



**Effects of Two Methods of Comparing Relevant
and Control Questions on the Accuracy of
Psychophysiological Detection of Deception**

Kendall W. Shull, M.S. and Michael Crowe, Ph.D.

April 1993

Department of Defense Polygraph Institute
Fort McClellan, Alabama 36205-5114
Telephone: 205-848-3803
FAX: 205-848-5332

19960221 143

DMIC QUALITY INSPECTED A

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE April 1993	3. REPORT TYPE AND DATES COVERED Final Report (From Jan 93 - Apr 93)
-----------------------------------------	-------------------------------------	--------------------------------------------------------------------------------

4. TITLE AND SUBTITLE Effects of Two Methods of Comparing Relevant and Control Questions on the Accuracy of Psychophysiological Detection of Deception	5. FUNDING NUMBERS DoDPI93-P-0029
------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------

6. AUTHOR(S)

Kendall W. Shull and Michael Crowe

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Jacksonville State University Jacksonville, Alabama DoD Polygraph Institute Fort McClellan, AL	8. PERFORMING ORGANIZATION REPORT NUMBER DoDPI93-R-0002
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of Defense Polygraph Institute Building 3165 Fort McClellan, AL 36205-5114	10. SPONSORING/MONITORING AGENCY REPORT NUMBER DoDPI93-R-0002 DoDPI93-P-0029
----------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT Public release, distribution unlimited.	12b. DISTRIBUTION CODE
------------------------------------------------------------------------------------------------	-------------------------------

13. ABSTRACT (Maximum 200 words)

This study was designed to examine the effectiveness of using two methods of comparing relevant and control questions. A mock homicide scenario was set up using a sleeping, female mannequin. A thief was burglarizing the room. While attempting the robbery, the female woke up causing the thief to kill her. A total of 120 subjects were used for training, piloting and data collection. Tests were analyzed by polygraph instructors who were blind to the programmed condition. The first comparison involved comparing the relevant questions to the overall strongest control question. The second comparison consisted of comparing the relevant question to the strongest and closest control question. The study results showed the evaluation of the tests using the strongest control and the strongest and closest control were not significantly different.

14. SUBJECT TERMS psychophysiological detection of deception (PDD), chart interpretation, decision criteria, question comparisons	15. NUMBER OF PAGES 36
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT
--------------------------------------------------------------	-----------------------------------------------------------------	----------------------------------------------------------------	-----------------------------------

Report No. DoDPI93-R-0002

Effects of Two Methods of Comparing Relevant
and Control Question on the Accuracy of
Psychophysiological Detection of Deception

Kendall W. Shull, M.S. and Michael Crowe, Ph.D.
Jacksonville State University
Jacksonville, Alabama

April 1993

Department of Defense Polygraph Institute
Fort McClellan, Alabama 36205

Director's Foreword

The Department of Defense Polygraph Institute (DoDPI) has been encouraging psychophysiological detection of deception (PDD) examiners, who are practitioners in the field, to participate in research which will advance the knowledge base of forensic psychophysiology. The approach requires that the examiner have a research idea; that the idea be approved by the Institute's research staff; that they have the complete support of their agency; that when necessary the data collection be accomplished at DoDPI; and, that the examiner serves as the principle investigator (PI). The Institute provides financial and logistical support.

This study is the first study, in what is anticipated to be a series of studies, that fits the above requirements. In this instance an experienced forensic psychophysiologicalist from the Federal Bureau of Investigation (FBI) served as the PI. The purpose of the study was to compare the accuracy of two systems for scoring physiologic data collected during PDD tests. The results, which show no significant difference between the two scoring systems, are presented along with the details of the study in the following report.



Michael H. Capps
Director

Acknowledgments

The authors wish to express special thanks to: the volunteers who participated in the study; Dr. Barbara L. Carlton, Dr. Michael J. Janniro, Wayne Mackey, Michael Parks, Dr. Sheila D. Reed, Ed Roessler, Charlene Stephens, Sarah Tidwell, and the entire staff of the DoDPI for their assistance throughout data acquisition and processing. This research was supported by DODPI93-P-0029 project funds from the Department of Defense Polygraph Institute. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

Abstract

SHULL, K. W. and CROWE, M. Effects of two methods of comparing relevant and control questions on the accuracy of psychophysiological detection of deception. April 1993, Report No. DoDPI93-R-0002. Department of Defense Polygraph Institute, Ft. McClellan, AL 36205 and Jacksonville State University, Jacksonville, AL 36265.--This study was designed to examine the effectiveness of using two methods of comparing relevant and control questions. A mock homicide scenario was set up using a female mannequin sleeping, while a thief burglarized the room. During the robbery, the female victim woke up, causing the thief to kill her. A total of 120 subjects were used for training, piloting and data collection. Tests were analyzed by instructors who were blind to the programmed condition. The first comparison involved comparing the relevant questions to the overall strongest control question. The second comparison consisted of comparing the relevant questions to the strongest and closest control question. The study results showed the evaluation of the tests using the strongest control and the strongest and closest control were not significantly different.

Key-words: psychophysiological detection of deception (PDD), chart interpretation, decision criteria, question comparisons

Executive Summary

SHULL, K. W. and CROWE, M. Effects of two methods of comparing relevant and control questions on the accuracy of psychophysiological detection of deception. April 1993, Report No. DoDPI93-R-0002. Department of Defense Polygraph Institute, Ft. McClellan, AL 36205 and Jacksonville State University, Jacksonville, AL 36265.

Two methods of comparing relevant and control questions on psychophysiological detection of deception (PDD) test were studied.

