PREDICTION OF EMPLOYEE THEFT WITH THE AID OF THE POLYGRAPH

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Leonard Williams, Sr.

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C. Allen Harris 8/13/79
Adviser Date

Leon Land 8/17/79
Dean of the Graduate School Date

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ABSTRACT

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Leonard Williams, Sr.
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There is an increasing concern with the development of polygraph techniques as a means to control employee theft. A variation of the traditional polygraph approach is the "guilty-knowledge" technique. The basic assumption of the "guilty-knowledge" technique is that a guilty subject will show a stronger autonomic response to what he recognizes as a significant fact than he would if he had no guilty knowledge. The research project attempted to determine if by using the "guilty-knowledge" technique with the polygraph one can predict which persons have an intent to steal.

The project consisted of ten controlled experimental sessions each containing four subjects assigned theft or non-theft roles. The subjects were given polygraph examinations using the "guilty-knowledge" technique, both before and after a staged theft had occurred.

Two hypothesis were tested. The first hypothesis states that a polygrapher with the use of the "guilty-knowledge" technique can identify those persons who have

the intent to steal (before the fact). The second hypothesis poses that a polygrapher with the use of the "guilty-knowledge" technique would be able to identify those persons who stole, after the fact.

The research project was not able to support the validity of the "guilty-knowledge" technique. However, the study was able to identify that the subject's "anxiety level" is one of the keys to successful polygraph usage. Recognizing the methodological weakness in design and the deviations from the previous studies, recommendations were made for future research.

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CHAPTER I

Introduction

According to expert estimates losses resulting from employee theft in American business and industry total more than $4 billion annually.[1] This source also states the small business administration estimates that employee theft is the principal cause of business failure in over 50% of bankruptcies. Both large corporations and small businesses are usually able to absorb theft losses by raising prices, thus passing a large part of the loss onto the consumers. However, unnecessary price increases are antithetical to business concerns. In order to be competitive businesses must keep prices down.

One way to reduce such theft may be to give more and more authority to the security people within the company who can prevent theft. With more power and status and more money for themselves and their budgets, security people may have an incentive to look out for the company's best interest. The security industry has come

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[1] J. Kirk Barefoot, The Polygraph Story (Glenview, Ill.: American Polygraph Association, 1974), p. 1.

of age and each year is a milestone. Yet with all our modern methods--our shopping surveys, inside operations, watchmen, guards, cameras, and all sorts of electronic protection devices--employee dishonesty gets worse and worse.

The primary function of the traditional type of pre-employment screening is to determine what an individual has done in the past. The primary concern of any employer should be what a perspective employee will do in the future, not what has been done by the individual in the past. This indicates a need to develop a method or technique which will deal only with the future. With the aid of the polygraph using the "guilty-knowledge" technique, we may be able to predict what an employee will do in the future.

Facts About Employee Theft

There are numerous cold, hard facts about employee theft. The following discussion is taken from Sheryl Leinger's book, Internal Theft: Investigation and Control.[2] During the past ten years there has been a 38% increase in employee dishonesty on the part of people who are handling cash. This fact was determined by taking statistics per thousand shopping tests for

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[2]Sheryl Leinger, Internal Theft: Investigation and Control (Security World Publishing Co., Inc., 1975).

businesses throughout the country ten years ago against per thousand tests rendered today. Not only is there an increase in the number of people stealing but also confessions indicate that the amount stolen is larger by an even greater per cent (45%) than was the case ten years ago. In cash handling in the retail business the average man or woman who in the past would take fifty cents from a transaction is now taking over a dollar.

Employee theft of supplies in the merchandising industry is also a serious problem. Statistics show a 43% increase within the time span of ten years. (These results were obtained by the figures received through a hundred inside operatives placed ten years ago compared against a hundred inside operatives placed in 1975.) The incidences of collusive theft among employees is higher than it has ever been. This seems to imply that today more and more thieves are getting their fellow workers to steal along with them. Consequently, when we do solve cases today we are finding more group involvement than before.

It is not only the loss of money and merchandise that is causing profits to fall. The stealing of time is also a factor, i.e., time for which people are actually being paid to work but are not. The lack of accountability and violations of rules and procedures also cause loss.

Polygraph In Private Business

The polygraph has become of interest to almost everyone because it has come into such wide use in private business. It is possible that anyone, no matter what their occupation or station in life, may at some time find it desirable to seek the service of a polygraph examiner.[3]

Unfortunately, wide discussion of the polygraph had gotten far ahead of good sources of information. It is common for people discussing the subject to state opinions without any working knowledge of either the instrument or the technique. The polygraph is a scientific instrument and using it is a specialized field that must be studied at length to fully comprehend its advantages and limitations. Still, many laymen form their opinions about the polygraph from listening to other laymen. It is unfortunate that during the early development of the polygraph the term "Lie Detector" came into use. Not only is the term inaccurate, but it is also bad psychologically. The reason for this statement is that the instrument does not measure "lies," but rather the examiner measures deception (lies). The examiner evaluates the charts and comes up with a conclusion. It is his expertise combined with the information on the charts which will show deception.

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[3]Leinger, 1975.

The application of the polygraph in private industry and business consists of such things as background checking of job applicants, setting up periodic testing of persons working in highly sensitive positions to prevent problems from occuring, and investigation of specific losses within a company structure to establish responsibility for an act against the company and fellow employees.

The primary purpose of the polygraph in private business is to provide for the subject of the test an objective and accurate means of verifying truthful statements about his actions or background. The forementioned serves a unique and desirable purpose, when properly introduced into any business.

Pre-employment Screening (Traditional)

The pre-employment test has probably become the most controversial of all the tests given and is probably the chief target of organized labor's thrust against the polygraph profession.[4]

Many people fail to realize that a valid polygraph examination cannot be administered without prior discussion between the examiner and the examinee of the issues to be covered. Of the typical hour-long pre-employment test, 40 to 45 minutes is spent in what is called the "Pre-test Interview." It is during this inter-

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[4]Barefoot, p.11.

view that the examinee's background, medical history and present physical condition are reviewed in relation to the questions to be asked. The examinee is always given an opportunity to explain any situations in his past which might require modification of the wording of the questions. For instance, a standard pre-employment type question might be: "Have you ever been convicted of a crime?" The subject might say that at the age of nineteen he had been arrested for petty shiplifting and that he had pleaded guilty. If this were the case, the original question could not possibly be used and would require a rewording. The pre-test interview is absolutely essential and a review of the questions to be utilized in the examination must be made, giving the examinee the opportunity to make explanations so that proper rewording can be accomplished.

The actual polygraph examination consists of two or more tests. Each would typically consist of ten or twelve questions, or in the case of wrist-type blood pressure cuff, as many as twenty questions might be asked. Each test consumes about three to four minutes. Irrelevant questions are normally interspersed with relevant questions, and also at one or two strategic points in the examination, the control questions are asked. Irrelevant questions are intended to be completely neutral to the examinee, questions such as: "Is

this month May? Is your first name Bill? Is your last name Jones? Are you wearing a tie? Are you in Youngstown at the present time?" etc. Relevant questions in personal screening are those questions dealing with any part of the subject's background. See examples in the following paragraph. Control questions are designed to produce a response in the innocent person and serve as basis for evaluating the examinee's psychological set.

