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Chapter 1

# Summary

## **INTRODUCTION**

The primary purpose of this OTA technical memorandum is to review and evaluate current scientific evidence about the validity of polygraph testing. This memorandum responds to the February 3, 1983, letter of request from the Committee on Government Operations, U.S. House of Representatives, and the need to provide information that is relevant to congressional consideration of the polygraph aspects of the President's National Security Decision Directive-84 (NSDD-84), proposed revisions to Department of Defense (DOD) Directive 5210.48 governing the DOD polygraph program, and the recently revised administration policy on polygraph use by Federal agencies.

The OTA technical memorandum is limited to a critical review and evaluation of prior research. The memorandum does not consider, in detail, other polygraph issues such as utility, ethics, impact on employee morale and productivity, privacy, and constitutional rights. The technical memorandum, instead, focuses on the nature and application of polygraph tests, scientific controversy over polygraph testing, data from field and simulation studies, and factors that affect test validity.

## **FEDERAL POLYGRAPH USE**

OTA found that Federal Government use of polygraph tests has more than tripled over the last 10 years, with about 23,000 examinations conducted in 1982 compared to about 7,000 exams in 1973. Current use now exceeds the previous known peak level of use (about 20,000 exams) in 1963. In all Federal agencies except the National Security Agency (NSA) and the Central Intelligence Agency (CIA), more than 90 percent of polygraph testing in 1982 was for criminal investigations. Only NSA and CIA make significant use of the polygraph for personnel security screen-

ing—preemployment, preclearance, periodic, or aperiodic—to establish initial and continuing eligibility for access to highly classified information. However, NSA accounted for almost half of all Federal polygraph examinations administered in 1982. Federal agencies at present make only limited use of the polygraph for investigation of unauthorized disclosure of sensitive or classified information-261 examinations (excluding NSA and CIA) for this purpose over the 1980-82 period.

## **FEDERAL POLYGRAPH POLICY CHANGES**

The March 1983 draft proposed revisions to the DOD polygraph regulations (5210.48) authorize the use of polygraph tests to determine initial and continuing eligibility of DOD civilian, military, and contractor personnel for access to highly classified information (Sensitive Compartmented Information and/or special access). The use of polygraph tests in determining continuing eligibility,

would be on an aperiodic (i. e., irregular) basis. These expanded uses of the polygraph would be part of DOD personnel security screening.

Also, the proposed revisions to DOD 5210.48 provide adverse consequences for refusal to take a polygraph examination, when established as a requirement for selection or assignment or as a

condition of access. Refusal to take an examination may, after consideration of other relevant factors, result in nonelection for assignment or employment, denial or revocation of clearance, or reassignment to a nonsensitive position.

NSDD-84, issued by the President on March 11, 1983, authorized agencies and departments to require employees to take a polygraph examination in the course of investigations of unauthorized disclosures of classified information. NSDD-84 also provides that refusal to take a polygraph test may result in adverse consequences such as administrative sanctions and denial of security clearance.

On October 19, 1983, the Department of Justice (DOJ) announced that administration policy

would also permit Government-wide polygraph use in personnel security screening of employees (and applicants for positions) with access to highly classified information. The new policy provides agency heads with the authority to give polygraph examinations on a periodic or aperiodic basis to randomly selected employees with highly sensitive access, and to deny such access to employees who refuse to take a polygraph examination,

Thus, the combined effect of NSDD-84, the DOD proposals, and administration policy is to authorize substantially expanded use of the polygraph for purposes of personnel security screening and unauthorized disclosure investigations.

## **POLYGRAPH VALIDITY**

In 1965 and again in 1976, the House Government Operations Committee concluded that there was not adequate evidence to establish the validity of the polygraph. OTA has assessed the research to determine the present state of scientific evidence,

OTA concluded that no overall measure or single, simple judgment of polygraph testing validity can be established based on available scientific evidence. Validity is the extent to which polygraph testing can accurately detect truthfulness and deception.

There are two major reasons why an overall measure of validity is not possible. First, the polygraph test is, in reality, a very complex process that is much more than the instrument. Although the instrument is essentially the same for all ap-

placations, the types of individuals tested, training of the examiner, purpose of the test, and types of questions asked, among other factors, can differ substantially. A polygraph test requires that the examiner infer deception or truthfulness based on a comparison of the person's physiological responses to various questions. For example, there are differences between the testing procedures used in criminal investigations and those used in personnel security screening. Second, the research on polygraph validity varies widely in terms of not only results, but also in the quality of research design and methodology. Thus, conclusions about scientific validity can be made only in the context of specific applications and even then must be tempered by the limitations of available research evidence.

## **FINDINGS**

### **Personnel Security Screening**

OTA concluded that the available research evidence does not establish the scientific validity of the polygraph test for personnel security screening. OTA was able to identify only four studies

directly relevant to personnel security screening use (one by DOD). None of these studies specifically assessed validity of polygraph testing for the purposes proposed by DOD or the administration, and all had serious limitations in study design.

