, once the heirarchy is established the subjectivity of which control reaction to select for comparison and what numerical evaluation to assign it are eliminated.



In Figure 4, the examiner analyzes the reactions in the pneumo at all of the relevant and control questions, setting up the heirarchy of greatest to minimum reaction.

Figure 4

The examiner then assigns a numerical evaluation from 4 to 1 (if the structure had utilized three control and three relevant questions the hierarchy consists of six items and numerical evaluations from 6 to 1 is given), with the 4 representing the greatest reaction and 1 the minimum (see Figure 5).



Figure 5

When the numerical evaluation represents a control question it receives a plus(+), if it represents a relevant question, a minus(-). (See Figure 6).



The scores can then be totaled across. In Figure 6, we have a minus three (-3) and a plus seven (+7), giving an overall pneumo score of a plus four (+4). The same process is then repeated for the GSR and cardio, and all of the scores from each parameter on all charts can then be summed for the overall examination score.

Figure 7, is a sample chart analysis scoring sheet which allows for either a two or three control-relevant question sequence. Cut-offs of a +/-2 are required for each relevant question being analyzed on each chart administered. Therefore, in a test structure consisting of two relevant questions, being administered on two charts, the total examination score would have to be a plus or minus eight (+/-8), or greater for a definite opinion of truth or deception to be reached. If three charts had been administered a +/-12, or greater, would have been needed. For a test structure consisting of three relevant questions, administered on two charts, a +/-12 or greater is required, and a +/-18 if a third chart is administered.

Figure 8, is a Backster "You Phase" technique with three relevant questions (33, 35 and 37), and three control questions (46, 47, and 48), in an actual theft case.

In establishing a hierarchy for the pneumo reactions in Figure 8, the greatest reaction is to question #46 (baseline arousal, sustained suppression and serrated cycles). On the chart analysis form shown in Figure 8, we would place a 6 in the space provided for pneumo question #46. The second greatest pneumo reaction is to question #47. We would now place a 5 in the space provided for the pneumo reaction of question #47. The third greatest pneumo reaction is to question #35, which would receive a 4, followed by control #37, receiving a 3, control question #48 receiving a 2, and question #33, receiving a 1.

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Figure 7 Sample Horizontal Scoring Sheet

	Control Q#	Relevant Q#	Control Q#	Relevant Q#	Control Q#	Relevant Q#	Subtotal
Pneumo	+	-	+	-	+		
GSR	+		+		+		
Cardio	+		+		+		
Chart # Total	+	-	+	-	+	-	

Horizontal Scoring Sheet Chart Analysis Form



Figure 8 Backster "You Phase" Chart

	Control Q# 46	Relevant Q# 33	Control Q# 47	Relevant Q# 35	Control Q# 48	Relevant Q# 37	Subtotal
Pneumo	+ 6	- 1	+ 5	- 4	+ 2	- 3	+ 5
GSR	+		+	-	+		
Cardio	+		+		+		
Chart # Total	+	-	+	-	+	-	

Figure 9 Horizontal Scoring of Figure 8's Pneumo

The GSR hierarchy we established from greatest to minimum reaction was question #47 (6), question #48 (5), question #46 (4), question #33 (3); question #35 (2), and question #37 (1). The hierarchy we established for the cardio in Figure 8 is question #47 (6), question #46 (5), question #37 (4), question #48 (3), question #35 (2), and question #33 (1). Figure 10 illustrates the horizontal scoring sheet for all three parameters of Figure 8.

In addition to looking at the overall parameter scores, scores for each test question can be compared by adding each individual question vertically. This will be extremely useful for examiners using techniques with an unequal amount of relevant and control questions, such as Reid and Arther.

If there are no distinguishable differences in reactions to more than one of the questions being analyzed, they are given a zero. The remaining reactions that are discernible are then set up in a hierarchy. Numerical evaluations are then given based on how many discernible reactions were observed. For example, if there is only one discernible GSR reaction it would receive a 1, while all of the other GSR reactions would receive a zero. If there were two discernible GSR reactions the greatest would have received a 2, the smaller a 1, and the remaining undiscernible reactions zeros.

In summary, the Horizontal Scoring System eliminates many of the problems presented in the Backster, Army, and Utah numerical scoring systems. This is accomplished by forcing the examiner to establish a hierarchy of reactions of all control and relevant questions in the test structure, eliminating examiner subjectivity in assigning a +3 to -3 for each comparison made and alleviating the problem of which control question to select for comparison with the relvant question being analyzed.

At the same time the Horizontal Scoring System requires the examiner to evaluate all control and relevant question reactions on the entire chart

	Control Q# 46	Relevant Q# 33	Control Q# 47	Relevant Q# 35	Control Q# 48	Relevant Q# 37	Subtotal
Pneumo	+ 6	- 1	+ 5	- 4	+ 2	- 3	+ 5
GSR	+ 4	- 3	+ 6	- 2	+ 5	1	+ 9
Cardio	+ 5	_ 1	+ 6	- 2	+ 3	- 4	+ 7
Chart # <u>l</u> Total	+ 15	- 5	+ 17	- 8	+ 10	- 8	+21

Figure 10 Horizontal Scoring Sheet of Figure 8

in totality, rather than take a segmented, view of just one control question compared to just one relevant question at a time. Horizontal scoring eliminates the need for repositioning relevant questions on subsequent charts in an attempt to compare them with other control questions in the test structure. This comprehensive analysis is balanced and does not bias the test outcome toward truth or deception, as the Backster and Army methods do, nor does it impose the arbitrary rule of Utah.

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Bу

Norman R. Matzke

As a polygraphist I have concentrated on the examination of sex offenders over the past seven years. During this time I have gained information that I feel I should share with my fellow examiners and therapists. Anyone who works with sex offenders on a fact finding basis can benefit from the use of the polygraph. The list of users includes, but is not limited to, police agencies, prosecutors (diversion programs), parole and probation officers, therapists, both those in private and those employed by government agencies.

Treatment

The polygraph should be introduced into the treatment plan in the early stages to lessen the fear of the polygraph in the subject's mind and to create rapport between the subject and the examiner. In some cases I have found that the polygraph has been used as a fear factor in treatment. This practice must be avoided if the polygraph is to be used successfully.

From a polygraphist's standpoint, I prefer to use a three stage approach to the use of the polygraph in a treatment setting. This procedure goes from a broad spectrum to a narrow question area, I refer to this examination method as target testing. It is important to reemphasize that the polygraph is to assist the therapist in the treatment of the patient, therefore; the examination scope should be governed by the therapist not the polygraphist. I have not found a therapist who is unwilling to learn about polygraphy from the examiner and to determine the benefits and limitations in a treatment setting.

The first of the three stage approach in examining the subject is the "Sex Offender Polygraph Examination Booklet"*. This is a broad based questionnaire designed to gain as much information as possible from the subject during his initial contact with the polygraphist. The booklet contains more than forty (40) questions which are informational in nature and therefore, difficult to rationalize. After the completion of the booklet, an examination is given to the subject based upon his answers given in the booklet. The completed booklet and examination results are forwarded to the therapist for comparison with the information gained during their initial interviews or sessions with the subject (evaluation stage). Usually some new information, i.e., additional incidents or victims, is gained

* Developed by the author.

The author is a civilian polygraph examiner with a police department who is also in private practice. He is a member of the APA. Requests for reprints should be addressed to him at 213 Lyon Building, 3rd & James, Seattle, Washington 98104. Copies of the sex offender booklet mentioned in this article are available from Mr. Matzke at 50¢ each in lots of 10 or more, which covers printing and postage. using the Sex Offender Booklet. It is important to restate at this time that the booklet examination, if used, should be used in the early stages of treatment so the subject doesn't get so involved with lying and denial that he doesn't feel he can easily admit additional items if necessary.

The second of the three staged approach to examining the subject should be a standard "general series" examination that can deal with any area the therapist feels necessary. This examination can cover the subject's history of sexual deviance, different forms of sexual deviance, different forms of sexual deviance that come to light as treatment progresses or concentrating on additional victims. This type of examination, considered the standard examination, may be used several times in treatment, depending on its necessity. This examination is more narrow in scope than the first examination.

The third type of examination used in the treatment of sex offenders is a monitoring examination. I named this examination "monitoring" because that is its purpose. It is very narrow in scope and deals with a single issue, suitable for testing with the Backster Technique. The most common issue tested using the "monitoring" examination is treatment or probation rule violations. The therapists I deal with have been pleased with the results achieved using this testing technique. As previously stated, this narrows the testing scope even further. Therefore, by beginning with the booklet, then the general series and finally the monitoring examination you have adapted the polygraph technique to assist the therapist in his treatment of the sex offender. This treatment procedure can take place over a period of years, depending on the treatment stage and progress of the patient.