Relevant areas of inquiry in a pre-employment examination are selected by the client and usually fall within the following scope: deliberate falsification of application; deliberate falsification of medical history; illicit use of dangerous drugs or narcotics; thefts of cash from former employers; theft of merchandise from former employers; having been discharged or forced to resign from a previous job; significant trouble while in the military; involvement in serious unsolved criminal offenses; criminal complaints and convictions; and in the case of recently hired employees working on a probationary status, thefts from the present employer since employment.

Each polygraph question must be answered with a simple "yes" or "no." It is quite common that a person undergoing an examination will think of some situation which may or may not be directly relevant to the issue, but which is triggered in the thought process by a particular question. Such thought processes will usually reflect themselves in the polygraph tracing and can

easily be discussed with the examiner at the conclusion of each run. Normally, at the end of the first run the polygrapher will give the examinee an opportunity to volunteer any information that may have come to mind during the actual run. If nothing is volunteered at that point, the polygrapher will proceed to administer the second run, after which the polygrapher will discuss in detail the polygram or chart with the subject and pointedly inquire as to anything that may come into the subject's mind in relation to any particular question which produced a response. Any explanation on the part of the subject will simply require further rephrasing or rewording of the question, something along the lines of "other than what you have told me, have you ever stolen anything from a previous employer?"

Should a subject resort to outright deception the examiner will discuss it in a frank and candid manner and afford the subject the opportunity to explain the true facts in the area at issue. If an explanation is offered, the examiner will run one further chart, commonly called a "clearing chart."

Employee's Rights and Safeguards

Contrary to the picture painted by the protagonists, polygraphers are by no means indifferent to the rights of the examinees. Most polygraphers, qualified polygraph operators, have themselves been the subjects

of many polygraph examinations. Consequently, most believe in certain employee rights and try to influence their clients to use test results in the proper manner. There are three basic employee rights generally accepted by the profession.[5] These rights are: (1) the right to request and to receive a polygraph test (many thousands of employees over the years have found themselves under suspicion, and have requested tests on their own initiatives*); (2) the right to refuse to take an examination without fear of discharge (this right should prevail unless as a condition of employment the subject has specifically agreed to undergo testing at future times); (3) and the right to know beforehand the area of inquiry and the exact proposed question. These matters are always covered in the pre-test interview and are essential to the accuracy of the examination.

If misuse, abuse, or malpractice occurs the employee has a number of remedies available. The following paragraphs will be a discussion of some of the remedies available to the employee.[6]

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[5]Barefoot, 1974.

[6]Barefoot, 1974.

*NOTE: This is not the case in Massachusetts, however, as the right has been denied by the state legislature under pressures from organized labor. The anti-polygraph law in that state specifies that no employer shall "permit" a test to be given to an employee.

State Labor Department

In unemployment compensation hearings, most departments have taken the position that the refusal to submit to a polygraph test is not to be construed as misconduct or ground for disciplinary action. Accordingly, most employers are reluctant to discharge an employee because of refusal to take the test or because of its results.

Arbitration

Labor arbitrators have been almost unanimous in excluding polygraph test results from evidence and in refusing to uphold the discharges of employees for refusl to take the test.

National Labor Relations Board

Organized labor has long charged that polygraph testing was used as a weapon by employers against unions in their organizing campaigns. Of the several hundred thousand tests given each year, labor cannot produce more than a half-dozen cases in which the NLRB has found that the polygraph was used as an instrument of unfair labor practices. Indeed, the American Polygraph Association forbids its members to conduct examinations when there is reason to believe the examinations are part of an effort to hamper the lawful organizing

activities of a union.

Civil Lawsuits

Probably the most useful defensive tool for the employee is his right to file a civil suit for damages. The unions, recognizing this possibility, cite the case of a young Chicago engineer who was awarded damages by a jury after having been dismissed, partly as a result of a polygraph examination. What the Maritime Trades Department conveniently forgets is that the verdict was made possible in large part by the results of another polygraph test and the testimony of the polygrapher who administered it.

State Licensing Boards

In states which have enacted licensing legislation, any citizen may lodge a complaint with the licensing authority.

Grievance Committees

Any employee can make a complaint to a state polygraph association or to the American Polygraph Association. The APA and the state groups maintain grievance committees and welcome legitimate complaints.

Organized labor maintains that the existing machinery for the protection of the employee is inadequate and the polygraph should, therefore, be outlawed.

It would seem that if the machinery falls short of doing the job, then the solution is licensing, not wholesale abolition. Isolated cases of abuse and malpractive do exist in the polygraph profession, just as in all other professions.

The Polygraph

The polygraph is a scientific device that measures and records several involuntary body responses to stress. The polygraph measures and records: (1) blood pressure changes; (2) respiratory changes; (3) galvonic skin responses.

It appears that the sophistication and acceptance of the above measurements is constantly improving and is likely that another involuntary body response to stress (e.g., voice stress changes) will be utilized in the near future.

The polygraph is based on the principle that the autonomic nervous system will respond to stressful conditions and that sympathetic parts of that system will respond automatically. These parts of the system are generally not controllable, they are involuntary.[7] It has been established that the sympathetic part of the nervous system causes internal organs of the body, the heart, the breathing apparatus, the perspiration glands, and the

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[7]Restricted Course Material, Zonn Institute Of Polygraph, Inc., 1972.

stomach to alter their activity when placed under stress.[8]

Autonomic Nervous System

Two sub-systems actually make up the nervous system, the conscious nervous system and the unconscious or autonomic nervous system. The autonomic nervous system is the one with which lie detector examiners are chiefly concerned. The autonomic nervous system directs the actions that go on without our conscious knowledge--these actions are more or less automatic. This portion of the nervous system controls the actions of the intestine and other digestive organs, the heart and blood vessels, the adrenal glands, and the sweat glands. The autonomic nervous system has motor fibers only. There are no sensory nerve fibers in the autonomic system.

The autonomic nervous system is divided into two divisions--the sympathetic division and the parasympathetic division. If an organ receives nerve fibers from the sympathetic division, it also receives fibers from the parasympathetic division. The effects of these two divisions in any one organ are exactly opposite. For instance, the heart is slowed by its parasympathetic nerves and accelerated by its sympathetic nerves. The overall main function of the autonomic nervous system is to direct the ordinary housekeeping of the body and to

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[8]Course Material, 1972.

prepare the body for stress. It prepares the body for stress by adjusting the composition of the blood, and by adjusting the body temperature.[9]

The Sympathetic Division

The sympathetic division strengthens the defenses of the body against various dangers, such as lack of water, extremes of temperature, and attacks of our enemies.

The effects of the sympathetic division upon specific organs and structures are that blood vessels of the intestine contract and decrease the amount of blood flowing, blood vessels of skeletal muscles dilate to allow increased blood flow, blood vessels of the skin contract, eye pupils dilate, sweating increases, salivary glands stop secreting saliva, adrenal medulla is stimulated to pour out adrenalin to reinforce the other actions of the sympathetic division.