Participants included male and female trainees from Fort McClellan, Alabama. None of the participants had prior PDD examinations. All PDD examinations were conducted by examiners who were graduates of the DoDPI. Using a mock homicide crime scene, subjects were programmed either guilty or innocent. The programmed guilty subjects were instructed to steal from a bedroom. During the robbery, a female mannequin reportedly awoke, causing the guilty subject to beat her with a broom handle and kill her. Each guilty subject then wrote the word "SATAN" on a dresser mirror, with lipstick found on the dresser. Data was collected on a standard, 3-channel Lafayette field polygraph. One channel measured changes in thoracic and abdominal areas during expiration and inspiration. One channel measured skin conductance. A cardiograph channel employed a standard medical blood pressure cuff to monitor and record cardiovascular activity. A total of 120 subjects were used for training, piloting and data collection. Tests were analyzed by instructors who were blind to the programmed condition. The first technique compared each relevant question to the overall strongest control question. The second technique compared each relevant question to the strongest and closest control question. The study results showed the evaluation of the tests using the overall strongest control and the strongest and closest control were not significantly different. Practical attempts were made to make a stimulating mock crime, although there is valid concern regarding the motivation of the subjects to be deceitful in a scenario such as this one. The lack of motivation in the subjects might impact the applicability to the field. Subjects participating in a mock scenario may not possess the psychological and physiological arousal as those subjects in the field.

Table of Contents

Title Page	i
Director's Foreword	ii
Acknowledgments	iii
Abstract	iv
Executive Summary	v
List of Tables	vii
Introduction	1
Definition of Terms	2
Methodology	3
Subjects	3
Examiners	3
Equipment	3
Procedure	4
Scenario	4
Test Evaluation	5
Research Phases	6
Population of Study	6
Risks to Subjects	6
Results	7
Additional Analysis	9
Discussion and Implications	10
References	11
Appendix A: Script for Scenario Setter "Innocent & Guilty"	A-1
Appendix B: To You, the Subject	B-1
Appendix C: Volunteer Agreement Affidavit	C-1
Appendix D: Demographics	D-1
Appendix E: Script for Scenario Setter "Guilty"	E-1
Appendix F: Script for Scenario Setter "Innocent"	F-1
Appendix G: Script for Polygraph Examiner	G-1
Appendix H: Control Test Questions	H-1
Appendix I: Subject Debriefing	I-1
Appendix J: Evaluation Sheet	J-1
Appendix K: Chart Evaluation	K-1

List of Tables

1. Evaluator Decisions for Overall Strongest Control	7
2. Evaluator Decisions for Strongest and Closest Control . .	7
3. Means and Standard Deviations of Techniques 1 and 2 by Roles.	8
4. Results of Both Techniques Combining Innocent and Guilty.	9

Background Information for the Reader

Throughout this paper, the reader will see the terms "forensic psychophysiology" and "psychophysiological detection of deception (PDD) examinations (Podlesny and Raskin, 1977). These terms are being merged into current literature to define accurately what most people call "polygraph" (DoDPI Polygraph Advisory Committee Summary, 1992). To avoid confusion, the terms "PDD" and "polygraph" are used synonymously in this study. An explanation of these terms is provided in the section covering definition of terms.

Introduction

The Federal Bureau of Investigation (FBI) uses the Control Question Technique (CQT) as a primary testing format during a psychophysiological detection of deception (PDD) examination. The polygraph unit at the FBI Headquarters has requested that a study be conducted to explore which of two methods of scoring a control question examination is more accurate. The first method compares the strongest control question on each test to the relevant questions on that test. The second method involves comparing each relevant question to the control question that is both strongest and closest.

PDD examinations conducted by the FBI focus on sensitive matters that require flexible testing procedures. Research to validate PDD testing is necessary as new information, procedures, and instrumentation evolve and change rapidly. Furthermore, supervisors at the FBI want to ensure that field examiners use current approaches to detecting deception that are based on scientific research and experience.

During a literature review it was found that many studies have examined different scoring strategies. Koll (1979) reported a high degree of accuracy and low inconclusive rate for subjects participating in a mock crime using the Modified Zone Comparison Test. Scoring consisted of straight pairing of control questions to relevant questions.

Weaver (1985) evaluated the effects of scoring 15 control question examinations using the three most common methods: United States Army Military Police School (USAMPS), Backster, and Utah. The Backster system of scoring produced the most inconclusive calls. Subjects classified deceptive by the USAMPS method scored significantly more negative than with Backster scores. This occurs because the Backster system evaluates the response of a relevant question against the weakest control, unlike the USAMPS or Utah.

In a study conducted by Crowe, Chimarys and Schwartz (1988) 30 PDD examinations were scored by nine PDD examiners. The tests

were scored using three methods. The first method involved comparing the strongest control question to the reaction of each relevant question. The other two methods compared the weakest control question reaction to the reaction of each relevant question. In addition, a global evaluation was conducted. The results showed that the strongest control question comparison was the most accurate but had a high inconclusive rate. In a similar study conducted by Capps and Ansley (1992) it was found that using the strongest control was more accurate and reduced inconclusive calls.

Barland (1981) evaluated PDD examinations using the USAMPS method where the relevant question was compared to the nearest control question. The tests were scored again using the strongest control response on the test. It was concluded that the strongest control response resulted in less accurate scoring for subjects programmed guilty. However, the method was more accurate for subjects programmed innocent.