The Therapist

The polygraphist and the therapist should become familiar with each other's techniques and treatment philosophies to insure that the therapist gains from the polygraph examination procedure. Through several meetings and contacts a relationship can build so each realizes the strengths and limitations of the others abilities. This knowledge is most helpful during the pre-test and post-test interviews with the subject. When reviewing the examination questions with the subject I have been told countless times, "Dr. Smith says I can tell you if something comes to mind during the test." This is the time that an examiner who knows the therapist can obtain information prior to the examination that, perhaps, would only result in a failed examination but not gaining any new information. Therefore, a close relationship between the therapist and the polygraphist is extremely important.

Among the benefits of using the polygraph technique in the treatment of sex offenders are an expansion of the treatment program, assistance in checking problem areas, monitoring treatment stages, and a check on treatment progress. Therapists who use the polygraph have found that the added element in evaluating sex offenders can help determine the treatment methods to be used with specific individuals. I have found that with the use of the polygraph in treatment, generally the background of the subject (sexual history, etc.) surfaces more quickly than in those cases where the polygraph is not used. By using the polygraph in the treatment program problem areas are usually discovered earlier than without the use of the polygraph. I am also told that problem areas uncovered early by the polygraph are more easily dealt with, resulting in continued treatment of the subject instead of expulsion from the program. By use of the monitoring examination discussed earlier, treatment in general seems to move more smoothly, from stage to stage, than without the use of this examination. An added benefit to using the polygraph is from a statistical point of view. Follow-up examinations after the completion of a treatment program can be used to determine the effectiveness of a specific program or method.

Examinations

Problem areas in examining the sex offender focus on his defense mechanisms, specifically rationalization and denial. For example, If a person is at a social gathering and states he has a new method for dodging taxes, this will usually be met with positive feedback. Even though tax evasion is illegal, it is socially acceptable. Conversely, if that same person were to announce that he were a child molester ... enough said. In addition to not telling anyone about his sexual deviance, this person often must display a dislike for this behavior in others knowing he does this himself, reinforcing the self-rationalization of his deviant behavior. All this combines to give the polygraphist problems during the examination. Another problem is new felony crime information gathered during the examination in a treatment setting. Because this information is reported, it causes problems during the pre-test and post-test interviews. Also, the sporadic use of the polygraph in the treatment community as a whole, creates problems between therapists and their belief in the use of the polygraph in their treatment plan. This can be overcome with time, and with information from the polygraph community provided to the treatment community. This communciation is complicated by the lack of consistency in the field of polygraphy as far as techniques employed; and matched by the varied treatment philosophies in the field of mental health care.

Summary

In using the polygraph in the treatment of sex offenders, remember to go from a broad based test technique to a narrow field of view, be in constant contact with the therapist you are working with, and be careful of the subject's defense mechanisms if the polygraph is introduced in the treatment plan.

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EFFECTS OF MOTIVATING THE SUSPECT TO DECEIVE THE POLYGRAPH TEST

Bу

Takeshi Wakamatsu

Abstract

To investigate the effects of manipulation, 60 experimental subjects were divided into 3 groups and were tested under a mock crime paradigm, and were instructed to deceive the polygraph by suppressing any indication of deception. For the first trial, the groups were not instructed in specific deception techniques. Prior to the second trial, the techniques presented in Table 6 were explained to all subjects. The motivation for the deception was as follows: The first group subjects received 1000 yen if they could defeat the test, if they failed, they were punished. The second group was merely encouraged to deceive the operator. The third group was not given any motivation to de-GSR and heart rate were recorded. After the second ceive. trial, the first group subjects revealed the critical items of the test to the examiner, and other two groups confessed their stolen amount of money, and in the subsequent trial GSR responses and heart rate decreased. The two groups who were motivated, showed significantly greater GSR responses and more instances of increased heart rate during the test than the unmotivated group. The technique of the subject "keeping his eyes on one point in front of himself and concentrating his mind on it" was most effective to suppress deception. This result suggests that this technique may be an effective countermeasure in field examinations, because it may suppress deceptions by criminal suspects.

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Introduction

The polygraph lie detection device operates on the principle of measuring the responses of the autonomic nerve systems such as breathing, electrode responses on the skin, and blood pressure pulsation. It is also believed that attempts made by the examinee to intentionally deceive the trial were reflected in the results.

In the past it has been considered impossible for anyone to intentionally deceive the autonomic nerve systems. However, according to the opinions submitted by Stern[1] and Suzuki[2] the possibilities of intentional reinforcement of SRR and SPR deception of electrode and potentialelectrode responses of the skin were mentioned, and with regard to intentional deception of the blood pressure pulsation, Engel has offered an opinion as to intentional acceleration[3] and suppression[4] made possible under certain conditions. It has been considered possible to intentionally reveal, but not possible to suppress GSR[5]. Not only that, but it has been stated[6] that the deliberate attempt to reveal GSR when the examinee is consciously aware of the principle of revelation from the skin, may cause interference with the overall results. Other causes that seem to interfere with trial results are: autohypnosis, which could effectively alter the physiological response, [7,8] perceived legitimacy of the criminal act[9], conscious awareness by the examinee of the outcome of true or false results[10], and the rehearsal of deception prior to taking the trial.[11] Of these, opinions are divided as to the effects of autohypnosis, and the results are inconclusive. However, when the examinee feels that the criminal act committed was legitimate, or when the examinee felt that he could successfully deceive the test, the success of detection rate was apparently lowered. It has been reported that two kinds of attempts have been made to deceive the polygraph test. One is the use of physiological or mental dexterity, and the other is the use of drugs and alcohol[12] for the purpose of inhibiting or confusing the real response so as to falsify test results.[13,14,15]

It is very difficult to make clear the factor of the distortion because the examinees are in most cases suspects directly connected with the crime under investigation, and they do not cooperate with the examiner. Therefore, it was necessary to perform our experiment under the simulated conditions of a typical investigation to study the effects of faking the polygraph response and the important factor of succession of deceiving under various degree of motivation to deceive the trial.

METHODS

Examinees

The examinees consisted of sixty male police officers. It included thirty police academy students and thirty police officers of the police headquarters. The ages of the subjects varied between 18 and 41, with an average age of 23.9. None had experimented with nor had any prior knowledge of the polygraph test.

Equipment

The breathing pattern and blood pressure pulsation were measured with

a Polygraph KT-1 machine manufactured by Takei Instrument Industry, Co. 50 micron amp power was turned with bridge type circuitry which is used to measure the skin responses (hereinafter referred to as the Skin Resistance Response: SRR or GSR). We measured breathing and blood pressure pulsation by using the traditional methods. As to the breathing pattern, only deep breathing patterns were examined during this trial.

The Laboratory

We used the guest room of the police academy to experiment with the students, and we used the polygraph room at police headquarters for the regular police officers. At both locations the rooms were isolated from outside noise, and the room temperature was kept at 23 degrees centigrade +/- 3 degrees centigrade. The experiment was conducted between May and June 1975.

The Configuration of the Simulated Crime Scene

We placed four boxes in front of the entrance to the testing room, each containing cash in the amount of between 2,000 yen to 5,000 yen. The amount of money placed inside the boxes were clearly marked on the front. The boxes were used as an object of incentive to generate motives in the simulated act of theft. Then the examinees were asked to take the money out of one of the boxes and pretend as though they were stealing the money, and they were asked to hide it in their inside pocket so that the examiner would not know.

The Motivation, the Instruction and the Trial of the Examinees

We divided the sixty examinees into three groups of twenty each and gave them the following instruction to generate a motive:

1. One group was highly motivated to make every effort to suppress and deceive their responses to the trial. (This group will be referred to as the HM Group for Highly Motivated Group.)

2. Group with low key motivation. (This group will be referred to as the LM Group for Low Motivation Group.)

3. Group with no motivation. (This group will be referred to as the NM Group for Non Motivation Group.)

The First Experiment: HM Group

To motivate the examinees into falsifying, we followed the procedures outlined in Gustafson and Orne,[16] Specifically, we advised the examinees that: "The polygraph test is about 98% accurate in examining criminals. However, this rate drops to 50% when applied to ordinary citizens."

One explanation given for this is that criminals have lower intelligence and weaker self-control than the general public, that they are unable to outwit the polygraph test, and therefore are unable to hide the true response during the test. In other words, those with higher intelligence and strong self-control are capable of controlling their responses during the polygraph test.