The Parasympathetic Division

The parasympathetic division carries on the ordinary housekeeping chores of the body, restoring food reserves and conserving the body's energies. The effects of the parasympathetic division upon specific organs and structures are that the heart is slowed down, intestine

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[9]Course Material, 1972.

is stimulated to act, blood vessels of the intestine dilate, the pupils of the eyes contract, and various digestive glands are stimulated to further digestion.[10]

Functions Of the Polygraph

The polygraph consists of a cardiograph which measures blood pressure, pneumograph which measures respiration, and a galvonometer which measures galvonic skin resistance.

The basic purpose of the cardiograph section is to record: (1) relative blood pressure; (2) normal pulse pressure, and changes; (3) the rate and beat of the heart; (4) pulse wave amplitude. The force of the pulse wave in the artery increases air pressure within the blood pressure cuff. This movement provides power to move the penfold and its recording pen, in an upward direction. This is called the ascending limb of the cardio.

The basic purpose of the pneumograph section is to record: (1) normal respiratory patterns, and (2) deviations from the normal respiratory patterns, which would be abnormal breathing patterns.*

The basic purpose of the Galvonograph section is to record: (1) the increase flow of perspiration--the

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[10] Course Material, 1972.

*NOTE: Normal is that specific pattern during the test, which the individual projects on the chart paper, when asked the irrelevant questions.

basic cause of this is a change in the electrical resistance of the fingers and the hand caused by their sweat glands between the electrodes along its pathway; (2) the changes in temperature of the capillaries; (3) the changes in temperature of the capillaries may be affected by emotional nerve impulses which cause varying changes in sweat gland activity; (4) the polarization of skin tissue--index of nerve activity is the play of nerve impulses upon some structure such as a muscle or gland, with which the nerve is innervated by the nerves; (5) the changes in body homeostasis, i.e., the equalibrium of fluid content, chemical reaction and temperature within the body. The physiological "drives" for survival of the organism are often referred to as the compensatory units. All of these physiological phenomena are theoretically affected by the emotions and anxiety caused during deception in the interview process, i.e., the polygraph test.

Because of the forementioned physiological phenomena many employers have turned to the polygraph as a device for screening out dishonest job applicants, and as a method to aid in internal investigation of theft.

Polygrapher

The polygraph is not a computer or a magic-answering machine. It does not automatically produce solutions.

and without a skilled examiner, polygrapher, in attendance, the polygraph in itself is as useless as an automobile without a driver. In the hands of the efficient polygrapher, however, the polygraph fills a role analogous to that filled by an x-ray machine at a hospital. It allows the polygrapher the ability of viewing and understanding his subject on a level not offered by his five conventional senses.[11]

Polygrapher's Training

Before one is even eligible for polygraph school he must have a combination of the required college education and a generally significant investigative experience. He also must have high moral values and a sound emotional temperament. The course is eight to fourteen weeks long and consists of 320-506 hours of classroom instruction in polygraph subjects, specifics or variations of which depend on the school. Classroom instruction encompasses all aspects of polygraph theory, polygraph administration, maintenance at the polygrapher level, polygraph examination procedures, law, psychology, and physiology. All of the above courses are taught by qualified instructors in their respective fields. When an individual graduates from a

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[11] R.A. Stockford, "The Polygraph: An Investigative Aid," Law and Order, Vol. 26, No. 7 (July 1978), pp. 42-50.

polygraph school they are fully qualified, entry level polygraphers. After the classroom training, each individual is put on an apprenticeship of at least six months under the supervision of a certified polygrapher. During this time, they must demonstrate their proficiency as a polygrapher in actual situations. Only then are they considered qualified to conduct examinations on their own.[12]

Polygrapher's Role

There are several tasks in the role of the polygrapher. It must be remembered that their task is not simply the manipulation of an instrument; as a matter of fact, the actual operation of the instrument itself requires very little ability or training. The polygrapher's most important task and responsibility consists of the diagnosis of deception from our examination and study of the psychological changes recorded by the instrument. Along with these skills in that respect, however, they must be able to perform the next most important task--the skillful interrogation of a guilty subject with a view toward obtaining a confession of their guilt.[13]

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[12]Frederick C. Link, "The Polygraph," Military Police Law Enforcement Journal, Spring, 1975.

[13]Fred E. Inbau, Lie Detection and Criminal Interrogation (Baltimore, Maryland: The William & Wilkin Company, 1954).

Purpose Of Study

The purpose of this study is to attempt to determine if the employer's use of the guilty-knowledge technique will assist in some control of employee theft by the identification of dishonest job applicants and perspective thieves.

Peak Of Tension

But it must be emphasized that the guilty knowledge method is not in fact employed by professional polygraphers. One of the reasons it is not used is because the distinctive character of the method has not yet been understood. There is a tendency to regard the guilty-knowledge method as just a variant of something known to polygraphers as the peak of tension test. The peak of tension test involves presenting a series of questions, only one of which is expected to elicit a lie from a guilty subject, after first showing the subject what the sequence of questions is to be. The test gets its name from the assumption that a guilty suspect will show increasing autonomic arousal in anticipation of the critical question, will peak when that question is answered deceptively, and decline there after.[14]

But this is nothing more than a standard lie

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[14] John E. Reid and Fred E. Inbau, Truth and Deception: The Polygraph "Lie Detector" Technique (Baltimore, Md.: Williams & Wilkins, 1966 and 1977).

detector test embellished by the opportunity to look for a predictable trend or peak in tonic levels of autonomic functions in addition to whatever information is provided by the phasic autonomic responses to the individual question. The peak of tension test resembles a single item guilty-knowledge test. However, there seems to be no clear awareness that it is a very different thing to use the polygraph to determine whether the subject can identify the significant alternative, than to use autonomic arousal or "tension" as evidence that the subject is lying.[15]

Guilty-Knowledge Technique

The standard pre-employment screening will not be used, which consists of broad coverage, including all information contained in the employment application. Instead, this study will utilize the "Guilty-Knowledge" Technique for the pre-test (pre-employment screening) and the post-test (theft problem).

The pre-test hypothesis is to be used to determine if the guilty-knowledge technique can be used to identify individuals before they commit a theft, when they have the intention to steal. The post-test hypothesis will be similar to the study Lykken did to determine if the

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[15] Gordon H. Barland and David C. Raskin, Detection Of Deception (New York: Academic Press, 1973).

guilty-knowledge technique can be used to identify individuals after they have committed a theft.