It is expected this study will contribute to the knowledge about the accuracy of using the strongest control comparison. It is also expected that this study will initiate a precedent of having operational personnel involved in the preparation, collection, and practical interpretation of the data. The findings of this study should help forensic psychophysiologicalists in the accuracy of scoring their tests, reduce inconclusive evaluations, and help identify further validity and reliability rates.

Definition of Terms

Definition of terms used in this study are as follows:

Control Question. A question used during a polygraph examination which, although not relevant to the matter under investigation, is designed to elicit responses to compare to responses that are relevant to the investigation (DoD Directive 5210.48, 1984).

Forensic Psychophysiology. A recently named science that deals with the relationship and application of psychophysiological detection of deception examinations to the legal system. As such, it compares to other forensic sciences such as forensic medicine, forensic odontology, and several other specialties identified by the American Academy of Forensic Sciences (DoDPI Annual Report, 1992).

Psychophysiological Detection of Deception Examination. Encompasses all activities that take place between an examiner and an examinee during a specified series of interactions. It includes: the pretest interview--the use of the polygraph to collect physiological data from the examinee during a series of tests; the diagnostic phase which includes the analysis of

physiological data in correlation with the questions asked during each test to support a diagnostic decision; and the post test phase that includes the interrogation of the examinee if the examinee is diagnosed deceptive on the tests, or an explanation of the quality control process if the examinee is diagnosed truthful or inconclusive (Yankee, 1992).

Relevant Question. A polygraph question pertaining directly to the matter under investigation for which the examinee is being tested (DoD Directive 5210.48, 1984).

Methodology

Subjects

Subjects came from the population of troop trainees at Fort McClellan, Alabama. Subjects that come from this population tend to be in average to excellent health. The population consisted of both males and females between the ages of 19 and 33, with the median falling somewhere around 20. Subjects had no prior polygraph examinations at the Institute.

Examiners

All examinations were conducted by two certified psychophysiological detection of deception (PDD) examiners, not assigned to the Department of Defense Polygraph Institute (DoDPI). Upon their arrival at the Polygraph Institute, the examiners spent nine days practicing before piloting and data collection. After initial training and eight days of piloting, each examiner conducted between two and four examinations per day until completion of the study.

A certified PDD examiner was also used to program subjects or to set the scenario. Each subject was programmed individually. A certified polygraph examiner with the FBI was used to monitor the polygraph examinations to ensure suitability of subjects.

Equipment

A Lafayette 10-inch field polygraph was used. The specific channels consisted of two pneumograph channels to measure changes in thoracic and abdominal areas during expiration and inspiration. There was also one channel measuring skin conductance. The skin conductance fingerplates were placed on the hand opposite the arm with the conventional blood pressure cuff. The conventional cardiovascular blood pressure cuff was placed on the upper arm of the examinee. The cardiograph channel utilized a standard medical blood pressure cuff, pump bulb for inflation purposes, and a sphygmomanometer.

All examinations conducted during this project were videotaped using wall and ceiling mounted video cameras and commercial videotape recorders. The tapes collected were

maintained until completion of the operational and data analysis portions of this project was complete. At that time the video tapes were made available for re-use by research and instruction divisions.

Procedure

Upon arrival at the Department of Defense Polygraph Institute (DoDPI), subjects were met and briefed on the purpose of this investigation (Appendix A). The subjects were asked about prior polygraph experience. Those who had prior polygraph experience at the Institute were returned to their unit and not included in this study. The purpose and procedure of the study was fully explained to all subjects. Attached is a copy of the pre-brief and volunteer affidavit forms that were given to subjects (Appendixes B and C). At this time subjects were asked to read and sign the volunteer affidavit which informs the subject that his/her participation is solely voluntary. The subjects were then asked to complete a demographic form (Appendix D).

Upon completion of the introduction to the study, and completion of the demographic form the subjects waited in a room. The programming procedure was then explained to each subject.

Scenario

Utilizing one of the rooms at the DoDPI, a simulated homicide scene was set up. The victim was a female mannequin, placed in a bed prior to the arrival of the programmed guilty subject. The room contained a dresser, night table, chair, and a dresser mirror. The room also contained personal items such as jewelry, make-up, handbags, and purses, consistent with what might be found in a woman's bedroom.

The scenario setter, acting as a director brought each programmed guilty subject into the crime scene. As each programmed guilty subject was brought into the room, the scenario setter, working from a script (Appendix E), instructed the subject to pretend that he has entered the room to commit a theft. As the subject looked around the room, he was told that the victim is waking up and to take a broom handle from a corner of the room, and then strike the mannequin over the head with the broom handle.

The scenario setter then checked the pulse of the victim and informed the subject that his actions killed the woman. The subject was then told to conceal the broom handle under the bed.

The subject was then instructed to remove a ring from the woman's finger and conceal the ring in his pocket. The subject then wrapped the woman in a bright orange sheet (provided), and

placed the woman behind the bed. The subject then took a woman's lipstick from a dresser top. The subject then wrote "Satan" in lipstick on the mirror and exited the room with the scenario setter.

The programmed innocent subjects were given no information regarding the scenario and were not allowed to interact with any of the programmed guilty subjects. The innocent subjects were informed that they would be given a PDD examination regarding a homicide investigation, but since they were not involved in any way, they would have no information or knowledge of the details of the crime (Appendix F). The innocent subjects were taken to a room separate from the programmed guilty subjects to avoid contamination.

All subjects were then informed that they would be given a PDD examination shortly regarding a homicide investigation. Regardless of their programming, subjects were instructed to cooperate fully with the examiner and if asked by an examiner about the case, to say that they had been informed by DoDPI staff that a homicide had been committed and that they knew nothing more about it.