"The trial we are about to give you is intended to verify this statement; we will try to find out how much money you have taken from the box. In order to do that, we will ask you five questions; from 2,000 to 5,000 yen. We want you to answer 'No' to every question asked. In this way you will have to lie to at least one question when the amount you have taken is mentioned. At that point, we want you to lie, and we want you to make every effort to deceive the trial." The trial continued following the pattern outlined by Shapiro and Crider[17,18,19]. Specifically, it was implied that if the examinees succeeded in lying they will receive an award, but if they fail, they will not only be deprived of an award, but will also receive a punishment in the form of an electrical shock[20]. Then they were told: "In the event that you are successful in lying to the machine, your efforts will be of value to us in our research and you will be compensated with 1,000 yen for your efforts. Again, if you fail to lie by showing your true responses, you will not be compensated. Also, those of you who have revealed your true responses are considered vulnerable to the machine, and therefore you may be required to undergo another trial at a later date. Please understand that this trial will take a long test, and some have complained that they have received an electric shock during the trial, therefore the test may be somewhat uncomfortable for you."

LM Group

This group received only the first portion of instruction that was given to the HM Group. Specifically, they were told that "those with higher intelligence and stronger self-control are capable of controlling their responses to the polygraph test. So, we want you to try your best not to show your true responses when you are lying." We did not say anything about rewards or punishments.

NM Group

This group did not receive any motivation. They were told only to deny the truth.

The Second Experiment

The following instructions were given to the examinees who have taken the first experiment in order to increase their desire to deceive the trial. The same instructions were given to the NM Group:

"Please try and see if you can make some mental efforts that will control your mind so that you will not reveal your true responses when you are lying. The following are some of the examples that are known to have succeeded in lying to the polygraph test: Count numbers while being tested. Repeat verses from the Buddhist scripts. Make believe that you have obtained a different sum of money. Think about the opposite sex. Try to recreate the tranquil state of mind that is experienced during Buddhist meditations. Daydream continuously. Select one spot in front of you and concentrate your mind and vision on that spot. Sing a song to yourself. In addition to the above, you may have found your own successful solution. Please take the trial once more while applying any of these techniques that may keep you from revealing your lies."

The Third Experiment

In this experiment, the examinees were told to forget all about their efforts to suppress their responses of lying, and they were told to take the trial with a carefree attitude of "I couldn't care less whether they found out or not."

The examinees were asked to participate in the mock stealing. Then they were asked to be seated. Pneumograph tubes were attached to their chests, and we wrapped the blood pressure cuff to their upper right arm to measure the blood presure-pulse. On the left index finger and on the ring finger we attached GSR finger electrodes. The instructions were given to the examinees, and the amount of money that was taken (stolen) in the mock theft was mentioned every 15 seconds during the trial.

The examinees were told that they will be asked the five questions regarding the amounts of between 1,000 yen to 5,000 yen in progression like, "Did you take ______ yen?" to which they were told to reply "No." After these two trials were given, the HM Group charts were interpreted and they were told the amount of money they had selected, while the LM and NM Groups were required to "confess" the amount of money that they had selected (stolen).

Study in Introspect of Examinees

After the first and second trials were completed, we asked the examinees what type of deception techniques they used. Also, after the first and the third trial, we asked the testees to answer the five questions listed in the Koga Insecurity Test[21] as shown in Table 1. These questions are used to measure the degree of insecurity and tensions felt by the examinees.

	Greatly	To a large degree	To a lesser degree	Slightly	Not at all
Trembling					
Excited					
Accelerated heart beat					
Strained and tense					
An oppressive sensation					

Table 1 Subject's Introspective Reactions to the Test

RESULTS

SRR

(1) Mean Ranks for each Trial

Magnitudes of SRR to the above four questions, except the "buffer" question (1,000 yen), were ranked from 1 to 4 according to the sorting method described by Thackray and Orne.[22] If this rank was 1.0, it was considered a perfect detection, while a rank of 2.5 indicated chance detection.

Next, we averaged out the scores of Trial #1 and Trial #2, scores of which are the responses to questions relative to the amount of money selected (stolen), and established a detection rate for each examinee. We also computed the average score of each group as to the detection rate of falsifying. The results are listed in Table 2.

Mean number of the ranks of overall SRR was 2.0. Using this average score as the base, we compiled a high and low curve and applied the scores obtained from the three groups. Between the three groups in the x^2 test we did not see any significance. However, between the second trial in which we motivated the examinees to suppress their responses, and the third trial in which we gave no motivation, were significant at the .05 level. ($x^2 = 4.937$ df =2 P<.05).

 TRIAL:	I	II	III
GROUP:			
НМ	1.75	1.58	1.92
LM	1.70	1.73	2.10
NM	2.03	2.05	2.10

Table 2 Mean Ranks of SRR when Responding to Critical Questions

HM = Highly Motivated Group LM = Less Motivated Group

NM = Unmotivated Group

Change in Conductance: 1/R' - 1/R

The degree of variance found in the SRR score reflects the amount of stimuli generated while being asked the various questions[23] and is expressed in terms of "Change in Conductance." This value was averaged out for each type of trial condition.

The specific response score of the average "Change in Conductance" of SRR of critical items are shown on Table 3.

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TRIAL:	I	II	III	
GROUP:				
нм	3.36	2.14	0.91	
ĹM	2.39	1.26	0.72	
NM	1.13	1.27	1.30	

Table 3Mean SRR Conductance in Critical Items for Each Group

The result of the analysis of variance between three groups were significant at the .025 level. (F=4.014 df=2, 114) Also, between trials, it was significant at the .05 level. (F=11.654 df=1, 114)

During the first trial we found no significant variance between the HM Group and the LM Group, but between the HM Group and the NM Group (t=2.462 df=38 p<.01), and, the LM Group and the NM Group (t=1.688 df=38 P<.05), variance was significant. Also, during the second trial, variance between the HM Group and NM Group was significant. (t=1.956 df=38 P<.05) In the third trial there was no significance between the three groups.

There was no significance between the first trial and the second trial taken by the HM Group and the LM Group, but between the second and the third trials (t=2.209 df=78 P<.02), as well as the first and the third trials there were significant results. (t=3.558 df=78 P<.001).

The Frequency of Successful Detection

Whenever we were able to obtain a mean rank "1" to the responses of critical items, we felt that the detection trial was a success in identifying the effects of the instructions given to the examinees, and in evaluating the overall success rate of the detection trial. These results are presented in Table 4.

The success rate of the first and second trials administered to the HM Group and the LM Group exceeded the chance level (Binomial Distribution Test) (1/4N=20 P<.05). Others were considered well within the chance level. There was no significance between the three groups during the first, second, and third trials.

Heart Rate

Because the heart rate is known to be sensitive[24] to emotional stress, we evaluated the heart rate responses that are recorded on paper. We evaluated the heart rate response within one minute after the question was asked. If there is no curve indicating a response to one of the key questions, we would compute the score from the response obtained from the next question, thus making sure that within every minute of the heart rate

TRIAL:	F S/	IM V U	LM S/U	NN S/	1 U	
GROUP:						
I	12*	8	11* 9	7	13	
II	11*	9	11* 9	8	12	
III	8	1 2	7 13	8	12	

Table 4Number of Successful and Unsuccessful Detections By Examiner

* P<.05

count there was a response curved to the key question. The response to the buffer question was not included. Result of heart trial for each group and between each trial is listed in Table 5.

				·
TRIAL:	I	II	III	
GROUP				
НМ	80.6	79.4	70.6	
LM	79.2	78.3	72.6	
NM	73.7	76.1	71.2	

Table 5 Mean Heart Rates Per Minute

There was significant heart rate response between the HM Group and the NM Group as a result of the first trial (t=3.854 df=38 P<.001), but there was no significance between the HM Group and the LM Group.

Also, when the results of differential trials were compared, there was a significant heart rate decrease between the first and the third trials (t=3.181 df=118 P<.001).

The Methods and Effects of Falsifying

The type of falsifying techiques used by the examinees and their effectiveness are listed in Table 6 (Trial #1) and in Table 7 (Trial #2).

In the first trial the examinees were allowed to devise their own

method of "beating the test" by suppressing their responses of lying. The result showed no significant effectiveness in suppressing the response. However, when the various methods of deceiving the trial were presented to the examinees as in Trial #2, especially with regard to the instruction: "To concentrate the mind and vision on one spot," it showed significant effect in suppressing the response, as reflected in Table 7: Of the 12 examples, 10 showed that they had deceived the test, and as in the χ^2 test, it showed a significant result at the .025 level (χ^2 = 5.104[corrected value] df=1 P<.025). Apparently this method has a higher success rate.