The basic assumption of the "guilty-knowledge test" is that the guilty subject will show stronger autonomic responses to the significant alternatives than he would without such guilty knowledge. The amplitude of the involuntary autonomic responses to the significant alternatives has little meaning by itself; a hyper-reactive subject might respond strongly to that alternative without knowing that it was the correct one, while a hyperreactive suspect might give a small response even though he does have guilty knowledge. But, the same subject's responses to the other plausible but incorrect alternatives of the guilty knowledge test provide a nearly ideal control against which to evaluate his response to the significant alternative. In the language of psychophysiology, all of the guilty-knowledge test alternatives can be expected to produce orienting reflexes that will vary in amplitude from subject to subject for a number of reasons, of which guilt is only one. On the other hand, for the guilty subject, only, the "correct" alternative will have a special significance, an added "signal value," (Berlyne, 1960), which will tend to produce a stronger orienting reflex than that subject will show to the other alternatives. Whether he is high or low in reactivity, whether he is frightened and aroused, or calm and indifferent,

we can still expect that his response to this significant alternative will be stronger than that to the other alternatives, as long as he recognizes which alternative is "correct." Similarly, if he has no guilty-knowledge, neither his reactivity, his present emotional state, nor his confidence in the validity of the test can act to influence his guilty-knowledge test score.

Overview

The remainder of the thesis will consist of four chapters. Chapter Two will consist of a literature review. The major literature reviewed consisted of three articles by David T. Lykken and one by P. O. Davidson. All deal with the "guilty-knowledge" technique.

In Chapter Three, the methods for this study will be considered. The procedure and samples, instrument, measurement, conditions, and institutions will be discussed. Also, the question for the pre-test and their alternative answers, as well as a section on debriefing and a summary, will be included.

Chapter Four is the analysis of results and will include a reporting of the results of the experiment and a discussion. The final chapter will consist of an overview of the study, a brief discussion of some practical implications of the results, and recommendations for further research.

CHAPTER II

LITERATURE REVIEW

The review material for the research project consisted of social abstracts, psychological abstracts, and material from the National Criminal Justice Service.

Prior to 1955, there was a limited amount of material in reference to the polygraph and the "guilty-knowledge" technique. There were early experiments by Lombroso and Benussi with blood pressure and respiration symptoms of deception. Actual case testing was followed by Larson. The first instrument for continuously recording blood pressure, pulse, and respiration was also devised by Larson. The first question of the legality of the polygraph was in 1923 in the case of Frye vs. U.S. So, the literature that will be discussed and used will be from 1955 to the present. The major literature will be that on the "guilty-knowledge" technique. There will also be a review of literature on employee theft, the polygraph, and the polygrapher.

Employee Theft

Lipman, in his article in 1973, stated that at least half the people who work in industry, whether in

plants or in offices, are stealing.[16] The stealing ranges from petty theft of pens and paper to grand larceny involving hundreds of thousands of dollars, and is committed by all levels of employees. He describes common industrial theft practices and suggests measures to improve security and reduce opportunities for stealing.

Employee advocates have expressed the view that the use of the polygraph is an invasion of privacy. However, Romig, in an article written in 1973, rejects the argument that the use of the polygraph is an invasion of privacy.[17] Instead, he contends that the polygraph is superior to many traditional investigative techniques. He also states the polygraph test is valuable in private business enterprises for screening employers or prospective employees.

Gorril, in 1974, advocates the design and administration of effective personnel security measures as a means of contributing to the sustained growth of a company.[18] He feels that confining efforts to the apprehension of dishonest employees merely treats the symptom rather than the problem. He also feels that effective personnel security

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[16]Mark Lipman, Stealing: How America's Employees Are Stealing Their Companies Blind (New York: Harper & Row, 1973).

[17]Clarence H. Romig, "Does the Polygraph Invade the Mind?" Security Management, Vol. 18, No. 1 (March 1973), p. 16.

[18]B.E. Gorrill, How To Prevent Losses and Improve Profits With Effective Personnel Security Procedures (Homewood, Illinois: Dow Jones-Irwin, 1974).

procedure begins with specific recommendations on how to evaluate and select job applicants so that the unstable will be rejected.

Polygraph

Reid and Inbau, in their book published in 1977, discuss the complete test procedure and diagnostic technique.[19] They also show numerous illustrations of actual tracings of blood pressure, pulse and respiration for both lying and truthful subjects. In addition to symptoms of lying, symptoms of truthfulness and behavior common to both liars and truth-tellers are described.

Barefoot, in his book, discusses the history and explanation of the polygraph technique.[20] He also explains precautions taken in ensuring the propriety of test questions. Case studies and other evidence are presented to show that it is in the union's employers and employee's best interest to utilize the polygraph.

Polygrapher

There are several factors that play a role in the effectiveness of the polygrapher. One factor discussed by Horvath, in an article written in 1973, describes the

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[19] John E. Reid and Fred E. Inbau, Truth and Deception: The Polygraph (lie detector) Technique (Baltimore, Md.: Williams and Williams, 1977).

[20] Barefoot, 1974.

pre-test interview of subjects conducted by polygraphers.[21] Behavioral characteristics during these interviews were divided into three categories: elicited verbal answers to questions; spontaneous verbal comments, remarks, or complaints; and nonverbal, mannerisms and facial expressions, classified as those characteristics of either a truthful or lying subject.

Raskin, in his study reported in 1976, tested the effectiveness of the various measures employed in polygraph examinations to determine whether examiners are influenced by factors other than information provided by the polygraph charts.[22] He also studied the extent of agreements between independent evaluations of polygraph examinations as far as the decisions made by Law Enforcement and private polygraphers were concerned. The frequency and percentage of cases where the Law Enforcement Polygrapher arrived at decisions of deceptive, truthful, and inconclusive were compared to the results of the private polygrapher.

A study, conducted by Hunter and Ash, was designed to determine if polygraphers were accurate and consistent in their judgements of real-life cases with known truth

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[21]Frank S. Horvath, "Verbal and Non-Verbal Clues To Truth and Deception During Polygraph Examinations," Journal Of Police Science and Administration, June, 1973.

[22]David C. Raskin, "Evaluation Of Polygraph Techniques Currently Practiced By Law Enforcement and Private Polygraph Examiners," National Institute Of Law, 1975.

and deception responses.[23] When the results of this study was combined with the data, already compiled from other studies completed by polygraphers using real-life and laboratory case situations, there is no denying the overwhelming proof of the accuracy and consistency of the polygraph techniques.

A study, conducted by Philip Bersh, was performed to assess the validity of lie detection judgements made by polygraphers in criminal investigations conducted by the military services.[24] The data of the study bear only the validity of the polygrapher's judgement, not upon the validity of the polygraph method or of the polygraph record itself. In the final analysis, it is the judgement, and not the record, which influences any further action that may stem from the interrogation. The present study strongly supported the polygraphers judgement.

Guilty-Knowledge Technique

In an article in 1974, Lykken dealt with the guilty-knowledge test and its use in criminal cases.[25] This method requires that the examiner be able to determine a number of facts that only a guilty subject will be able

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[23]Fred L. Hunter and Philip Ash, "The Accuracy and Consistency Of Polygraph Examiners Diagnosis," Journal Of Police Science and Administration, 1973.

[24]Philip J. Bersh, "Avalidation Study Of Polygraph Examiner Judgements," Journal Of Applied Psychology, 1969.