The subjects were then taken to a lab at DoDPI where they were given a Control Question Test (CQT) made up of seven questions. The instructions for these subjects can be found in Appendix G. A copy of the questions to be used for the CQT can be found in Appendix H.

After the initial instructions, the polygraph components were then attached. After the examination, all subjects underwent a debriefing before release (Appendix I).

Test Evaluation

Ninety tests were randomly assigned and scored by three instructors assigned to the DoDPI. Each test was scored using both methods of comparing control questions. The first comparison involved comparing the relevant questions to the strongest and closest control question. The second comparison consisted of comparing the relevant questions to the strongest control question.

Evaluators utilized a 3-point scoring system with an inconclusive call being less than plus-or-minus three. If an inconclusive call was made, the evaluators used a 7-point scale in an attempt to avoid the inconclusive call.

Research Phases

1. Training and practice period for PDD examiners was nine days.
2. Piloting was conducted for eight days.
3. Formal data collection conducted for 29 days.

Population Study

1. Thirty-eight subjects were used for training examiners.
2. Thirty subjects were used for piloting of the study. The purpose of the piloting was to test the adequacy of procedures and make minor changes as necessary.
3. Ninety subjects were scheduled for formal data collection. Considerations for determining suitability of those subjects were:
 - a. Subject's health (i.e., bad colds, etc.)
 - b. Is the subject on medication for cold or pain?
 - c. Is the subject extremely sleepy?
 - d. Is the subject cooperative, does he appear to be intentionally distorting charts, and so forth?

A total of 120 subjects were utilized for piloting and the study.

Risks to Subjects

The risks to the subjects in this study were minimal. A scenario setter accompanied the subject through all phases of the simulated crime scene. Subjects did not engage in any physical or psychological risks. The physiological measures recorded employed safe, commercially available, grounded equipment that is used in clinical, medical and experimental laboratories in this field. There were no known physical or psychological risks to the subjects.

Law requires that the appropriate authorities be notified if information regarding a serious breach of national security or participation in a serious crime is divulged during the polygraph examination. Subjects were informed of this in the pre-brief form and were asked to initial the clause in the volunteer affidavit.

Subjects who declined to participate did not need to divulge their reasons for discontinuing and could refuse to continue at any time before, during or after the examination. Other than these instances, all of the records were maintained as confidential.

Results

Analysis of decision by the original evaluator utilizing the overall strongest control comparison found significant difference, Pearson chi-square $p < .0004$, in the distribution of decision between innocent and guilty. The technique discriminated between programmed innocent and guilty and more often resulted in guilty being deception indicated (DI) and innocent being no deception indicated (NDI). The data are depicted in Table 1.

Table 1
Evaluator Decisions for Overall Strongest Control

Programmed	Decision		Total
	DI	NDI	
Guilty	20 (66.7%)	10 (33.3%)	30 (44.1%)
Innocent	9 (23.7%)	29 (27.3%)	38 (55.9%)
Total	29 (42.6%)	39 (57.4%)	68 (100.0%)

Analysis of decision by the original evaluator utilizing technique 2 (nearest and strongest control comparison) found significant difference, Pearson chi-square $p < .0000$, in the distribution of decisions between innocent and guilty. The technique discriminated between innocent and guilty and resulted in guilty more often being identified as DI and innocent more often being identified NDI.

Table 2
Evaluator Decisions for Strongest and Closest Control

Programmed	Decision		Total
	DI	NDI	
Guilty	28 (84.8%)	5 (15.2%)	33 (50.8%)
Innocent	8 (25.0%)	24 (75.0%)	32 (49.2%)
Total	36 (55.4%)	29 (44.6%)	65 (100.0%)

A 2 x 2 analysis of variance with programming role (innocent/guilty) a between subjects variable and scoring technique (strongest control comparison/and strongest and closest control comparison) a within subjects variable was performed on the data in Table 3. The interaction of role and technique was not significant. Both main effects were significant. For role, the guilty had significantly smaller total scores $F(1,108) = 30.05, p < .0001$. For technique, the strongest control comparison had significantly lower scores $F(1,108) = 19.99, p < .0001$.

Table 3
Means and Standard Deviations of Techniques 1 and 2 by Roles

Technique	Programmed Guilty	Programmed Innocent	Total
T1	- .549 6.268	4.864 5.865	2.355
T2	-2.549 6.011	3.593 5.233	.745
<u>Total</u>	<u>-1.549</u>	<u>4.229</u>	

Note: Technique 1 = strongest control; Technique 2 = strongest and closest control.

An analysis of interrater reliability using a fourth evaluator to evaluate a subset of 36 examinations was conducted.

These were then compared to the decision of the original evaluator. Percentage of agreement on decisions were calculated between the original examiner and the fourth evaluator for each technique. Agreement occurred when both evaluators made a NDI, DI or INC decision. For Technique 1 percent agreement was 75% and for Technique 2 percent agreement was 61%. However, in those cases where evaluators did not agree, there were no incidents of opposite calls. For example, when one evaluator makes an NDI call and the other a DI call.

A Pearson r was calculated using the total scores of a randomly selected subset of 36 examinees. Interrater reliability was calculated and the reliability coefficient for Technique 1 was 0.90. The reliability coefficient for technique 2 was 0.90. Both were significant at $p < .0000$.

As shown in Table 4, Technique 1 resulted in correct calls of 49 of 68 cases (72.1%) and Technique 2 in 52 of 65 cases (80%). The Fishers exact test indicated no significant difference existed.

