

Chapter 6

# **Factors Affecting Polygraph Examination Validity**

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## INTRODUCTION

The analyses of both field and analog studies reported in chapters 4 and 5 indicate that there is considerable variability in accuracy rates of polygraph examinations. To interpret these variations, numerous factors, such as the restricted range of techniques and applications tested in these studies, need to be considered. In addition, researchers have attempted to explain the variability in accuracy scores by proposing a number of factors that theoretically may affect polygraph test validity. These include characteristics of examiners, settings, and subjects. In addition, sub-

jects have been known to use, or might be trained to use, a number of countermeasures to “beat” the polygraph. For many of these factors the research evidence is contradictory. For others, there has been little or no empirical testing. This chapter describes evidence from field and analog studies, as well as from laboratory investigations, on factors that may affect the accuracy of polygraph tests. The chapter also discusses possible priorities for additional research on factors affecting polygraph validity.

## POLYGRAPH EXAMINER, SUBJECT, AND SETTING

The previously described analyses of field and analog studies (see chs. 4 and 5) emphasize the characteristics of polygraph tests and their relation to accurate or inaccurate outcomes. In the present section, the focus shifts away from the tests themselves, to additional factors that may affect validity. These factors are sometimes referred to as dimensions of external validity and aid in the assessment of the generalizability of research findings. Considerations of these factors will enable evaluation of the conditions under which various levels of validity may be expected from polygraph examinations. Differential validity in polygraph tests may be obtained with different examiners, subject populations, and with examinations conducted in different settings.

### Examiner

It has long been recognized (cf. 108,122,135, 154) that the examiner’s skill has an important effect on the validity of polygraph tests. Examiner experience is an essential element reported by investigators and has often been used to explain dif-

ferences in accuracy rates (137,138). There are some data to indicate that experienced examiners have better accuracy rates. In recognition of this outcome, training has been accorded a high priority both within and outside Government agencies which conduct polygraph examinations and by polygraph examiner groups (cf. 3). An extensive array of training facilities now exists, offering a somewhat diverse set of orientations to polygraph testing.

### Experience

A number of studies have tested how examiner experience relates to validity of polygraph examinations. Horvath and Reid (84), for example, had charts utilized in their validity study reexamined by a group of 10 polygraph examiners. Seven of the examiners were experienced and three of them were examiner-interns (each with less than 6 months’ experience). According to Horvath and Reid, experienced examiners made an average of 91.4 percent correct judgments, while the average for inexperienced examiners was 77.5 percent.

## Training

Experience in conducting polygraph examinations suggests that there are a number of clinical components to detection of deception. To some extent, training programs capture these clinical elements by extensive training in “proper” examiner attitude and relationship with subjects. Increasingly, however, training programs emphasize standardized techniques for constructing questions and scoring examinations. In this respect, the U.S. Army Military Police School (USAMPS) is perhaps the best example. The school serves as the central training site for almost all Government agencies which maintain polygraph examiner staffs. USAMPS teaches several versions of the control question technique (CQT) (including what they call the modified general question technique (MGQT) and the original Backster’s zone of comparison (ZOC) method) and several specific protocols for selecting question sets and scoring polygraph charts. Trainees receive both didactic classroom training and supervised experience conducting polygraph examinations. The current curriculum for USAMPS uses Reid and Inbau’s (139) text on polygraph testing, supplemented by materials prepared especially for its trainees (179). USAMPS is one of a number of training programs certified by the American Polygraph Association (cf. 3).

On the basis of presently available data, it is not possible to determine whether types of training have an effect on outcomes. A study by Raskin (133) indicates that examiners trained in schools that emphasize numerical scoring were significantly more accurate than examiners who attended other schools (97.1 v. 86.9 percent). It is difficult to determine, however, if training in numerical scoring is more efficient or if better examiners/schools select such techniques. The fact that examiners who were trained in numerical techniques, but who did not use them, did more poorly than examiners trained in numerical techniques who used them (88.5 v. 98.9 percent) suggests that numerical evaluation rather than examiner selection (or some other aspect of the training) provides an advantage.