C 2 0 1 0 .				м			Tet - 1	
	S	U	S	U	S	U	S	U
Has money from another box	5	4	4	4	1	3	10	11
Think of something else	3	1	3	3			6	4
Keep calm	2		3	1	1		6	1
Breathe regularly	1	1	1				2	1
Keep an eye on one point in front and concentrate the mind on it		1		1				2
Keep composed					1			1
Think of nothing	1						1	
Count numbers		1						1
Total	12	8	11	9	2	4	25	21

		Table 6	
Numbers	of	Successful and Unsuccessful Detections	for
		Each Technique of Manipulation	
		(Trial #1)	

Survey of Examinees' Introspect

In evaluating this part of the survey, we have applied a scoring structure from 1 through 5, with the lowest part of awareness rated as 1. This means that the higher the score, the more the examinees experienced a sense of insecurity or tension. The average score of 1.0 was used as the base, and scores higher than that were compiled in Table 8.

Motivating the Suspect

GROUP:	S	HM U	S	LM U	S	N M U	S	Total U
Has money from another box	6	1	1	1	3	5	10	7
Think of something else	1	3	4	3			5	6
Keep calm	1				3		4	
Breathe regularly		1		1	1		1	2
Keep an eye on one point in front and concentrate the mind on it	1	3	1	2		5	2	10*
Count numbers	1		2	2	1		4	2
Sing songs		1	3				3	1
Create excitement					1			1
Others	1					1	1	1
Total	11	9	11	9	8	12	30	30

Table 7 Numbers of Successful and Unsuccessful Detections for Each Technique of Manipulation (Trial **#**2)

* ... P<.025

Table 8 Subject's Introspective Results

GROUP:	НМ	LM	NM
TRIAL:	I III	I III	I III
	12** 5	14* 5	10 8
	t = 3.492	t=1.954	t=1.211
	df=38	df=38	d f = 38
	P<.001	P<.05	P<.20

Between Trial #1, the examinees who were highly motivated to deceive, and Trial #3, who were told to stop deceiving, there was significant difference of an introspective sense of insecurity or tension at the .005 level. (t=2.724 df=118 P<.005) However, there was no significant difference in the NM Group.

DISCUSSION

The Effects of Deliberately Suppressing One's Response of Lying

The importance of detecting this matter has received wide support because it has a decisive effect on the validity of polygraph tests. The purpose of this mock polygraph examination was to study what effect the various stages of motivation would have on influencing the outcome of polygraph tests. Various methods of motivation to deceive are used in the experiment, especially developed by Lykken and Davidson.[25] They recommend rewarding the examinees when succeeding in deceiving the examiner as a positive approach in motivation. On the other hand, there is a negative approach suggested by Lykken[26] which included giving punishments in the form of electric shocks when questions are asked. But in these tests, the results of operation of the test condition were never explained due to what he calls "failure to produce a score comparing conditions under motivation and non-motivation."

In view of the above, our experiment included an additional group that received no motivation. This last group was compared with two other groups that received different kinds of motivations. The result revealed a significant detection rate among the group that received motivation in comparison to the group that did not receive any motivation. In other words, it means that the harder the subjects try to suppress the response to lies, the harder it is to suppress. Specifically, the examinees who were motivated to fake their responses to lies experienced greater tension and uncertainty which increased their instability. This leads to a type of mind-set(set)[27] that excites the autonomic nerve system and causes certain biological reactions.

This was substantiated during our third trial when the motivation was removed and the examinees were told to forget all about deceiving the test. The result was a significant drop in biological responses.

Other tests were performed that show what effect the examinees' attitude had on the detection rate. For example, Gustafson and Orne[28] made a study of two groups with contrasting motivations.

One group was told that "those who are quite superior in intelligence and have more than the usual amount of control can suppress their autonomic response," while the other group was told that "those who have psychopathic tendencies or who are mentally disturbed do not show the psychological reactions associated with lying." During the first test they were given feedback so they would know how they were doing against detection. The second trial was the actual detection test whereby scores were compared. Gustafson and Orne[29] summarized their test results as follows: The examinees came up with totally opposite results in spite of receiving identical instructions. Specifically, those who were concerned with the portion of the statement that said "those who have psychopathic tendencies or who are

mentally disturbed do not show the psychological reactions" were anxious to be detected, and when they were told after the first trial that they were detected, their responses were lowered. In contrast to this group, those who were concerned with the part that said, "those who are quite superior in intelligence and have more than the usual amount of control can suppress their autonomic response" were so anxious not to be detected that when they were told that they were detected after the first trial, they overreacted during the second trial and made detection much easier.

These facts indicate that the state of mind of the examinee reacts differently to a different set of motivations, and that the outcome can be very different. In this experiment, the conclusion they reached was the same as our findings. It reaffirms our belief that there is a direct relationship betweeen motivation and detection. It substantiates our theory that the technique of motivation to deceive can contribute enormously to the success of detection programs.

In other words, any effort to suppress the reaction of lying will cause opposite results from what the examinee intended, unless, of course, the examinee had received training in countermeasures, or was offered feedbacks during the test as outlined in the theory of Operant Conditioning.[30]

Effects of Motivation

The reason why there was no significant variance between the HM Group and the LM Group is probably because the type of reward and punishment offered was inadequate. But there is a limit to the amount of instruction that can be given to the LM group, and we cannot expect additional responses.

Table 8 reflects our endeavor to measure the degree of insecurity. In this table, the HM Group and the LM Group show their reactions when motivations are removed. But the NM Group shows no effect when motivation is removed. Also it is noted that the HM Group and the LM Group show motivational variances similar to the NM Group does, an indication that our interpretation above was correct.

As to the other possible causes that are mentioned in the Suzuki[31] report, there may be a problem with the characteristics of the SRR measuring circuit design, and this problem should be studied further.

Methods of Willfully Suppressing the Response to Lying

Prokasy[32] and his associates point to the experiment conducted by Beebe which found that when the examinees are performing mathematical calculations or concentrating on deep thoughts, the GSR response to the detection questions were reduced and analysis became difficult.

In our experiment, some of the examinees chose to count numbers during the trial, but it did not have much of an effect on suppressing their response. However, Table 8 shows a significant success rate in suppressing responses when the examinees "Concentrated their mind and vision on one spot." Perhaps this may be one of the more effective ways of faking the test.

It is assumed that the reason why the examinees showed no responses or weak responses while concentrating their mind and vision on one spot is as Weinstein[33] indicated, a type of forgetfulness induced by hypnotic effect, or a lowering of sensory response caused by mental fatigue.

SUMMARY

The purpose of this experiment is to study the effects on the polygraph results when the examinee is making a deliberate effort to fake his responses to lying. We also wanted to know the effects of different ways in which test results were falsified, and to study the influence of various degrees of motivation.

We conducted our experiment on 60 adult males who were divided into three separate groups of 20 personnel each. The first group was highly motivated (HM Group), the second was less motivated (LM Group) than the first, and the third group received no motivation (NM Group). Prior to the experiment, the HM Group was told about the rewards and punishments in addition to the motivational statement, the LM Group received only the motivational statement, and the NM Group received no motivation. A mock theft scene was created as a backdrop to conducting the experiment.

Each group underwent three trials applying the peak of tension methods. For the first trial, the HM and LM Groups were instructed to devise their own ways of avoiding detection, while the NM Group received no instruction. For the second trial, each group was told of the various methods of defeating the test and were encouraged to make further effort to defeat the test. And, for the third trial, all motivation to defeat the test was removed.

During the above trials, the breathing pattern, GSR and blood pressure pulsation were measured. (The breathing was monitored only to check the deep breathing pattern.)

We found that the HM and the LM Groups, which received the motivations, showed a significantly higher GSR detection rate than the NM Group that received no motivation. After the second trial, when the examinees mind-set was removed by "confessing" the amount of money, or when told which amount of money they had selected, there was a decrease in conductance of SRR. We also found that the heart rate showed a similar pattern as the GSR in that the HM and the LM Groups that received the motivation had a much higher score than the NM Group that received no motivation. After motivation was removed, all three groups lowered their score.

The HM Group, which was told about awards and punishments in addition to the motivational instruction, showed somewhat of a higher change in conductance of SRR when compared to the LM Group. But the difference was not significant. In regard to the different methods used by examinees to fake the test, there were categories such as (1) making believe that a different amount of money was taken, (2) concentrating his mind and vision on one spot, (3) thinking about something unrelated, plus eight other methods. Of these, we found that "concentrating one's mind and vision on one spot" received an exceptionally high success rate in deceiving the test. (x^2 =5.104 df=1 P<.025)

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This fact can also be construed as a warning to potential interference while performing the lie detection test. Therefore, we intend to study this area further because it may reveal some interesting facts when we apply the brain-wave test.

The above research was conducted by the research class of the Police Academy, Class 149 of the year 1975, at the Kurume University Medical Department Biological Laboratory.