[25]David T. Lykken, "Psychology and the Lie Detector Industry," American Psychologist, October, 1974.

to recognize. These facts can be quite trivial and which would not usually appear in newspaper accounts. These facts can be presented in the form of three or four alternatives that would be equally plausible to an innocent subject without guilty knowledge.

The basic assumption of the guilty-knowledge test is that the guilty subject will show a stronger autonomic response to what he recognizes as the significant alternatives than he would have shown without guilty knowledge. The probability of the "correct" alternatives producing the largest response on each of the tests will be $(1/k)^N$, where K is the number of alternatives per item, and N is the number of tests.

Lykken's original work, published in 1959, suggested that the use of physiological measurements could be used to detect the presence of "guilty-knowledge" rather than lying.[26] Forty-nine male college students were randomly sorted into four groups. They were required to enact one, both, or neither of two mock crimes. All students were given a "guilty-knowledge" test, wmploying only the G.S.R. and using six standard questions relating to each of the two crimes. Each student was seated in an interrogation room with:

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[26]David T. Lykken, "The G.S.R. In the Detection Of Guilt," Journal Of Applied Psychology, 1979.

(1) G.S.R. electrodes attached to his dominant hand; (2) shocking electrodes to his other hand; (3) a blindfold put over his eyes; and (4) a pair of headphones adjusted to his ears. The examiner was located with the apparatus in an adjoining room and spoke to the student via electronic sound system through the headphones. Each subject was told that each question consisted of several parts and that if, at the end of any question, the examiner felt that the physiological response (G.S.R.) indicated guilt, then the subject would be given an electric shock. The shock was then demonstrated, with most subjects finding it to be unpleasant. The shock was always given following the completion of the G.S.R. to certain predetermined questions. There was no motive to deceive in this first study.

In 1960, Lykken, with the use of the questionnaire method, was able to find the guilty-knowledge technique highly resistant to "faking."[27] The subjects used in this experiment consisted of twenty people, which included a number of medical students and several of the secretarial staff. Each of the subjects was required to fill out a questionnaire containing twenty-five items such as, "What is your father's name?; What is the name of your

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[27]David T. Lykken, "The Validity Of the Guilty-Knowledge Technique: The Effects Of Faking," Journal Of Applied Science, Vol. 54, No. 4, 1960.

high school?..." Each subject was told what the format of the questioning would be, was cautioned against attempting to defeat the test merely by inhibiting responses and was advised correctly that the best way to confuse the scoring system would be to produce a G.S.R. of various amplitudes to the innocent alternatives in as random a pattern as possible. Each subject was then offered a prize of $10.00 if he or she could, by the foregoing method or any other means, manage to defeat the objective scoring system. The subjects were seated in an interrogation room; with G.S.R. electrodes attached to their dominant hand, shocking electrodes to his other hand, a blindfold put over his eyes and a pair of headphones adjusted to his ears.

The subjects, with their own sets of questions, were correctly matched with responses in all twenty cases. Classification was obtained in 100% of these cases without ambiguity, using objective scoring of the G.S.R.

Davidson, in 1968, duplicated and extended Lykken's work. He evaluated the validity of the guilty-knowledge technique under more ego involving circumstances and with varying amounts of motivation.[28]

The subjects used wereforty-eight college students assigned at random to four groups. Three subjects, chosen

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[28] P.O. Davidson, "Validity Of the Guilty-Knowledge Technique: The Effects Of Motivation," Journal Of Applied Psychology, 1968.

at random from each group, were highly motivated to commit a simulated crime: (1) allowed to succeed; (2) attempted but failed; and (3) not allowed to attempt the crime. The fourth subject for each crime had no knowledge of the nature of the experiment. Motivation for this experiment was a $25.00-$50.00 reward for the subject who was not detected as the criminal after a polygraph examination. The subjects were seated in an interrogation room with G.S.R. electrodes attached to their dominant hand, shocking electrodes attached to their other hand, a blindfold put over their eyes, and earphones adjusted to their ears.

Eleven of the twelve guilty subjects were correctly classified as guilty (92%). All thirty-six of the innocent subjects (100%) were correctly classified as not guilty. There was a total of forty-eight interrogations and forty-two of these were correctly classified as guilty (an overall 98% correct classification against a chance level of 25%).

Observation

It may be concluded that the "guilty-knowledge" technique works to show deception after the fact, when anxiety levels are artificially high by the use of the electric shock combined with a level of physical and sensory deprivation, i.e., blindfold, earphones, and alone

in a soundproof room. It could be hypothesized that through the use of the "guilty-knowledge" technique a polygrapher could identify those persons who had the intention to steal before they had the opportunity. It could also be hypothesized that without the use of sensory deprivation controls and electric shock to create anxiety, a polygrapher, using the "guilty-knowledge" technique, could identify thieves after their thefts. This would be a partial replication of the studies done by both Lykken[29] and Davidson.[30]

Summary

The review material for this research project consisted of material on employee theft, the polygraph, the polygrapher, and the "guilty-knowledge" technique. The major concern being the "guilty-knowledge" technique.

Lykken's original work suggested that through physiological measurements one could detect the presence of "guilty-knowledge" rather than lying.[31] In the second study, Lykken, in 1960, stated that with the use of a questionnaire method he was able to find the "guilty-knowledge" technique highly resistant to "faking."[32]

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[29]Lykken, 1959-1960.

[30]Davidson, 1968.

[31]Lykken, 1959.

[32]Lykken, 1960.

Then Davidson duplicated and extended Lykken's work.[33] He evaluated the validity of the guilty-knowledge technique under more ego-involving circumstances and with varying amounts of motivation. The subjects in all their studies were seated alone in an interrogation room with G.S.R. electrodes attached to their dominant hands, shock electrodes to the other hand, a blindfold over their eyes and a pair of head phones adjusted to their ears.

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[33] Davidson, 1968.

CHAPTER III

METHODS

Procedure

The experimental stage of the study was conducted over a two-week period. The volunteers were college students, advised that at least two hours of their time would be needed. Each day, during the running of the experiment, an attempt was made to work with two groups, one in the morning and another in the afternoon.

The participants in this study were forty volunteers scheduled at their convenience to one of ten groups. Each group was made up of four participants, two of which were motivated to commit a simulated crime. One was allowed to succeed, and one had the intent but not the opportunity to commit the crime. Two other participants were not motivated nor were they allowed to attempt the crime. One of these two controls was told to lie about his age, if asked, during the polygraph examination.

The participants were told that this was a hypothetical study in polygraph deception. Each participant was randomly assigned a number of 1 thru 4 and the groups were identified by a letter from A thru J, for the 10 groups. The polygrapher used the number only, not names,

to identify the participants in each group. Thus, each participant could be identified by the group and his assigned number, i.e., J2 would identify participant "two" in the "tenth" group.

Each participant was numbered and assigned to a group, so that the polygrapher and researcher could identify them at a later date. This also enabled the polygrapher to identify each subject without knowing their role in the experiment.