## Subjects

Much effort in recent years has been devoted to development of systematic training. Less attention appears to have been paid to the characteristics of subjects of polygraph testing. Frequently, research reports of polygraph examination do not report even the most easily available data on subject characteristics (e.g., proportion of males and females). There have, however, been a number of studies of specific population groups (e.g., psychopaths) hypothesized to be less detectable. In addition to subjects’ psychopathy, other diagnostic categories and subject variables such as gender, intelligence, motivation, and responsiveness to arousal may also affect validity.

Subject factors are often described in the literature as personality or individual difference factors (136,194). They refer to traits associated with individuals that may make them differentially detectable in a polygraph examination. Understanding these effects should enable determination of the conditions under which polygraph testing will yield particular levels of validity. The mechanism by which subject variables affect polygraph examination validity has to do with differential autonomic arousal. Validity is affected when an interaction results between arousal and polygraph testing.

### Psychopathy and Level of Socialization

One aspect of potential subject effects that has received considerable attention is the effect of level of socialization and psychopathy on detectability. In a series of studies by Waid and his colleagues (193,198,199) significant relationships were found in the laboratory between socialization and autonomic responsiveness. An initial finding (193) was that college students who scored low on socialization (on a standard psychological inventory), gave smaller electrodermal responses (EDRs) to stimuli than did high scoring subjects. In a more directly relevant investigation (198), a group of college students was asked to deceive or not to deceive a professional polygraph examiner. Results indicated that subjects who were not

detectable were significantly less socialized than those who were detectable. Susceptibility to detection seemed to be mediated by socialization; results indicated that low socialization subjects showed reduced EDRs. Highly socialized subjects were more responsive electrodermally, and as a result, several of them were misclassified as deceptive.

Raskin (136) has criticized Waid, et al.'s (198), research as not having practical significance for evaluations of polygraph validity. According to Raskin, simply demonstrating that there is a difference in responsivity on the first set of questions does not mean that subjects would not be correctly detected in an actual polygraph examination (which may involve three to four charts). Some of Raskin's own studies (e.g., 21,137) suggest that psychopathic individuals are not less detectable than nonpsychopathic individuals. In Raskin and Hare's study, convicted felons, half of whom were diagnosed as psychopathic, performed a mock crime. These subjects were then administered a polygraph examination and offered a substantial monetary bonus if they could produce a truthful outcome. In contrast to Waid, et al.'s findings, Raskin and Hare found that individuals diagnosed as psychopathic and/or low in socialization were more reactive and easily detectable than those not psychopathic and high in socialization. Earlier research by Raskin (21) supports this finding. Barland and Raskin's (22) field study, on the other hand, found that subjects who scored high on the psychopathic deviate (Pd) scale of the Minnesota Multiphasic Personality Inventory (MMPI) (a measure of psychopathy) had smaller cardio (but not respiration or skin conductance) scores than low Pd subjects.

In a previously described study, Balloun and Holmes (12) conducted an analog study of college students using a "cheating" situation. Their results indicated that subjects who scored high on the Pd scale of the MMPI were just as easy to detect as were those individuals who scored low on the scale. It is important to note, however, that the polygraph test was a concealed information type of test, not a CQT or relevant/irrelevant (R/1) test. A doctoral dissertation by Hammond (64a) also found no differences between normal and psychopaths.

## Other Psychopathology

Guilty psychopaths may escape detection because they are not concerned enough about a misdeed to create interpretable physiological responses. Individuals with other forms of psychopathology may escape detection or be classified as false positives for other reasons (e.g., emotional instability, delusional thinking). The one study that has investigated this possibility (74) found, in fact, that innocent neurotics and particularly psychotics were likely to be identified as deceptive. There were no guilty subjects in this "real crime" analog study.