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VALIDITY OF THE POSITIVE CONTROL POLYGRAPH TEST USING THE FIELD PRACTICE MODEL

By

Robert F. Forman and Clark McCauley

Abstract

The validity of polygraph testing remains problematic because of reliance upon unverifiable criteria in field studies and lack of external validity in laboratory studies. This study introduces a model of field polygraph testing that provides examinee choice and commitment in a laboratory setting. Using this model, we tested 38 subjects with one repetition of a four-item Positive Control Test, two repetitions of a four-item Control Question Test, and one repetition of a three-item Guilty Knowledge Test. The Positive Control Test, a new and previously unvalidated test format, obtained average accuracy of 73% for the examiner and 78% for a "blind" judge of the polygraph record. Similar average accuracy was obtained with the other two tests, but the Positive Control Test was less biased against detection of truth than the Control Question Test and less biased against detection of deception than the Guilty Knowledge Test. Further results indicate that incentive to avoid detection may increase detectability of the deceptive, that a combination of Positive Control and Control Question Tests may be more accurate than either alone, and that number of repetitions of questions may be more important than "chart minutes" in increasing detectability with the Control Question Test.

This study evaluates the validity of an innovative form of polygraph test, Reali's Positive Control Test, and compares it with a Control Question Test and a Guilty Knowledge Test in a laboratory model of field polygraph practice. In addition to mirroring the procedures and incentives of field practice, the model tests examinees concerning a behavior that is freely chosen.

Reali first described the Positive Control Test (PCT) in 1978, and has since used and taught this form of polygraph testing at Personnel Polygraph Research in Philadelphia, Pennsylvania. The PCT asks the examinee to tell first a lie and then the truth in answering a yes-or-no question. ("Tell me a lie, did you rob the Friendly Loan Company? Now tell me the truth, did you rob the Friendly Loan Company?"). The assumption is that a guilty examinee is less aroused by "telling a lie" (the truth for a guilty person)

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Reprinted from <u>Journal of Applied Psychology</u>, 71(4)(1986): 691-698. •1986 by the American Psychological Association. Reprinted by permission of the publisher and authors. than by "telling the truth" (a lie for the guilty person). An innocent person, on the other hand, is assumed to be more aroused by telling a lie than by telling the truth. Although its assumptions are not implausible, there is no evidence to support them, and so far as we are aware (see also Lykken, 1981, pp. 135-138), our study is the first investigation of the validity of the PCT.

The usual form of polygraph testing is the Control Question Test (CQT). The CQT compares an examinee's polygraph response to a relevant question ("Did you rob the Friendly Loan Company?") with response to a control question ("Before the age of 15, did you ever steal anything from someone who trusted you?") It is assumed that a guilty person is more aroused by the relevant question than by the control question, and further assumed that an innocent person is more aroused by the control than by the relevant question. The problem (see Lykken, 1981) is that even an innocent person is likely to be more aroused by the relevant false positives with the CQT. In fact, studies of polygraph validity in field practice generally do find more false positives than false negatives (Office of Technology Assessment [OTA], 1983), and two of the better field studies (Barland & Raskin, 1976; Horvath, 1977) have found about 50% of innocent examinees incorrectly called guilty.

Lykken's criticism of the CQT leads him to emphasize the potential value of the Guilty Knowlege Test (GKT) as an answer to the control problem The GKT compares arousal to each of a number of multipleof the COT. choice altenatives where the relevant alternative is known to the guilty (and to the examiner) but not to the innocent. ("Is this a picture of the teller robbed at the Friendly Loan Company? Is this? Is this?"). The assumption here is that a guilty examinee will be most aroused in response to the relevant alternative, whereas an innocent examinee has only a 1/n(for n alternatives) probability of being most aroused to the relevant alternative. Although its assumptions are plausible, the GKT can be difficult to apply in field practice, because neither criminal investigation nor employment screening will usually provide the examiner with enough items of quilty knowledge. Despite its rarity in field practice, a GKT was included in our study as a kind of benchmark against which to compare performances of the PCT and CQT.

The major impediment to improving polygraph practice has been the difficulty and uncertainty of determining "ground truth" for field validity studies. According to the recent review of polygraph validity by the Office of Technology Assessment (1983) there are no adequate studies of polygraph validity in employment screening, presumably because of the difficulty of finding any criterion measure of truthfulness. In criminal investigations, studies of polygraph validity can use expert judgments from case records or judicial outcomes as criteria, but these are obviously fallible approximations of ground truth. Another way to obtain a criterion in criminal investigations is to study only cases with truth or deceit established by a verified confession. Here the problem is that the confession may not have been independent of the polygraph results, which is to say that the verified cases are likely to be an unrepresentative sample of all criminal cases in which polygraph is used.

The obvious alternative to field studies of polygraph validity is

research in the laboratory, where the truthfulness of examinees can be determined with certainty by experimental design. Equally obvious is that laboratory studies have problems of generalizability. That is, it is easy to question whether polygraph accuracy in laboratory "games" can say anything useful about accuracy in field practice. Despite his criticism of professional polygraphers, Lykken (1981) has agreed with them that results of laboratory studies should not be generalized to field practice. The recent OTA review of polygraph validity has taken a similar position:

Although analog studies have greater criterion validity and offer greater experimental control, their use as indicators of polygraph testing validity is potentially problematic. The reasons have to do primarily with external validity ..., <u>i.e.</u>, the crime situation differs, the testing situations in the field and the laboratory differ, the training of the examiners differs, the subject population differs, and apparently most important, the consequences for "suspects" differ dramatically between the field and the laboratory. In addition, in analog studies, the questions and question techniques most often are not tailored to individual subjects. In actual criminal field investigations, case information about the crime and the subject usually provides a basis for tailoring questions (OTA, 1983, p. 62)

Although it is not cited by OTA in this regard, the OTA summary of field versus laboratory accuracy supports the view that laboratory results are not generalizable. According to OTA (1983, p. 97), both true positive and true negative percertages average higher in field studies than in laboratory studies (86% vs. 64% and 76% vs. 58%, respectively). However, the OTA averages were calculated with inconclusive judgments treated as errors. Because in practice inconclusive judgments lead to suspension of judgment or retesting, it is accuracy of conclusive judgments that should be compared. Elsewhere (McCauley & Forman, 1985), we have shown that the accuracy of conclusive judgments is very similar for the field and laboratory studies reviewed by OTA (respectively, 86% vs. 92% true positives and 77% vs. 78% true negatives).

Our study builds on this indication of the generalizability of laboratory results by introducing a laboratory model of field practice for an initial assessment of PCT validity that includes comparison with a CQT and a GKT. The field practice model represents faithfully the characteristics of field testing in that (a) a commercial three-channel (pneumograph, cardiograph, galvanic skin response [GSR] field polygraph instruement is used; (b) the polygraph tests are administered by an experienced, certified polygrapher, (c) scoring is by the nonnumerical method commonly used in field practice; (d) examinees are tested for guilt or innocence that is freely chosen rather than assigned; (e) both guilty and innocent stand to lose money if detected as deceptive in the test, and (f) questions are formulated and scored in accordance with the field practice of PCT and CQT.

METHOD

Each subject responded to a test combining representative forms of PCT, CQT, and GKT. Backster, an innovator of the CQT format and the originator of the Total chart minutes concept, claims that the first 4 to 8 min

of polygraph testing are less reliable than the subsequent 10 to 13 min (Backster, 1966). Thus, Backster-trained polygraphers typically give little weight to the first repetition of their test (usually a minimum of three repetitions are given). On the other hand, Reali, the originator of the PCT. places no value in the total chart minutes concept (Reali, personal communication, 1983) and gives more than one repetition of his test only to confirm a judgment of deception. Therefore, by presenting examinees with one repetition of a four-question PCT followed by two repetitions of a CQT using the same four relevant questions, it was possible to present each technique at its claimed peak effectiveness. Finally, one repetition of a 3-item GKT was presented, because Balloun & Holmes (1979) have found that only the first repetition of a GKT is effective. Each GKT item had six alternatives (the first an unscored buffer) as recommended by Lykken (1981, p.299). We considered that field use of the GKT rarely would have more than 3 items available and so we used only 3 despite Lykken's preference for 10 to 16 items.

Subjects

Subjects were 39 female Bryn Mawr undergraduates who volunteered to participate in the study after being informed that they could earn either \$2, \$10, or nothing, depending upon their own decision and the outcome of the polygraph test. All subjects indicated that they had never taken a polygraph test before. Results are presented for 38 subjects (22 deceptive, 16 truthful); 1 subject was dropped because of physical abnormality (three kidneys) which distorted her polygraphic recording.

Apparatus

All subjects were tested on a Lafayette Ambassador electronic polygraph. One pneumograph, one GSR recording, and one cardiograph were recorded for each subject.