Table 4
Results of Both Techniques Combining Innocent and Guilty

Technique	TP & N	FP & N	Accuracy
T1	49	19 27.9%	72.1%
T2	52	13 20.0%	80.0%

Note. Technique 1 = strongest control; Technique 2 = strongest and closest control.

Additional Analysis

The McNemar test for the significance of changes is not appropriate in this study. The null hypothesis would state that in those decisions that change across techniques, the probability of a change, such as from DI to INC, will be the same as the probability of the change from INC to DI (H_0 : the frequencies of changes in either direction are the same). In this study, there were no such opposing changes in decision across the two techniques. The decision changes which occurred were from DI to INC and INC to NDI. If DI and NDI were grouped as "Any Decision", the McNemar test could be performed between the two techniques using INC and "Any Decision" as categories. In that case, the total frequency of changes in both directions should be greater than 10. Using this technique, the cells would appear as follows:

		Programmed Innocent	
		Technique 1	
		INC	ANY DEC
		<hr/>	
Technique 2	ANY DEC	2	
		<hr/>	
	INC		6
		<hr/>	

$$\chi^2 = 1.125, p > .05$$

Note. The sum of changes in the cells of interest is less than 10, and therefore does not satisfy the requirements for using the McNemar test. A binomial test would be more appropriate.

Programmed Guilty

Technique 1

INC

ANY DEC

Technique 2 ANY DEC

10

INC

5

$$\chi^2 = 1.067, p > .05$$

There are no significant differences between the decision changes across techniques. It is obvious that information is lost when DI and NDI calls are given a single category. It seems reasonable to assume that more information may be obtained by examining trends in safe and unsafe calls as a function of the technique employed.

Discussion and Implications

The results of this study show that the evaluation of the tests using the strongest control and the strongest and closest control were not significantly different. The data indicates that use of the strongest control results in more true negative (TN)/ false negative (FN) (subjects programmed innocent and guilty determined to be no deception indicated (NDI)). Use of the strongest and closest control results in the true positive (TP)/false positive (FP) (subjects programmed both innocent and guilty determined to be deception indicated (DI)). More research is needed to evaluate psychophysiological detection of deception (PDD) examinations to determine if using the strongest control comparison results in more innocent examinees being called no deception indicated (NDI) and less being called inconclusive. In the opinion of the researcher, correct DI calls will remain DI because of the theory of psychological set.

Although attempts were made to make the mock crime as stimulating as possible, a question arises concerning the motivation of the subjects to deceive in a study such as this one and how that possible lack of motivation might impact on the applicability to the field. Research subjects do not possess the psychological and physiological arousal as those subjects in the field. Many polygraph examiners and researchers believe that greater motivation to deceive leads to greater detectability. (Abrams, 1972; OTA, 1983, Forman & McCauley, 1986).

References

- Abrams, S. (1972). The polygraph: Laboratory v. field research, Polygraph, 1, 145-150.
- Barland, G. H. (1981). A validation and reliability study of counterintelligence screening test. A report to Security Support Battalion, 902d Military Intelligence Group, Fort Meade, Maryland.
- Capps, M. H. & Ansley, N. (1992). Comparison of two scoring scales. Polygraph, 21(1), 39-43.
- Crowe, M. J., Chimarys, M. & Schwartz, J. (1988). The GOT polygraph test: Scoring and validity. Poster presentation at the 96th Annual Convention of the American Psychological Association, August, 1988. Department of Defense Directive (1984). DoD Directive 5210.48 (DoD Polygraph Program), Washington, DC
- Department of Defense Polygraph Program: Annual report to Congress for fiscal year 1991. (1991). Polygraph, 21, 92-108.
- Department of Defense Polygraph Institute. (1992, July) Polygraph advisory committee meeting minutes, Fort McClellan, AL 36205.
- Forman, R. F. & McCauley, C. (1986). Validity of the positive control test using the field practice model. Journal of Applied Psychology, 62, 127-136.
- Gay, L. R. (1992). Educational research: Competencies for analysis and application (4th ed.). Manhattan, NY: Macmillian.
- Koll, M. (1979). Analysis of zone charts by various pairings of control and relevant questions. Polygraph, 8, 154-160.
- Podlesny, J. A. & Raskin, D. C. (1977). Physiological measures and detection of deception. Psychological Bulletin, 84, 782-799.
- Weaver, R. S. (1980). The numerical evaluation of polygraph charts: Evaluation and comparison of the major systems. Polygraph, 9(2), 94-108.
- Yankee, W. (1992). A case for forensic psychophysiology and other changes in terminology. Memorandum prepared at the Department of Defense Polygraph Institute, Fort McClellan, AL.

Appendix A

Script for Scenario Setter

Part 1

FOR "INNOCENT" AND "GUILTY" GROUPS

"Hi, my name is _____ and welcome to the Department of Defense Polygraph Institute (DoDPI). This may be the first time you have been at the Institute so we would like to provide you with some information concerning the purpose for being here today. We hope that you will find your time here to be enjoyable and educational.

Allow me to start by explaining the examination process to you. A polygraph examination is a process by which physiological information is recorded to determine whether somebody is being truthful when asked questions about a particular subject or incident.

We have two missions here at DoDPI. To begin with, we are one of only two schools in the Federal Government that trains polygraph examiners. We train all the DoD polygraph examiners and most of the other federal agencies, such as the FBI, DEA, Secret Service, etc. The other part of our mission here is to conduct research. In this capacity we test new and existing polygraph procedures for accuracy and utility. It is in that capacity that we are asking for your assistance today.