## Gender

One of the most obvious subject differences is gender. Males and females may have different patterns of autonomic arousal, and such differences may affect polygraph testing validity (136,194). Unfortunately, few data exist to examine this hypothesis; most research only studies male subjects. The one study by Cutrow, et al. (45), that specifically tested for sex differences did not find any. In another study (61), all female subjects were tested in a mock-crime situation using the guilty knowledge test (GKT). GKT was found to be highly accurate, but because males were not also tested, it is impossible to determine if males would have been less detectable. The two Honts and Hodes (76,77) analog studies described in chapter 5 included both females and males; the researchers do not report any gender differences in detectability.

## Intelligence

Intelligence is an additional variable which potentially might affect detectability. The ability of intelligent subjects to anticipate questions may affect polygraph accuracy. One possibility is that intelligent subjects are less detectable because, if trained, they are able to anticipate questions and employ countermeasures. Another possibility is that because intelligent subjects better understand the implications of a polygraph examination, they will respond to relevant questions with heightened arousal when they are attempting to deceive (20).

There has been relatively little research on intelligence and polygraph testing. In one of the few

experiments which look at intelligence and detectability, Kugelmass (95) found no correlation between intelligence and responsivity on a peak of tension (POT) card test. On the other hand, research by Gustafson and Orne (65) found that motivation to deceive increased the probability of detection. Barland and Raskin (20) feel this is evidence of the potential role of intelligence. Barland and Raskin's study (22) which compared detection rates among subjects of different education levels, found no difference. However, a separate analysis of the sources of false positive errors by Raskin (133) found that the majority of false positives occurred among subjects who had college degrees. Level of education, of course, is not a perfect indicator of intelligence, and there is a need to better understand these relationships.

### Ethnic and Group Differences

Another category of subject differences that may affect polygraph validity has to do with ethnic and group differences in physiological response. Research conducted cross culturally (e.g., 97,104,158), indicates that there are ethnic differences in response to stress. Such differences may, in turn, affect detection of deception. As noted earlier, these effects may interact with the ethnic identification of the examiner. However, effects of ethnic differences have not been directly tested with respect to polygraph examinations.

### Autonomic Lability

A final individual difference is what Waid and Orne (194) have referred to as autonomic lability. Regardless of other differences among subjects, there may be consistent individual differences connected with their level of autonomic arousal.

Although there is considerable variance for an individual in autonomic responses to most physiological measures of autonomic nervous system (ANS) arousal, electrodermal lability maybe different. Given the importance of the EDR for polygraph examinations, it maybe essential to understand more about this factor. Unfortunately, most of this research (e. g., 200) has been conducted with concealed information tests and not with CQT or R/I tests.

### Setting

One theory underlying lie detection using the polygraph is that the threat of punishment leads an individual to manifest a physiological reaction (48). This suggests, then, that settings in which an individual is more certain of being detected and in which the consequences are greatest, will permit higher levels of detection. Furthermore, in order to be certain of being detected, a subject must believe in the efficacy of the polygraph procedures in order for it to function. According to some (e.g., 194), the polygraph is often used somewhat like a "stage prop," and its presence is meant to "enhance the subject's concern." Stimulation tests, used in almost all field polygraph examinations, serve the same function, albeit more directly. There is considerable discussion (e. g., 202) in the literature about how frequently within a polygraph examination such stimulation tests should be utilized in order to increase the validity of the examination.

### Instrument

Some research, reported by Orne and his colleagues, addresses the question of the situational features necessary for a polygraph examination. In one component of a study reported by Orne, et al. (123), subjects were led to believe that the polygraph recording equipment was not operative. There was some indication that the pretest condition in which subjects were led to believe that the polygraph instrument was inoperative produced a lower detectability; however, results were not statistically significant. In an earlier study (161), detectability **was not** affected by subjects' belief in whether the machine was recording. Both of these studies involved use of concealed information tests.

A more recent study by Orne's group (198) tested a similar hypothesis using a different procedure. In this study, subjects saw the polygraph machine turned off, although the experimenters actually ran the leads to a second polygraph device and were able to record responses during a pretest review of questions. The results indicated that subjects who were aware of being recorded had significantly higher responses to relevant questions and not significantly different responses to control questions.