A 1980 survey conducted by the Director of Central Intelligence Security Committee concluded that the polygraph was the most productive of all background investigation techniques. However, this was a utility study not a validity study, and had many qualifications.

OTA recognizes that NSA and CIA believe that the polygraph is a useful screening tool. However, OTA concluded that the available research evidence does not establish the scientific validity of the polygraph for this purpose.

In addition, there is a legitimate concern that the use of polygraph tests for personnel security screening may be especially susceptible to: 1) countermeasures by persons trained to use physical movement, drugs, or other techniques to avoid detection as deceptive; and 2) false positive errors where innocent persons are incorrectly identified as deceptive.

### **Criminal Investigations**

OTA found meaningful scientific evidence of polygraph validity only in the area of investigations of specific criminal incidents. However, OTA concluded that, even here, findings about polygraph validity must be qualified. This is because prior research has used widely varying types of questions, examiners, and examinees, among other differences. And there is, to date, no consistently used and accepted methodology for polygraph research. Also, the cases selected in field studies and situations simulated in analog studies may not be representative of most actual polygraph testing conditions. Therefore the ability to generalize from the results of prior research is limited.

OTA found a wide divergence in the results of relevant research, due in part to variations in research quality and design. Six prior research reviews showed average validity ranging from a low of 64 percent to a high of 98 percent. OTA'S own review of 24 relevant studies meeting minimum acceptable scientific criteria found that, for example, correct guilty detections ranged from about 35 to 100 percent. Overall, the cumulative research evidence suggests that when used in criminal investigations, the polygraph test detects

deception better than chance, but with error rates that could be considered significant.

In a typical criminal investigation, the polygraph, if used at all, is used only after prior investigation has been completed, and a prime suspect or suspects have been identified. To the extent polygraph use in unauthorized disclosure investigations would be similar, then the available research provides some evidence of polygraph testing validity. However, for so-called "dragnet" screening where a large number of people would be given polygraph tests in the investigation of unauthorized disclosures, relevant research evidence does not establish polygraph testing validity. There has been no direct scientific research on this application.

### **False Negatives/Countermeasures**

Theoretically, polygraph testing—whether for personnel security screening or specific-incident investigations—is open to a large number of countermeasures, including physical movement or pressure, drugs, hypnosis, biofeedback, and prior experience in passing an exam. The research on countermeasures has been limited and the results—while conflicting—suggest that validity may be affected. OTA concluded that this is particularly significant to the extent that the polygraph is used and relied on for national security purposes, since even a small false negative rate (guilty person tested as nondeceptive) could have very serious consequences.

### **False Positives**

OTA concluded that the mathematical chance of incorrect identification of innocent persons as deceptive (false positives) is highest when the polygraph is used for screening purposes. The reason is that, in screening situations, there is usually only a very small percentage of the group being screened that might be guilty. So, in a typical situation, there may be, perhaps, one person per 1,000 engaged in unauthorized activity. Therefore, even if one assumes that the polygraph is 99 percent accurate, the laws of probability indicate that one guilty person would be correctly identified as deceptive but 10 persons would be

incorrectly identified (false positives). This potential problem has not been researched in field or analog studies and clearly warrants attention.

### **Voluntary v. Involuntary**

NSDD-84, the DOD proposals, and administration policy authorize adverse consequences for refusal to take a polygraph test. Apart from the ethical and legal implications, which OTA did not address, it is generally recognized that, for the polygraph test to be accurate, the voluntary cooperation of the individual is important. Thus, OTA concluded that imposing penalties for not taking a test may create a de facto involuntary condition that increases the chances of invalid or inconclusive test results. However, no direct research on this topic was identified.

### **Polygraph Theory**

The basic theory of polygraph testing is only partially developed and researched. The most commonly accepted theory at present is that, when the person being examined fears detection, that fear produces a measurable physiological reaction when the person responds deceptively. Thus, in this theory, the polygraph instrument is measuring the fear of detection rather than deception per se. And the examiner infers deception when the physiological response to questions about the crime or unauthorized activity is greater

than the response to other questions. However, the examinee's intelligence level, state of psychological health, emotional stability, and belief in the "machine" are among the several other factors that may, at least theoretically, affect physiological responses,

A stronger theoretical base is needed for the entire range of polygraph applications. Basic polygraph research should consider the latest research from the fields of psychology, physiology, psychiatry, neuroscience, and medicine; comparison among question techniques; and measures of physiological response.

### **Further Research**

OTA identified a need for further research on polygraph countermeasures, polygraph theory, and polygraph validity under field conditions (for both screening and criminal investigative situations). The currently planned Federal research on countermeasures appears to be inadequate. There is no known Federal research planned on polygraph theory. And the Army's current 10-year research program to develop a new, perhaps computerized, state-of-the-art polygraph instrument should be reevaluated to determine if research priorities and direction need adjustment. Finally, the planned FBI-Secret Service polygraph validity study needs an extensive independent scientific review.