Procedure

Subjects met individually for approximately 20 to 30 min with a research assistant who read the following briefing to each subject as the subject read along on her own copy of the instructions:

1. In a few moments you will be given the opportunity to choose one from among 10 envelopes. Half of these envelopes contain a \$2 promissory note and the other half contain a \$10 promissory note.

2. If you open the envelope you will "tentatively" be awarded whatever sum of money is indicated on the promissory note (<u>i.e.</u>, \$2 or \$10).

If you do not open the envelope you will "tentatively" be awarded
\$2.

4. After having opened/not opened the envelope in the presence of the research assistant, you will then have a short pre-polygraph test briefing.

5. Following the briefing, you will be tested by an experienced, Certified Polygraph Examiner using a Lafayette 4-pen polygraph instrument (1982 series).

6. If you did not open the envelope and pass the test (<u>i.e.</u>, the polygraph examiner determines that you indeed did not open the envelope) you will be awarded the 2 promised.

7. If you did open the envelope and beat the test (<u>i.e.</u>, the polygraph examiner incorrectly determines that you did not open the envelope) you will be awarded the sum of money promised in the promissory note.

8. In other words, if the examiner judges that you opened the envelope (regardless of what you actually did) you will be denied whatever monies were tentatively promised. Thus, regardless of whether or not you opened the envelope, you should respond to all questions as if you did not open the envelope.

9. The polygraph examiner will do his best to determine the truth and it will be difficult to deceive him. Nonetheless, highly intelligent and mature individuals may be able to "beat the polygraph" by controlling their emotions well enough to succeed.

10. While being tested by the examiner, take care to remain perfectly still. Intentional movements will be an automatic tip to the examiner that you are attempting to deceive and may result in your being disqualified from the study.

ll. All monies will be awarded approximately one month from today's date after the test results have been interpreted.

The research assistant was instructed to assist subjects in understanding the contingencies, but was told not to influence the subjects in making their decisions. Subjects who chose not to open the envelope were provided with an exact copy of the questions which they were going to be asked by the examiner. After filling in the appropriate blanks and reviewing all of the questions with the research assistant, the subject was seated in the waiting area until the examiner was ready to test her. Subjects who opened the envelope were given the same review of questions. In addition, the research assistant led these subjects through a brief session in which they were asked to write on a piece of paper (a) the color of the promissory note, (b) the color of the ink used on the note, and (c) three drawings of the picture found on the note. This procedure was introduced in order to increase the salience of these stimuli for the GKT. Following this additional briefing, the subject was seated in the waiting area until the examiner was ready to test her.

All subjects were tested in a small bare-walled room. The examiner explained to each examinee that the instrument being used was a state-ofthe-art polygraph. The examiner also identified himself as an experienced examiner who would be able to detect deception without fail. Finally, the examiner presented a brief demonstration of the polygraph's sensitivity by allowing the examinee to observe the GSR recording as she talked about a boyfriend, a sibling, or a pet. This introduction by the examiner was designed to enhance the credibility of the instrument and the examiner for the examinee, and it was included because it is in common use in the field.

Each examinee was tested in a single session with PCT, then CQT, then

GKT as follows: one buffer and four relevant questions (each "lie" then "truth" as per Reali), two buffer and four relevant versus control question pairs (using the same relevant questions as in the Reali Test), and three guilty knowledge questions (with six alternatives for each question). The guilty knowledge questions were about the color of the promissory note paper, the picture on it, and the color of the ink used. The control and relevant items for the GKT (paper color, ink color, and picture) were revised each of the given days of testing to prevent any contamination effect from conversations subjects may have had with individuals tested earlier.

Examiner and Blind Judge

The examiner (Robert Forman) was an experienced, certified polygraph examiner who has been conducting polygraph tests for approximately 3 years. In addition to the judgments made by the examiner, independent judgments were made by a judge who had no contact with the examinees nor discussion about any of the charts with the examiner. The blind judge (Sylvestro Reali) has been conducting polygraph tests for 16 years and is the originator of the PCT. For the blind judge, each chart was separated into three sections (PCT, CQT, and GKT) and coded for identification so that it was not possible for the blind judge to compare different tests of the same examinee.

Chart Scoring

In interpreting the polygraph charts, the examinee's response to a question was judged deceptive if at least two of three parameters (cardiograph, pneumograph, and GSR) indicated deceptiveness, and the examinee was judged deceptive if more than half of the questions (of 4 for PCT, of 4 x 2 for CQT, of 3 for GKT) were deceptive. This is standard field practice when nonnumerical chart interpretations are being made. Again following field practice, a chart was identified as inconclusive if half the questions indicated deception and half indicated truth. Similarly, those charts that were not interpretable because of distorted recordings (because of excessive subject movement) were also judged inconclusive.

RESULTS

Reliability of Judgments

The agreement of judgments made by the examiner and blind judge for the three tests can be represented both as percent agreement and as the correlation between judgments (l = innocent, 2 = inconclusive, 3 = deceptive).

<u>Positive Control Test</u>. The examiner and blind judge were in agreement on 30 out of 38 judgments (80%): 15 truthful, 12 deceptive, and 3 inconclusive. Two of the eight disagreements involved a judgment of deception opposed to a judgment of innocence. Correlation of judgments of examiner and blind judge was positive, r(36) = .80, p < .01 with inconclusives considered and r(27) = .87, p < .01 without inconclusives.

<u>Control Question Test</u>. The examiner and blind judge were in agreement on 27 out of 38 judgments (71%): 7 truthful, 18 deceptive, and 2 inconclusive. Three of the 11 disagreements involved a judgment of deception

opposed to a judgment of innocence. Correlation of judgments of examiner and blind judge was positive, r(36) = .71, p < .01 with inconclusives and r(26) = .84 without inconclusives.

<u>Guilty Knowledge Test</u>. The examiner and blind judge were in agreement on 26 out of 38 judgments (68%); 21 truthful, 4 deceptive, and 1 inconclusive. Five of the 12 disagreements involved a judgment of deception opposed to a judgment of innocence. Correlation of judgments of examiner and blind judge was positive, r(36) = .47, p < .01 with inconclusives and r(28)= .51, p < .01 without inconclusives.

Judgment Bias

It is noteworthy that both examiner and blind judge tended to make more guilty judgments with the CQT (22 and 22, respectively) than with the PCT (16 and 13, respectively) or GKT (9 and 10, respectively). Looking at conclusive judgments only and combining results for examiner and blind judge, the percentage of conclusives called deceptive was 70% for CQT, 45% for PCT, and 26% for GKT, $x^2(2, N = 199) = 25.3$, p < .01. Thus, the CQT was biased toward judgments of guilt, the GKT was biased towards judgments of innocence, and the PCT was more evenly balanced between judgments of guilt and innocence.

Accuracy of Examiner and Blind Judge for Each Test

Table 1 shows accuracy of detection for deceptive and truthful examinees and Lykken's average accuracy, for each of the three tests, separately for examiner and blind judge. Following Lykken (1981), average accuracy is designed as the unweighed average of percent accuracy for detection of deception and percent accuracy for detection of truthfulness. Accuracy percentages and correlations were calculated without the inconclusive judgments (see under "Number of conclusive judgments" in Table 1) because in field practice inconclusive judgments lead to retests or suspension of judgment.

<u>Positive Control Test</u>. Examiner accuracy was 68% for detection of deception, 77% for detection of innocence, and 73% average accuracy. For the blind judge, accuracy was 63% for detection of deception, 92% for detection of innocence, and 78% average accuracy. Correlation of the examiner's judgments with the criterion was positive, r(30) = .44, p < .01, as was correlation of the blind judge's judgments with the criterion, r(30) = .56, p < .01.

<u>Control Question Test</u>. Examiner accuracy was 82% for detection of deception, 47% for detection on innocence, and 65% average accuracy. The blind judge obtained accuracy of 89% for detection of deception, 58% for detection of innocence, and 74% average accuracy. Both examiner and blind judge obtained the highest detection of deception and the lowest detection of innocence using the CQT. Correlation of the examiner's judgments with the criterion was positive, r(30) = .37, p < .05, as was correlation of the blind judge's judgments with the criterion, r(29) = .52, p < .01.

<u>Guilty Knowledge Test</u>. Examiner accuracy was 45% for detection of deception, 100% for detection of innocence, and 73% average accuracy. For the blind judge, accuracy was 45% for detection of deception, 94% for detection of innocence, and 70% average accuracy. Both examiner and blind judge obtained the lowest detection of deception and the highest detection of innocence using the GKT. Correlation of the examiner's judgments with the criterion was positive, r(34) = .50, p < .01, as was correlation of the blind judge's judgments with the criterion, r(34) = .44, p < .01.