One of the ways that we test a particular procedure for accuracy is to ask people like you to commit a simulated crime. The particular crime that we will use for this project, is a make believe murder. We then give you a polygraph test to see if we can determine that you did commit that crime. Of course if everyone we test is guilty, than we would not have a very good experiment, so we also test some people who did not commit the simulated crime and are therefore "innocent". Today we may make you part of an "innocent" group or part of a "guilty" group. In either case it is very important that you do exactly as instructed before, during, and after your polygraph examination, or we will not have a good experiment. As part of the project today, your polygraph examinations will be videotaped. These tapes are not released outside the Polygraph Institute.

I would like to assure you in advance that your participation is completely voluntary. If you have any questions, please feel free to ask any of the DODPI staff.

Appendix B

To You, the Subject

Welcome to the Department of Defense Polygraph Institute. This may be the first time you have been at the Institute so we would like to provide you with some information concerning the purpose for being here today. We hope that you will enjoy the task we will give you today. Your participation in this project is completely voluntary. If you have any questions, please feel free to ask the investigator who greets you today.

PART A -- EXPLANATION

1. DISCUSSION: Congress has directed the Department of Defense to conduct research to determine the effectiveness of the polygraph. Part of this mandate requires that new and existing polygraph procedures be tested for accuracy and reliability. You are being asked to volunteer for an investigation that will help us investigate the accuracy of this specific polygraph test.

You may or may not be asked to be involved in a simulated homicide scenario. If you are asked to participate in a scenario, then you will be asked to follow certain instructions from a staff member. After following those instructions, you will be asked to take a polygraph examination. If you are not asked to be part of any scenario, then you will be taking a brief polygraph examination regarding a matter in which you will obviously have no direct involvement.

2. DISCOMFORTS: Some people find it difficult to sit still for several minutes at a time during the polygraph test, while psychophysiological measurements are being made from the body. Part of the polygraph process requires the wearing of an inflated blood pressure cuff, which some people find moderately uncomfortable. However the actual polygraph tests run for approximately five minutes. Some of you will be taking exams made up of different types of questions. You will learn more about this when you meet your polygraph examiner. The total length of time required for your participation in this investigation will be approximately one to one and half hours, however, you may be here at the Institute for the entire day.

3. VIDEOTAPING: All examinations conducted during this project will be videotaped using wall and ceiling mounted video cameras and commercial videotape recorders. The tapes will be collected, and maintained until completion of the operational and data analysis portions of this project are complete. At that time the video tapes will be made available for re-use by research and instruction divisions.

4. RISKS: There are no known risks involved in this study.

5. CONFIDENTIALITY OF RECORDS: Except for admissions of a serious national security nature or of a crime, all of the information you tell the examiner is confidential information and will not be revealed to anybody not directly involved in the research. Admissions about a crime or a serious breach of national security may be reported to the proper authorities for investigation.

In the absence of such admissions, all of the videotapes, polygraph charts, score sheets, interview forms, examiner work sheets, and related documents associated with your examination will be used for research purposes only. Members of the Army Surgeon General's Human Subjects Research Review Board may inspect the records of the research in their capacity as reviewing officials, but your identity will be kept confidential.

6. YOUR RIGHTS: You have the right to ask any questions about any aspect of your participation in the study. If any problems arise at any time in conjunction with your involvement in the study, or if you have been injured in any way as a result of the study, the person to contact is the Director of the DoD Polygraph Institute. In the event that you do have questions or any of the above has occurred please contact Dr. Yankee at (205) 848-3803. Should any question arise concerning study-related injury, you may contact COL Weisser, M.D., Director of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, telephone number (205) 848-2200.

7. VOLUNTARY PARTICIPATION: Your participation in this study is completely voluntary. If you would prefer not to participate, do not volunteer for it! Even if you decide to participate in the study, you may discontinue at any time without penalty or loss of benefits to which you are entitled. Should you decide not to participate please inform someone on the staff at the Defense Polygraph Institute, or if it occurs during the polygraph examination itself, inform the examiner and you will be released and returned to your unit as soon as possible.

8. ADDITIONAL COMMENTS: Regardless of whether you participated in the simulated crime, it is essential that you never tell the examiner. If you provide him/her with that information either verbally or non-verbally, you will be withdrawn from the study and returned to your unit as soon as possible.

Appendix C

Volunteer Agreement Affidavit

This form is affected by the Privacy Act of 1974

1. AUTHORITY: 10 USC 3012.44, USC 3101 and USC 1071-1067.
2. PRINCIPAL PURPOSE: To document voluntary participation in the Defense Polygraph Institute Research Program. Your name will be used for identification.
3. ROUTINE USES: The name will be used for identification and locating purposes. Information may be furnished to Federal, State and local agencies.
4. MANDATORY OR VOLUNTARY DISCLOSURE: Your signature is necessary if you want to be included in this research. If you do not sign, you will not be able to serve in this study and you will be returned immediately to your unit.

PERSONAL STATEMENT

I, _____, being at least 19 years old, do hereby volunteer to participate in a research study entitled " _____"

being conducted by the Department of Defense Polygraph Institute (DoDPI) at Fort McClellan, under the direction of Dr. B. L. Carlton.