## **CHAPTER-BY-CHAPTER OVERVIEW**

The preceding discussion summarizes OTA'S major findings. This section provides a brief chapter-by-chapter overview of the technical memorandum.

Chapter 2 describes the varieties of polygraph questioning techniques and a number of uses for polygraph examinations, with an emphasis on Federal Government use. The chapter describes the polygraph instrument as relatively standard, and, by itself, unable to detect truthfulness or deception. What is often referred to as "the polygraph" is actually a set of relatively complex procedures for asking questions and measuring phys-

iological responses in order to detect deception or establish truthfulness. This chapter discusses the procedures and their common applications, and explains why different polygraph testing techniques appear to be required depending on intended uses.

The validity of polygraph examinations to detect deception has long been a controversial issue. Chapter 3 describes how the courts, State legislatures, and the executive and legislative branches of the Federal Government have viewed assessments of scientific validity as central to decisions about polygraph use. Despite many decades

of discussion, no consensus has emerged about the accuracy of polygraph tests. The chapter defines scientific criteria for establishing validity and reviews previous efforts to evaluate the scientific literature on polygraph testing. Disagreement about the validity of polygraph testing in the scientific community reflects wide variations in the criteria used for inclusion of studies in prior research reviews, differences in research design and definitions of validity among specific research studies, and, perhaps most important, failure to clearly differentiate the scientific evidence in terms of the purposes for which polygraph examinations are conducted and the techniques employed.

Chapter 4 presents OTA's own analysis of polygraph field studies in order to make an independent assessment of validity. Field studies involve real-life uses of polygraph testing. With one exception, all of the available field evidence meeting minimal scientific criteria comes from cases involving specific-incident criminal investigations using the control question technique. OTA found no field studies on the validity of polygraph testing for preemployment screening or periodic screening. Overall, the studies varied in important ways with respect to, in particular, the criteria used to verify truth, and whether original examiners' decisions or blind evaluation of charts were used as the basis of comparison with ground truth. In addition, all studies had substantial problems of research design, especially with case and examiner selection. As a result, the studies may represent a highly select sample of cases. These caveats limit the confidence that can be placed in any conclusions about polygraph validity based on field research.

Chapter 5 parallels chapter 4 and presents OTA'S analysis of polygraph analog studies in which field methods of polygraph examinations are used in simulated rather than real-life situa-

tions. These analog studies were conducted primarily in psychology laboratories using college students as subjects. Like the field studies, analog studies have primarily investigated the control question technique in specific-incident criminal investigations, although there are some studies of an alternative ("guilty knowledge") technique for criminal investigations and two studies of preemployment screening, one using military intelligence personnel as subjects. While using a more standardized methodology than field studies, the analog studies had other kinds of significant research design problems, and the range of error in polygraph results was greater than in field studies. The two studies of preemployment screening were of poor methodological quality, and did not adequately reflect screening for national security purposes.

Chapter 6 discusses a number of factors that may affect the accuracy of polygraph examinations. Some of these account for the variation in study results discussed previously. Examiner, subject, and setting characteristics are considered, with special attention to the use of physical, drug, and mental countermeasures that may be employed by individuals to attempt to beat the polygraph. This chapter also presents some possible priorities for further research on factors affecting polygraph validity.

Chapter 7 highlights the major conclusions and policy implications of the scientific analysis. Appendix A includes illustrative informed consent forms use in Federal Government polygraph examinations. Appendix B presents the results of OTA'S survey of Federal Government polygraph use and practice. Appendix C includes the coding form for OTA'S analysis of field and analog studies. Appendix D provides a list of acronyms and glossary of key terms.

## CONCLUSIONS

A major reason why scientific debate over polygraph validity yields conflicting conclusions is that the validity of such a complex procedure is very difficult to assess and may vary widely from one

application to another. The accuracy obtained in one situation or research study may not generalize to different situations or to different types of persons being tested. Scientifically acceptable re-

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search on polygraph testing is hard to design and conduct.

Advocates of polygraph testing argue that thousands of polygraphs have been conducted which substantiate its usefulness in criminal or screening situations. Claims of usefulness, however, are often dependent on information (e.g., confessions and admissions) obtained before or after the actual test, and on its perceived value as a deterrent.

The focus of the OTA technical memorandum is not whether the polygraph test has been useful, but whether there is a scientific basis for its use.

OTA concluded that, while there is some evidence for the validity of polygraph testing as an adjunct to criminal investigations, there is very little research or scientific evidence to establish polygraph test validity in screening situations, whether they be preemployment, preclearance, periodic or aperiodic, random, or "dragnet." Substantial research beyond what is currently available or planned would have to be conducted in order to fully assess the scientific validity of the NSDD-84, DOD, and administration polygraph proposals.