The participants were asked to draw from a set of four Jacks, with the role having been predetermined for each Jack. They were also told that one of them would be instructed to steal a calculator, and that none of them was to share their role with any of the other participants in the group. The participants were also told that whoever was instructed to steal the calculator would be taking a polygraph with the rest of the participants, and if not detected as the thief, they would win a calculator. A small calculator (Caltronic 812) was the theft item.

The participant who drew the Jack Of Hearts was the thief, and was told to steal the calculator during a work situation. They were also instructed to "do a few calculations with the calculator and become familiar with it before returning it to its case." This required these participants to become familiar with

its color, the color of the case, the name of the calculator, and how it operates. These participants were told precisely where the calculator was located. The participant with the Jack Of Diamonds was instructed to steal the calculator, "if the opportunity presents itself." During the work situation, these participants were not given the opportunity, as the calculator had already been taken and they did not know its location. The participant with the Jack Of Spadeswas told to "lie" about his or her age, if asked. The purpose of the participant lying was to build some level of anxiety and to provide additional involvement in the experiment. The participant with the Jack Of Clubs was instructed to assist the others in the work situation and they were told that they did not have a theft role. The participants were taken to the work area so they would be able to determine if there was anything in that area that could be stolen. This would also help the participants answer the questions on the first guilty-knowledge test.

Instrument

The polygraph used was a Lafayette Model #76056 with an electronically enhanced cardiograph. The pneumograph had a dual pivot shaft with connecting cantilens to minimize pivot point breakage. Also, this model of the Lafayette Polygraph had four saphire jewel

bearings. The galvonic skin response (G.S.R.) had a resistance range of 1-1,000,000 ohms. Electrode jelly was used to insure a good reception from the finger electrodes of the G.S.R.

Measurement

The scoring system was based on a deviation of the "zone of comparison" method. The pariticipants' responses to the several alternatives given on each question were ranked in order of amplitude. If the largest response was to the relevant alternative, a score of two (2) was given to that question. If the largest response was to one of the irrelevant alternatives, a score of one (1) was given to that question. Thus, a perfect innocent score was five (5), and a perfect guilty score was ten (10). The forementioned scoring system was used on both pre-test and post-test polygraph analyses.

There were a total of forty participants of whom ten were designated as "thieves," with a ten for ten identification, there would be a 100% correct score.*

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*NOTE: In one group, two participants were "thieves," but due to the fact that one participant did not have guilty-knowledge, i.e., he did not look at the calculator, its color, how it operated and its make, it should not have affected the results.

The probability that an innocent subject might chance to "hit" all of the guilty-knowledge items in either the pre-test or post-test would be approximately 1/1000 (.001).

The probability that an innocent participant will "peak" on a guilty item, in any one question, is 1/4 (.25). However, for any subjects who are without guilty-knowledge, the probability that the "guilty-knowledge" alternatives will produce the largest response on at least one of the five questions is 76/100 (.76). The probability of a subject getting four or more correct hits by chance out of the five questions is less than 2/100 (.016). Therefore, any participant who shows "guilty-knowledge" on four out of the five questions will be considered guilty.

Guilty-Knowledge Test

Pretest Experiment

Right after their instructions, all the participants were given a polygraph, using a set of five guilty-knowledge questions. The questions included four responses or alternatives, one of which shows "guilty-knowledge" on each question. (See Appendix A.)

Post-test

All the participants were taken to the work area. Each of the participants was given a chance to be in the

work area by themselves, so that the person that was instructed to steal the calculator had the opportunity. All the participants were given a polygraph to determine who stole the calculator, by using a set of five guilty-knowledge questions. Each of the questions had four responses or alternatives, one of which would show "guilty-knowledge."

Conditions and Instructions

Prior to the physical taking of the polygraph, each participant was taken and seated in an interrogation room with a polygrapher. The polygrapher briefed the subject on the "Lie Detector" in general, as well as the function and purpose of each of the components. The components then were attached to the participant. The participant at this time was instructed to listen to each question but not to reply to any of them. The polygrapher read the question and then each of the short alternative answers, allowing sufficient time after each, 10 to 15 seconds, for the component's activity to dissipate.

Debriefing

After completing the second polygraph examination, the participants were told the purpose of the study. The participants were advised the study was to try to identify people who had the intention to steal before they committed

a theft. The intent was, also, to identify a thief using the guilty-knowledge test after a theft had occurred. The subjects were also asked not to talk or to tell anyone what happened during the study, because there were other participants who volunteered and had not been through the experiment.

Summary

Forty college students, scheduled at their convenience to one of ten groups, were motivated to commit a simulated crime. All were then given a pre- and post-guilty-knowledge test employing all the components of the polygraph. There were five standard questions relating to the work area and the simulated crime. The scoring system was based on a deviation of the zone of comparison method. The participants were debriefed and asked not to discuss the study with others until the study was completed.

CHAPTER IV

ANALYSIS OF RESULTS

Results

The experimental stage of the research project started with ten (10) groups of four (4). Group "A" was essentially a pilot group intended to identify and resolve the problems in the experiment. In group "B" all the participants did not have all of the information that was intended in the original design of the study. So group "A" and "B" were eliminated, and in the final analysis eight (8) groups, "C-J" were analyzed. All of the participants were given a polygraph examination both before and after the theft of the calculator, employing all of the components of the polygraph.

Hypotheses

The pre-test Null Hypothesis states that the guilty-knowledge technique cannot be used to identify people before they commit a theft when the person had the intention to steal. The Alternative Hypothesis states that the guilty-knowledge technique can be used to identify people before they commit a theft if they had the intention to steal. The post-test Null Hypothesis states that the guilty-knowledge technique cannot identify,

after the fact, those who have committed a crime. The Alternative Hypothesis states that the guilty-knowledge technique can identify, after the fact, those who have committed a crime.

Polygraph Chart Interpretation

The major factor in determining the results is the interpretation of the charts. The polygrapher foresaw problems in this area when he administered the first group's polygraph. The normal signs of deception on the charts, in the area of the pneumograph, changes in rhythm amplitude, base line, inhalation/exhalation ratio, and loss of base line, were not displayed on the relevant alternative to the question on either the pre-test or post-test. Instead, the forementioned signs were displayed on the irrelevant as well as the relevant alternatives to the questions on both tests.

The same problem, mentioned above, occurred on the galvonograph and cardiograph. The normal signs of deception on the charts, in the area of the galvonograph (changes in the base line, increase and/or decrease in pulse rate, and amplitude), were not displayed on the relevant alternatives to questions on both tests. Also, cardiograph changes in the base line, increase and/or decrease in pulse rate, and amplitude were not displayed on the relevant alternative to the question on either of

the tests. Instead, the forementioned signs were displayed on the irrelevant as well as the relevant alternative to the questions on both of the sets of tests.

Scoring

The scoring is a deviation of the Zone of Comparison method. If the largest response is to the relevant alternative, a score of two (2) was given to that question. If the largest response is to one of the irrelevant alternatives, a score of one (1) was given to that question. Thus, a perfect innocent score is five (5) and a perfect guilty score is ten (10).