Table 1

Accuracy 6 Conclusive Judgements by Examiner and Blind Judge for Positive Control Test (PCT), Control Question Test (CQT), and Guilty Knowledge Test (GKT)

	Decep	<u>Deceptive examinees (n = 22)</u>				<u> Truthful examinees (n = 16)</u>						
	# of conclusive judgments		% correct		# of conclusive judgments		% correct		Average accuracy			
TEST	EX	BJ	<u> </u>	BJ	EX	BJ	EX	BJ	E X_	BJ		
PCT	19	19	68	63	13	13	77	92	73	78		
СQТ	17	19	82	89	15	12	47	58	65	74		
GKT	20	20	45	45	16	16	100	94	73	70		
PCT + CQT	8	10	100	100	10	8	60	75	80	88		

Note: EX = examiner, BJ = blind judge

Accuracy of 1st Versus 2nd Judgments in the Control Question Test

The CQT was given in two repetitions and the separate judgments from each of these can be correlated with the criterion for each judge. Without inconclusives, the correlation of the examiner's judgments with the criterion was positive, r(25) = .13, ns for the first repetition and r(32) = .28, ns for the second repetition. Without inconclusives, the correlation of the blind judge's judgments with the criterion was positive, r(27) = .21, ns for the first repetition and r(32) = .60, p < .01 for the second repetition.

Because of the unequal number and identity of conclusive judgments for the first and second repetitions for each judge, it was not possible to test the significance of the differences in validity correlations for the two repetitions. The first and second repetitions can be compared directly and on the same basis, however, if the inconclusives are included. Here the tendency for the second repetition to have higher validity than the first is not significant for the examiner's judgments (r = .20 vs. r = .27) but is significant for the blind judge: r = .19 versus r = .61, t(36) =3.49, p < .05 for two-tailed test of difference between related sample correlations.

Accuracy of Combined Test Judgments

For the examiner, the PCT and CQT were in agreement in a conclusive

judgment of guilt or innocence for 18 of the 38 examinees (47%). The accuracy for these two-test-agreed judgments for detection of deception was 100% (8 judgments) for detection of guilty, 60% (6 out of 10) for detection of innocence, and 80% average accuracy. For the blind judge, the PCI and CQT were in agreement for 18 out of 38 examinees (again 47%), and the twotest-agreed accuracy was 100% (10 judgments) for detection of deception, 75% (6 out of 8) for detection of innocence, and 88% average accuracy.

Thus, examiner average accuracy went from 73% to 80% and blind judge accuracy went from 70% to 88% as inconclusive judgments increased from 6 to 20 with the use of the combined test format.

Comparison of Incentives

Of the 22 examinees who opened the envelope, 9 received a \$10 promissory note and 13 received a \$2 promissory note. Considering only the conclusive judgments, both the examiner and the blind judge tended to be more accurate in detecting those who received the \$10 note (for the examiner, 86% vs. 67% for PCT, 88% vs. 78% for CQT, 63% vs. 33% for GKT; for the blind judge, 71% vs. 58% for PCT, 100% vs. 83% for CQT, 50% vs. 38% for GKT). Combining conclusive judgments across all tests for both examiner and blind judge, the accuracy of deceptive judgments for the nine \$10 examinees was 76% and for the thirteen \$2 examinees was 60%, $x^2(1, N = 114) = 3.14, .05$

Discussion

The Field Practice Model

It is useful to begin by reviewing the ways in which the present analog polygraph study addresses the concerns for external validity raised in the OTA report. First, the examiner and blind judge were both certified, experienced polygraph examiners. Second, the testing situation reproduced typical field practice: A pretest interview was conducted in which the examinee was encouraged to believe in the validity of polygraphic technique, a field polygraph instrument was used to administer the tests, and scoring was by the nonnumerical majority rule that is standard field procedure. Third, by careful choice of the behavior in question (i.e., opening or not opening the envelope) it was possible to tailor the relevant and control questions with the same kind of precision found in the field.

Fourth is the concern with differences between analog and field examinees. Although our undergraduate female subjects are not typical field examinees, it is by no means clear that detectability is thereby affected. There is no systematic study of the effects of age on detectability, though Abrams (1975) reported using polygrpah testing to detect lying in a l2year-old examinee. There has been only one study (Cutrow, Parks, Lucas, & Thomas, 1972) that looked for sex differences in detectability, and it found women no less detectable than men. Although Frisby (1976) cautioned examiners to "take note of a possible hidden variable" (p. 306) in his pilot study on the effects of menses on polygraph examinations, he presented no evidence to indicate that the menses affect detectability.

Likewise, there has been little research on the effect of educational or intellectual level on detectability. Barland and Raskin (1976) found no relation between educational level and detectability, whereas Raskin (1976) found that there were more false positives among his college-educated examinees (i.e., lower accuracy with more educated examinees). Only one study (Kugelmass, 1967) has examined the relation between intelligence and detectability and it found no correlation. Thus there is no evidence to suggest that the sex, education, or age of our subjects created problems for generalizability; if anything, our higher socioeconomic subjects may have been less detectable than the typical field examinee.

The fifth concern about the external validity of analog research focuses on differences in the crime situation. The common practice in analog research (e.g., Barland & Raskin, 1975; Bradley & Janisse, 1981; Davidson, 1968; Dawson, 1980; Honts & Hodes, 1982a,1982b, Kircher & Raskin, 1981; Lykken, 1959; Podlesny & Raskin, 1978) is to assign subjects to the condition of guilt or innocence (but see Balloun & Holmes, 1979, and Ginton, Netzer & Eland, 1982). This practice clearly deviates substantially from real criminal situations, where the criminal act is actively chosen. In our study, however, each examinee did make an informed choice to open or not open 1 of the 10 envelopes presented to her. The decision to open the envelope was made with the hope of obtaining \$10 even though detection would result in getting no money at all; not opening the envelope, on the other hand, was the safer option, which held greater promise for winning a lesser reward (\$2). These contingencies parallel those involved in real criminal situations except that gains and losses in real criminal investigations are much larger.

The issue of the severity of consequences for the examinee is the sixth problem of external validity that analog research must address. As mentioned earlier, there is a strong belief among polygraph examiners and researchers (Abrams, 1972, p. 145; Berrien, 1939, p. 542; Orne, 1972, p. 173; OTA, 1983, p. 62; Waid & Orne, 1981, p. 73) that greater motivation to deceive leads to greater detectability. This belief, however, has apparently developed without any empirical foundation. Davidson (1968) examined the relation between motivation and detectability and found that examinees motivated by a \$1 voucher for successful deception were just as detectable as those motivated by a \$50 voucher. It should be noted, however, that because there were only six subjects in each of Davidson's conditions, these results must be considered only suggestive. Our own results do suggest that detection of guilt increases with higher incentive to lie successfully (76% vs. 60% for \$10 vs. \$2, respectively), though the difference was statistically marginal (.05). Because our study varied incentive for guilty examinees only, our results cannot suggest what effect increased motivation might have on the detection of innocence. It seems possible, however, that increased motivation may improve guilt detection only at the expense of poorer detection of innocence, that is, that increased motivation does not increase average accuracy.

In summary, we believe that our study using the field practice model offers a strong claim for external validity. This claim is reinforced by comparing CQT accuracy in our analog study with CQT accuracy obtained in field practice. For our examiner, the CQT produced 82% accuracy for the guilty and 47% for the innocent, for an average accuracy of 65%. Thus, our examiner's accuracy agrees closely with the corresponding examiner accuracy of 77%, 51% and 64% obtained by Horvath (1977) in which is generally considered (Lykken, 1981; Waid & Orne, 1981) the best field study available. We believe the superior performance of our blind judge (90% and 58%, with an average accuracy of 74%) is attributable to his exceptional skill and experience.

Accuracy of Positive Control, Control Question, and Guilty Knowledge Tests

The PCT tended to be more accurate in detection of innocence (77% for the examiner, 92% for the blind judge) than for detection of deception (68% and 63%, respectively). Ours is the first evidence concerning the accuracy of the PCT, and we can be quite confident in ascribing this accuracy to the PCT rather than to any intuition of the examiner or leakage of information from other tests. The blind judge saw only coded segments of the polygraph record and could not tell which PCT went with which CQT or GKT. Thus, the blind judge should have done worse than the examiner to the extent that contact with examinee, clinical intuition, or information from either CQT or GKT were contributing to PCT accuracy. In fact, average accuracy was, if anything, higher for the blind judge (78%) than for the examiner (73%).

Average accuracy for the other two tests was similar to that obtained with the PCT. For the CQT, the examiner's average accuracy was 65% and the blind judge's average accuracy was 74%, whereas for the GKT the coresponding average accuracies were 73% and 70%. As with the PCT, we can be confident in ascribing the achieved accuracy to the particular test and not to examiner intuition or information from other tests.