1. _____ I understand that I am participating in a research study that will examine several measures and several techniques, some of which are currently employed in criminal polygraph situations.
2. _____ I am aware that I will be spending between four (4) and eight (8) hours at the DoDPI and that during this time I may be asked to participate in the commission of a simulated "homicide".
3. _____ I understand that as a part of this study, I will be taking a polygraph examination, during which I will be asked to sit still for several minutes at a time during the polygraph test, while psychophysiological measurements are being recorded from my body.
4. _____ I understand that any admissions concerning a breach in national security or of a serious crime may be reported to the appropriate authorities.
5. _____ I understand that there are no known dangers or risks arising as the result of my participation in this study.
6. _____ I understand that part of the polygraph process requires the wearing of an inflated blood pressure cuff, which some people find moderately uncomfortable.
7. _____ I understand that I will be videotaped during the polygraph examination and that the videotape will be maintained for additional study.

8. _____ I understand that I will receive no reward or benefit of any kind as the result of my participation in this study.

9. _____ My participation, the nature, duration and purpose of the investigation and the methods by which it is to be conducted, have been thoroughly explained to me. I have been given the opportunity to ask questions concerning this study, and any such question has been answered to my satisfaction.

10. _____ I understand that I may terminate my involvement in this study at any time and for any reason.

11. _____ Should I have any concerns or complaints concerning this study, I understand that I may contact Kendall W. Shull, or Dr. William Yankee at (205) 848-3803.

12. _____ Should any question arise concerning my rights relating to study-related injury, I should contact COL Weisser, M.D. Commander of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, telephone number (205) 848-2200.

SIGNATURE

DATE

Print your name here

WITNESS

Witness Name Printed

Appendix D

Demographics

This form is affected by the Privacy Act of 1974

1. AUTHORITY: 10 USC 3012, 44 USC 3101 and 10 USC 1071-1067.
2. PRINCIPAL PURPOSE: To document voluntary participation in the Defense Polygraph Institute Research Program. Your name will be used for identification.
3. ROUTINE USES: The name will be used for identification and locating purposes. Information may be furnished to Federal, State, and local agencies.

Subject _____

Date ____/____/____

Age _____

Gender 1 - Male 2 - Female

Race: 1 - Caucasian 2 - African American 3 - Hispanic

4 - Asian 5 - Native American

6 - Other (Specify) _____

Family Background: (Name, Age, POB, and occupation for each)

Mother _____

Father _____

Sister(s) _____

Brother(s) _____

Spouse _____

Children _____

Education Level: Check the highest level and indicate the number of years completed and degree awarded if appropriate.

() High School

() Technical/Vocational

College / Degree

_____/_____
 Post-Undergraduate / Degree

Employment: (Month, Year, Employee, Position)

Military Service: (Month, Year, Service, Location)

Arrest Record: (Month, Year, Location, Offense, Civ, Military)

Leisure Activities: (Sports & Hobbies)

Health: How would you describe your present health and physical status?

Excellent Good Fair Poor

Are you presently under a physician's care and are you taking any medication? No Yes

If yes, for what condition?

What is the medication?

Pain/Discomfort today?

1- None 2- Not Bad 3- Mild 4- Moderate
5- Bad 6- Very Bad

Reason:

Substance Use: (Last used within the last 48 hours)

Narcotic/Drugs: _____

Caffeine: _____

Alcohol: _____

Tobacco: _____

Physical Fitness: Prior to coming to Ft. McClellan, did you participate in regular fitness/exercise?

Yes No

Sleep: How much sleep did you get last night?

Comments:

Appendix E

Script for Scenario Setter

PART 2

FOR "GUILTY" GROUP

Today YOU are going to commit a murder. What I would like you to do, is to sort of psychologically place yourself in the position of somebody going into a motel room to steal something. The "victim" is going to "wake up" causing you to kill the "victim." It is going to be very important that you follow all my instructions to the letter, because there are a number of details which you must remember, for you will be tested later. Are there any questions before we go to the room?

THE SUBJECT AND SCENARIO SETTER GO TO THE CRIME SCENE

"Joe, this is VIP room #2. See that woman in the bed? (pointing to the female mannequin, placed in a bed prior to the arrival of the programmed guilty subjects). As you can see, this room contains a dresser, night table, chair, and a mirror. There are your victim's personal items" (SS points out jewelry, make-up, handbags, and other items).

Now Joe, pretend that you have entered the room to commit a theft. See that ring on the woman's finger? See her purse on the floor? What are you going to steal? Wait a minute, the woman is waking up! Quick, take that broom handle from the corner of the room. Now strike the mannequin over the head with the broom handle as hard as you can.

I will now check her and see if she is dead (The SS, walks over to the victim, "checks the pulse" and informs the subject in a matter of fact manner that his actions "killed" the woman). "Now I want you to hide the broom handle under the bed" (Subject complies). Now steal this ring off her finger and place it in your pocket." Subject steals and conceals ring. "Now Joe, I want you to pick up this lipstick here and write "Satan" on this mirror" (Subject complies). "Now put that lipstick down and wrap this woman in this orange sheet. After you wrap her in the sheet, I want you to conceal the body behind this bed" (Subject complies). "OK Joe, it's time to leave (SS and Subject depart the crime scene).

SS and subject go to a different room where SS states; "Today you committed a homicide." "There were a number of things that you did in connection with that crime and a number of things that you should have observed in the crime scene."

The subject was then told "In a little while a polygraph examiner would be asking them to take a polygraph examination.

I would like you to go with him and take the test. He may ask you what you know about the "Homicide." Do not tell him anything about what you did today. Simply tell him that you were told that a homicide had been committed but that you have no involvement in the crime and that you have no knowledge of any of the details. In every other way I would like you to be as cooperative as possible and do your best to follow all the examiner's instructions, but DO NOT confess to having any knowledge or involvement in the crime.

If you have any questions or feel uncomfortable about anything, tell the examiner that you would like to talk to me and I will do my best to assist. Thank you again for your assistance.