Results

By interpreting and evaluating all of the charts administered in the pre-test, the polygrapher was hardly able to come up with results. The thirty-two (32) participants' charts were difficult in nearly all cases to interpret as the participants' autonomic responses to the five (5) questions and four (4) alternate responses, could not be clearly defined.

In the preceding test, using the forementioned scoring procedure, the polygrapher came up with eight (8) misclassifications, which were eight (8) misses out of sixteen (16). The approximate probability of chance for eight (8) out of sixteen (16) misclassifications is 50%. Using a 50% probability of chance, it can safely be said

that the findings on the preceding requires a failure to reject the Null Hypothesis. (See Table 1.)

In the post-test, using the forementioned scoring procedure, the polygrapher came up with seven (7) misclassifications, which was seven (7) out of eight (8) misclassifications. The probability of the polygrapher identifying at least one of the thieves correctly is 3 out of 4 (.76). Considering these results, the researcher fails to reject the Null Hypothesis on the post-test experiment.

Discussion

The post-test guilty-knowledge experiment will be discussed before the pre-test experiment because it was a near duplication of previous studies. There were several differences between this study and the studies by Lykken and Davidson. During the interrogations in Lykken's and Davidson's studies, they used blindfolds on their subjects, headphones, and shocking electrodes for rigorous experimental control. In this study, the researcher did not use any of the forementioned procedures, as this study was designed to simulate a more realistic situation.

It is suspected due to the lack of the built-in experimental controls used in the previous studies, this study lacked the anxiety and attention levels required to get the autonomic responses needed for adequate chart in-

TABLE I

Lie Detector Study Results

Group "A"		Group "B"	
Pre	Post	Pre	Post
1 +	1 -	1 +	1 -
2 -	2 +	2 +	2 +
3 -	3 -	3 -*	3 -
4 +	4 -	4 -*	-**

Group "C"		Group "D"		Group "E"	
Pre	Post	Pre	Post	Pre	Post
1 -	1 -	1 *	1 -**	1 +	1 -
2 -	2 -	2 +	2 -	2 *	2 -**
3 +*	3 -**	3 +*	3 +	3 -	3 -
4 +*	4 +	4 -	4 -	4 +*	4 +

Group "F"		Group "G"		Group "H"	
Pre	Post	Pre	Post	Pre	Post
1 -*	1 -**	1 -	1 -	1 -	1 -
2 +	2 +	2 -*	2 -	2 -*	2 -**
3 -*	3 -	3 +	3 -	3 +	3 +
4 +	4 -	4 +*	4 +**	4 +*	4 -

Group "I"		Group "J"	
Pre	Post	Pre	Post
1 -	1 -	1 -	1 -
2 +	2 +	2 +	2 -
3 -*	3 -**	3 +*	3 +
4 +*	4 -	4 -*	4 -**

Legend: Letter Signifies Group

Number Identifies Individuals In Each Group

\+ Signifies Guilty Participant Picked Up By Polygrapher

\- Signifies Non-Guilty Participant Picked Up By Polygrapher

* Signifies Guilty Participants On Pre-Guilty Knowledge Test

** Signifies Guilty Participants On Post-Guilty Knowledge Test

terpretation. In the planning of this study, it was felt that the reward of a calculator would induce the needed anxiety level in the thieves, but it was found that their anxiety levels were low. These results would indicate that the anxiety level of the participants is a primary factor in obtaining a successful autonomic response.

During the administering of the polygraph in previous studies that used the guilty-knowledge technique, the polygrapher was not in the same room as the participant. Lykken, in the reporting of earlier studies, does not state or indicate whether or not the participant repeat the questions and responses. However, in a 1974 article by Lykken, he indicated that he does have the participants repeat both the question and their alternatives. In this study, the polygrapher was in the same room with the participants. Also, the participants were instructed not to respond verbally to the questions and alternatives. This fact alone could have caused the polygrapher not to retain the participants' attention.

Several participants indicated, after the experiment, that during their polygraph examination they tried to ignore the questions and alternatives by thinking or concentrating on something else.

Theoretically, the participant would subconsciously give off autonomic responses even though consciously

thinking or concentrating on something else. The findings in this study are not supportive of this.

The participants were not as aware of their role as they could have been in the preceeding guilty-knowledge test. It is thought that during the instructional stage of the project that the participants' roles should have been explained in more detail. Due to the participants' lack of knowledge of their roles, they were not as comfortable as they should have been. It is quite likely, that this also affected the participants' confidence in the polygrapher. The participants in this study only spent a few minutes in the work area, either working, attempting to commit the theft, or accomplishing the theft. Therefore, they had little opportunity to note the facts and details of the situation which was used for the guilty-knowledge question in the post-test.

There were a few other elements that should be discussed, that could have had an effect on the results of both tests. An artificial response can be produced in various ways on the different components by a sophisticated subject. The scoring systems used in this study were simple and did not involve any attempt to defend against the possibility of a participant making a deliberate response in order to defeat the test. Although the polygrapher normally allows 15 seconds to 20 seconds for component activity to dissipate, in this study, that

appears to be an insufficient amount of time.

There are two factors related to the time allowed in the experiment for the polygraph examinations which could have affected the results of the study. The polygrapher would normally allow approximately one hour for any one polygraph examination. In this study, the participants were with the polygrapher for only approximatelly fifteen minutes. In addition, the polygrapher in this study administered polygraph examinations for two groups in one day, i.e., sixteen polygraph examinations. This scheduling was undoubtedly too demanding on any one polygrapher.

Summary

The pre-test had both a Null and Alternative Hypothesis. The Null Hypothesis states that the guilty-knowledge technique cannot be used to identify people before they commit a theft, even if the person has the intention to steal. The Alternative Hypothesis states that the guilty-knowledge technique can be used to identify people before they commit a theft, if the person had the intention to steal. The researcher came up with eight (8) misclassifications, which was eight (8) misses out of sixteen (16), thus causing the researcher to fail to reject the Null Hypothesis. The approximate probability of chance for eight (8) out of sixteen (16) misclassifications is 50%.

The post-test had both a Null and Alternative Hypothesis. The Null Hypothesis states that the guilty-knowledge technique cannot identify, after the fact, those who have committed a crime. The Alternative Hypothesis states that the guilty-knowledge technique can identify, after the fact, those who have committed a crime. The researcher came up with seven (7) misclassifications, which was seven (7) misses out of eight (8), thus, causing the researcher to fail to reject the Null Hypothesis. The approximate probability of the polygrapher identifying at least one of the thieves correctly is 3 out of 4 (.76).

CHAPTER V

SUMMARY AND CONCLUSION

Summary

The purpose of this research project was to attempt to determine if the use of the "guilty-knowledge" technique could assist employers in the control of their theft problems and the screening of dishonest job applicants. The review material for this research project consisted of social abstracts, psychological abstracts, and materials from the National Criminal Justice Service.