We acknowledge that the GKT may operate at a disadvantage (or advantage) in this study because it was presented after the other two tests. Nevertheless, it was included because, as the last test given, it could not interfere with the previous two tests and was valuable as a benchmark for the field practice model. That is, the percent false positive expected with three GKT items, each having five scored alternatives, should be $(1/5)^{3}$ + $(1/5)^{2}$ (4/5)(3) or approximately 10%. The obtained false positive rate was indeed low: 0% for examiner and 6% for blind judge.

Similarly, we acknowledge that there is a possible order effect such that the two repetitions of the CQT may be less (or more) accurate when following the PCT than when following an initial (and usually disregarded) repetition of CQT. Although this kind of order effect could be avoided with a cross-subjects design in which each test format is administered to different examinees, we chose instead a within-subjects design for this first study of the PCT, for two reasons. First, we were interested in looking at the validity of PCT and CQT used in combination. Second, we believed an order effect a priori unlikely; because the PCT used the same four relevant questions as the CQT and differed only in asking each relevant question twice ("lie" then "truth") whereas the CQT paired each relevant question with a control question (e.g., "Have you ever lied to someone who trusted you?")

Even if there is an order effect with our CQT, our study is unambiguous in offering the first evidence of the accuracy of the PCT: percentages of lie and truth detection that can be compared with similar data from the many previous studies (OTA, 1983) of CQT accuracy. However, we believe our data argue against an order effect to the extent that results for both CQT and GKT are consistent with previous experience with these tests when used alone. Our CQT showed both the high true positive rate and the too-high false positive rate found in field studies (see Introduction). And, as noted above, our GKT showed the low false positive rate expected for this test. Of course it could be argued that our results cannot usefully be compared with results of previous studies, because the accuracy obtained with CKT and GKT varies considerably across studies (OTA, 1983) and because subjects in our study chose whether or not to open the envelope, whereas previous analog research has usually assigned subjects to truth or deception conditions. This is a matter of judgment, but we find it unlikely that order effects can account for the pattern of our results, particularly the similarity between our CQT results and CQT results obtained in what is arguably the best available field study (Horvath, 1977).

Thus we take seriously the indication in our results that the PCT is less biased against detection of truth than the CQT. Combining conclusive judgments for examiner and blind judge, the CQT produced more judgments of deception (70%) than did the PCT (45%) or GKT (24%).

As Lykken (1981) has noted, the logic of the CQT suggests an explanation of its bias towards the judgment of deception. In the case of a guilty examinee, the control question, "Have you ever stolen anything of value?" is not likely to be as arousing as the relevant question, "Did you open the envelope?" Unfortunately, an innocent examinee may also be more aroused by the relevant question than by the control question. The logic of the PCT, on the other hand, seems more defensible. By first asking the examinee to lie and then to tell the truth to the same relevant question, the arousal value of the question is held constant. The guilty examinee is assumed to respond with greater arousal when asked to tell the truth (which for him is a lie) than when asked to tell a lie (which for him is the truth). On the other hand, the innocent examinee is assumed to respond with a greater reaction when asked to confess falsely to an offense she did not commit.

On the basis of these results and considerations, Reali's PCT appears to be a promising innovation in polygraph testing. Unlike the CQT, which cannot be used for employment screening (see OTA, 1983), the PCT can be used in any polygraph situation. It uses a "question as its own control" format that has more face validity than the CQT. It appears to be mildly biased in favor of the truthful where the CQT is biased against detection of truth. And finally, a single repetition of the PCT produced average accuracy as high as two repetitions of the CQT using the same relevant questions.

The Combined Test Format

Because the PCT and the CQT are applicable in the widest range of testing situations, a combined test format using these tests was examined. In this two-test-agreed format, only those cases in which the PCT and CQT judgments agreed were considered as conclusive judgments. Using this decision rule, 47% of the combined judgments (or 18 out of 38 judgments) were conclusive. The combined-test format was 100% accurate in detection of guilty for both the examiner and blind judge. Detection of innocence, however, was not nearly as successful with accuracies of 60% and 75% obtained by the examiner and blind judge respectively. Still, average accuracy for the combined format increased from 73% to 80% for the examiner, and from 70% to 88% for the blind judge.

This preliminary investigation of the combined test format suggests that it may offer a means of improving polygraph accuracy. Although improved accuracy will be achieved at the expense of increased numbers of inconclusive judgments, this might be a small price to pay for the greater confidence in polygraphic judgments made with a combined test format.

Accuracy of 1st Versus 2nd Repetitions of the Control Question Test

The belief in the value of repetition in polygraphic test administration is widespread in the polygraph field (Abrams, 1977, p. 82; Buckley, 1981, p. 1193; OTA, 1983, p. 14). Backster, however, claims that the value of repetition is incidental to the total chart minutes concept, which "refers to the accumulation of time that the subject has been asked questions while balanced in on the polygraph " (Backster, 1966, p. 1). According to Backster, the most accurate time for any of the physiological channels is between 4 and 16 min. This time period coincides with the administration of a second and third test repetition when repeated tests are given.

Our results suggest that it is not the accumulation of time that the subject is balanced in on the polygraph that is important, but rather, the repetition of the test. Our CQT was administered twice after a single repetition of the PCT. Because the PCT took approximately 5 min. to administer, both the first and second repetitions of the CQT occurred during the optimal chart minutes testing period. Despite this fact, the examiner exhibited a trend toward greater accuracy with the second CQT repetition, and the blind examiner achieved significantly greater accuracy with the second CQT administration. This finding challenges the total chart minutes concept because, according to the concept, both charts should have been equally accurate. An explanation of the improved accuracy is possible when it is remembered that, for Backster, the first 4 min. of testing are usually spent administering his first test repetition. Consequently, his finding that the first test was less accurate than subsequent tests may have wrongly been attributed to the total time the subject was on the polygraph rather than the fact that CQT accuracy improves with a second repetition.

Future Research

In light of the preceeding discussion, it is clear that more research is needed on how subject characteristics such as age, sex, and education affect detectability. The generalizability of analog research would be supported if working class adults were shown to be no more or less detectable than the experimentally convenient college student. Frisby's (1976) concern with the effects of menses on polygraphic chart recordings might also be pursued.

On the basis of our initial results with the PCT, it appears that this lesser known procedure deserves further investigation. One specific question needing additional research is whether a second or third repetition of this test might improve its accuracy. The originator of the PCT indicates that a second test is only given when the first test leads to a judgment of deception (Reali, personal communication, 1983). However, the improved accuracy found with the second repetition of the CQT might also be found with the PCT. Another important issue concerns the relation between level of motivation and detectability. A thorough investigation of this issue must compare the detectability of both innocent and guilty examinees at different levels of motivation. In particular, it will be important to determine whether increased motivation might lead to decreased detection of innocence as well as increased detection of guilt.

Finally, the combined test format appears to hold some promise for increasing the accuracy of polygraph judgments. It will be important to determine whether a combination of CQT and PCT is more accurate than multiple repetitions of either format alone. Although we have argued that order effects are unlikely to have been important in the present study, the possibility of order effects in combining repetitions of the same or different tests needs to be subjected to explicit experimental investigation.

These are some of the issues and directions for polygraph research that we believe will be important for improving polygraph practice. The field practice model introduced in this study appears to provide a means of accomplishing this research with experimental control that does not undermine generalizability to field testing.

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ABSTRACT

Ion Levels

Robert A. Baron. "Effects of Negative Ions on Interpersonal Attraction: Evidence for Intensification." <u>Journal of Personality and Social</u> Psychology, 52(3)(1987): 547-553.

Research suggests that a high concentration of ions will intensify a subject's reactions to a stranger, thus enhancing their evaluations of the interviewer when they seem to share their attitudes and to like them, but reducing those evaluations when they do not share their attitudes and dislike them. In a second experiment, female subjects performed tasks involving copying letters and digits in the presence of low or high negative ion concentrations. Their blood pressure and pulse were measured at several points during the experiment. Results indicated that on various trials both systolic and diastolic blood pressure were higher in the high-ions than in the low-ions condition. In addition, subjects reported higher levels of arousal. They also made significantly more errors on the lettercopying task in the presence of a high concentration of negative ions. The author concludes that high concentrations of negative ions increase both physiological and psychological arousal.

By way of background, the author notes that other research shows that when there are high concentrations of negative ions in the atmosphere caused by warm, dry winds; suicides, some types of crime, and industrial accidents increase in frequency. Many persons report negative shifts in mood in these winds, such as feelings of irritability or fatigue. [There is no research on the effect of negative ion concentrations on polygraph results. Ed.]

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