Appendix F

Script for Scenario Setter

PART 2

FOR "INNOCENT" GROUP

Today there was a simulated crime committed. The crime was a homicide. Since you did not have any part of that crime, you obviously do not know any of the details of that crime. In a little while a polygraph examiner will be asking you to take a polygraph examination. I would like you to go with him and take the test. He may ask you what you know about the "Homicide." Simply tell him the truth. Tell him that you were told that a homicide had been committed but that you have no involvement in the crime and that you have no knowledge of any of the details. In every other way I would like you to be as cooperative as possible and do your best to follow all the examiner's instructions.

If you have any questions or feel uncomfortable about anything, tell the examiner that you would like to talk to me and I will do my best to assist. Thank you again for your assistance.

Appendix G

Script for Polygraph Examiner

"Hi, my name is Special Agent _____, of _____ . I have been assigned to administer a polygraph examination to you today. I see here by the paperwork that your name is Pvt. Joe SMITH. Tell me Joe, do you know why you are being administered a polygraph exam today? (The examinees, regardless of their programming were told that they would be examined as possible suspects in a homicide).

The next thing we are going to do is to look over the background form that you have filled out. It is important to make sure that all the information is absolutely complete and correct. As this time the examiner goes over the subject's demographic form and sets the controls. Take no more than 15 minutes to do this.

Now Joe, you have told me that you have no involvement in the crime that was committed today. Very soon I will be using the polygraph instrument to ask you certain questions regarding this crime to determine whether or not you are being truthful about this matter.

Now Joe, let me tell you a little about a polygraph and how it works. Briefly describe the polygraph and the components. Do not take longer than three minutes to do this.

I will be collecting a number of polygraph charts and on each of the charts I will be asking a number of questions. It is very important that you sit absolutely still during the test and not to talk during the collection of the charts, except to answer each question truthfully. Do you have any questions? If not, then let's proceed. The examiner attaches the components and proceeds with the in-test phase.

During the exam I will ask several kinds of questions. The first kind of question I will be asking you about concerns whether or not you were involved in the homicide. Go over relevants ending with the sacrifice relevant.

Next I'll be asking you questions concerning whether or not you are the kind of person who would do this kind of thing. Set controls and go over the control questions.

I will also be asking you some questions that I know for sure you will answer truthfully. Go over the irrelevant questions.

One other question I will ask is Go over the symptomatic (question #3) and proceed with the in-test phase.

Appendix H

Control Test Questions

IRR

1. Are we now in Alabama?
- 1a. Are the lights on in this room?
- 1b. Is this the year 1993?
- 1c. Is your last name _____.

SR 2. Regarding striking that woman on the head, do you intend to tell me the truth?

SY3. Are you afraid I will ask you a surprise question.

C1 4. Prior to this year, did you ever deliberately hurt someone?

R1 5. Did you strike that woman on the head?

C2 6. Before 1993, did you ever wish the death of someone?

R2 7. Do you know for sure who struck that woman on the head?

Appendix I

Subject Debriefing

Now that you have completed your role in our research study, it is the desire of the entire project staff to take this opportunity to sincerely thank you for your help. Your work here today was more important than you may realize.

Depending on the results of this study we will be able to provide federal agencies and police departments with a better understanding of how to change existing procedures to accurately determine whether a person has knowledge or involvement in a criminal offense.

For those of you who actually committed a simulated crime today, you are assured by the staff of this institute, that you in no way violated any rule or law. The simulated crime was just that, pretend.

For those of you who committed no simulated crime, your role was just as important, as no polygraph procedure is useful if it cannot identify the innocent as well as the guilty.

Regardless of your role, it is our hope that nobody involved in this study has made you uncomfortable in any way. If you do have questions or concerns please bring them to the attention of your briefer or to Dr. William Yankee, Director of the Institute.

Lastly, and most importantly, DO NOT discuss the details of this study with anyone else.

This is particularly important for those of you who have knowledge regarding our simulated crime scenario. If you go back to your unit and tell other soldiers what happened in that crime scene, then they will have GUILTY KNOWLEDGE. If one or more of those soldiers are subsequently asked to participate in this study as "innocent" people, the guilty knowledge that YOU gave them will cause false results and seriously damage this project.

Please sign this form in the space provided to indicate that you understand the instruction provided above.

SIGNATURE OF SUBJECT

Appendix J
EVALUATION SHEET

	R1	R2
CHART #1	PNEUMO _____	/ _____
	GSR _____	/ _____
	CARDIO _____	/ _____

SUB-TOTAL: _____

	R1	R2
CHART #2	PNEUMO _____	/ _____
	GSR _____	/ _____
	CARDIO _____	/ _____

SUB-TOTAL: _____

	R1	R2
CHART #3	PNEUMO _____	/ _____
	GSR _____	/ _____
	CARDIO _____	/ _____

SUB-TOTAL: _____

TOTAL EVALUATION: 3 pt scale _____ / _____

TOTAL EVALUATION: 7 pt scale _____ / _____
(use only if 3 pt is INC)

EXAMINEE: _____ EXAMINER: _____

Appendix K

CHART 1 R1 to strongest of
C1 & C2

R2 to strongest of
C1 & C2

CHART 2 R1 to strongest of
C1 & C2

R1 to strongest of
C1 & C2

CHART 3 R1 to strongest of
C1 & C2

R1 to strongest of
C1 & C2

CHART 1

R1 to strongest of
C1 or C2

R2 to C2

CHART 2

R1 to C1

R2 to strongest of
C1 or C2

CHART 3

R1 to C2
R2 to C1