This project did not utilize the standard pre-employment screening process, which consists of a broad coverage technique, including all information contained in the employment application. The "guilty-knowledge" technique was used in the pre-test hypothesis to identify people before they commit a theft, when the person has the intention to steal. The hypothesis in the post-test was nearly a replication of Lykken's[34] and Davidson's[35] studies, i.e., that the polygraph can identify the perpetrator of a crime, after the fact, through the guilty-

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[34] Lykken, 1959-1960.

[35] Davidson, 1968.

knowledge technique.

Lykken's original work suggested that the use of physiological measurements could be used to detect the presence of "guilty-knowledge" rather than lying. The basic assumption of the guilty-knowledge test is that the guilty subject will show a stronger autonomic response to what he recognizes as the significant alternatives than he would have shown without guilty-knowledge. In a second study, Lykken stated that with the use of a questionnaire method he was able to find the "guilty-knowledge" technique highly resistant to faking.[36]

Then Davidson, in 1968, duplicated and extended Lykken's work.[37] He tested the validity of the guilty-knowledge technique under more ego involving circumstances and with varying amounts of motivation.

The subjects in all of the above mentioned studies were seated in an interrogation room alone, with shocking electrodes attached to one hand, a blindfold over their eyes, and headphones over their ears. Also, in all of these previous studies, only the G.S. R., galvonograph, was used to measure autonomic responses.

This research project consisted of forty college students, scheduled at their convenience to one of ten groups, which were motivated to commit a simulated crime

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[36] Lykken, 1960.

[37] Davidson, 1968.

and work in a work area. All of the students were then given pre-crime and post-crime guilty-knowledge tests. The guilty-knowledge test consisted of five standard questions relating to the work area and a simulated crime. The scoring system is a deviation of the "zone of comparison" method. The participants were debriefed and asked not to discuss the study until the experimental stage was completed.

Scoring responses to the several alternatives given on each question were ranked in order of amplitude. If the largest response is to the relevant alternative, a score of two (2) is given to that question. If the largest response is to one of the irrelevant alternatives, a score of one (1) is given to that question. Thus, a perfect innocent score is five (5) and a perfect guilty score is ten (10), for both tests.

In the pre-test, the researcher came up with eight (8) misclassifications, which was eight (8) misses out of sixteen (16), thus causing the researcher to fail to reject the Null Hypothesis. In the post-test, the researcher came up with seven (7) misclassifications, which was seven (7) misses out of eight (8), thus causing the researcher to fail to reject the Null Hypothesis.

Practical Implications

This study did not confirm what the researcher had wanted. First, it was not confirmed that the guilty-

knowledge test could predict those persons who would steal, if they had the intent. Two, the guilty-knowledge test, as used by Lykken, without the shocking electrodes, the blindfold, and the headphones, did not confirm that the polygraph can predict after the fact. The guilty-knowledge method is not yet employed by professional polygraphers in the field. Partly because the distinctive character of the method had not yet been understood, nor is it thoroughly tested. On the other hand, the guilty-knowledge method simply is not practical in many situations in which the lie detector is now used, and it almost always will require much more careful preparation and pre-investigation than does a lie detector test. It would also require more operators and a greater expense to the contracting agency.

As mentioned earlier, the guilty-knowledge method could not be used in the vast majority of situations where the lie detector is now used. This would include many criminal investigations and all employee screening applications because of a lack of the guilty-knowledge information necessary to construct the item set. Therefore, the fact that it rests on reasonable assumptions, that it can produce an objective, quantitative estimate of the probability of guilt, and that in certain situations it is capable of yielding near perfect validity, was not supported in this study.

It appears the reason the researchers in the

previous studies had such a great correct classification "hit rate" was because of the shocking electrodes. The purpose of the shock was merely to increase the general anxiety level and increase to some extent the participant' motivation not to give a guilty record and, thus, to create a situation resembling a little more like that of real criminal interrogation. Another consideration was the researcher's use of headphones and a blindfold which caused the subjects' attention to be centered on the specific matter as well as increasing the anxiety of the subjects. This study did not use any of these added features that both Lykken and Davidson used in their studies. This study, by not duplicating these "anxiety raising" controls, has shown the importance of anxiety in the effective use of the polygraph. There is a clear explanation for the presence of anxiety in persons accused of crime. However, the anxiety level of job applicants in pre-employment polygraph tests is not as clear or assured. The question raised by these results then is whether the polygraph is as effective in pre-employment screening as it is in criminal investigations. If it is not, could its effectiveness be improved by the use of some induced anxiety during the test?

Future Research

This study was not able to support the validity of the "guilty-knowledge" technique. However, recognizing the methodoligical weaknesses in design and the deviations from the previous studies, the following recommendations are made for future research:

1. Try to instill in each of the subjects the importance of their attention to the questions and alternatives, as it is related to their respective roles in the study.
2. Have participants repeat the questions and alternatives, or give some response to get their involvement.
3. Institute a longer interrogation period, use a greater variety of questions, and make sure the questions and alternatives are repeated more than once.
4. Allow more time for the interrogation so the polygrapher can operate better.
5. Utilize a larger sample to increase validity.
6. Allow more time for the component's activity to dissipate, approximately 20 seconds to 25 seconds, in order to get a better response.
7. Experiments should be conducted which control for anxiety in the subjects to determine its full impact on the effectiveness of the polygraph.

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APPENDICES

APPENDIX A

Questions Used In Pre-Guilty Knowledge Test

(1) If chosen to work in the work area, will you:
(a) Try to be on time?
(b) Join the union?
*(c) Take things that don't belong to you?
(d) Cause confusion?

(2) While working with others, will you:
(a) Try to be friendly?
*(b) Take advantage of others when possible?
(c) Do as little as possible?
(d) Stay by yourself?

(3) While working, if someone asks you to take something, will you:
(a) Ignore the request?
(b) Report it ti a supervisor?
(c) Tell them to forget it?
*(d) Help to take it?

(4) While working, if you find something that belongs to someone else, will you:
(a) Leave it where it is?
*(b) Keep it for yourself?
(c) Do nothing?
(d) Report it to the supervisor?

(5) While working, if you see someone else take something, will you:
(a) Tell them not to?
(b) Report it to a supervisor?
(c) Try to embarass them?
*(d) Look the other way while they take it?

* Signifies guilty-knowledge response

APPENDIX B

Questions Used In Post-Guilty-Knowledge Test

(1) If you are the thief, you will know the calculator was:
(a) On its side;
*(b) In the front of the drawer;
(c) Face down;
(d) In back of the drawer.

(2) If you are the thief, you will know the make of the calculator was:
(a) A Texas Instrument;
(b) A Unitrex;
*(c) A Caltronic;
(d) A Sharp.

(3) If you are the thief, you will know the inside cover of the calculator case was:
(a) Red in color;
(b) Blue in color;
(c) Black in color;
*(d) Purple in color.

(4) If you are the thief, you will know the calculator was:
(a) Brown;
*(b) Black;
(c) Beige;
(d) Yellow.

(5) If you are the thief, you will know that the "On" and "Off" switch for the calculator is located:
(a) On the right, at the bottom;
(b) On the right, at the top;
*(c) On the left, at the top;
(d) On the left, at the bottom.

* Signifies guilty-knowledge response