## Bogus Pipeline

An interesting and potentially important aspect of how the polygraph achieves valid results is based on what social psychologists such as Jones and Sigall call the "bogus pipeline" (87). The bogus pipeline is a procedure used to elicit truthful attitudes in situations where social desirability effects (i.e., subjects' desire to express socially acceptable opinions) may mask actual attitudes. The procedure involves attaching subjects (via skin electrodes) to an ostensible physiological recording device called the "electromyograph" (EMG) and providing subjects with a "steering wheel" device to record their attitudes. In a typical study (87), subjects were told that the EMG measured implicit muscle potentials and that it was an improved polygraph or "lie detector." The recording device is actually "electrical junk" (87), and the purpose of the procedure is simply to convince subjects that their actual attitudes are detectable.

Results from a number of investigations which have used the bogus pipeline procedure (e.g., 131,150) support Jones and Sigall's premise. Several studies indicate that when subjects believe that their attitudes are detectable by a physiological recording device, they more readily express their actual attitudes. Although it is difficult to know what "actual" attitudes are, higher truthfulness is assumed with the bogus pipeline because the procedure yields more socially undesirable responses than when it is not used. For example, in Sigall and Page's (150) initial experiment, they found that subjects in the bogus pipeline condition would admit to negative attitudes about "Negroes." Similar subjects in nonbogus pipeline

conditions using paper-and-pencil tests would not reveal such attitudes. Later research has shown that this findings holds for attitudes toward handicapped individuals and for "confessing" to having prior knowledge about a psychological experiment.

Although the bogus pipeline research suggests that the conditions of testing (in particular, the perceived complexity and accuracy of equipment) may have important effects on polygraph subjects, it is not clear how or to what extent these effects influence the validity of the test itself. In a substantial number of criminal investigations subjects voluntarily confess after having the polygraph procedure explained or being shown the results of the examination. In personnel screening, subjects often admit to errors in their job application or past indiscretions (24,165). Most available field and analog research does not permit determination of the extent to which the polygraph is used in this way.

## Specific Settings

Polygraph examinations take place in a number of settings, ranging from facilities specifically designed for this purpose to motel rooms. Specifically designed facilities usually include one-way mirrors for observation and audio recording capabilities, and are located so as to prevent interruptions during the examination. It is reasonable to assume that the setting may interact both with subject and examiner characteristic-s to affect the validity of polygraph tests. No research, however, directly tests the impact of different settings on polygraph testing validity.

## COUNTERMEASURES

Countermeasures are deliberate techniques used by deceptive subjects to avoid detection during a polygraph examination (23,108,139,194,195). Countermeasures can range from simple physical techniques, to so-called mental countermeasures, to the use of drugs and biofeedback techniques. There is a potentially large list of such countermeasures, and there are a number of plausible, but not yet validated, techniques to avoid decep-

tion. The research on polygraph countermeasures is summarized below by type of countermeasure.

### Physical

Physical measures taken by a subject during a polygraph examination are, perhaps, the most frequently discussed countermeasures used by subjects (20,108). Any physical activity which could

affect physiological response is a potential problem for interpretation of a polygraph test record. There is no question that physical measures, from tensing muscles to biting the tongue, to squeezing toes, to shifting one's position can affect physiological response.

There are frequent references to the use of such measures (see e.g., 40,108). But little systematic research has been conducted to establish the impact of the use of such measures on polygraph decisions. Kubis (93) found that when subjects press their toes towards the floor they were able to reduce the probability of detection from 75 to 10 percent. A replication of this experiment, however, by More (119) found that there was no decrease in detectability caused by toe movements. In two more recent studies discussed in chapter 5, by Honts and Hodes (76,77), the efficacy of two physical countermeasures was tested in analog situations. Both studies found that countermeasures allowed subjects to "beat" the polygraph. Furthermore, there were a large percentage of inconclusive. In addition, both studies found that experienced examiners were not able to detect use of the countermeasures. A recent study by Honts, Raskin, and Kircher (78) also found that the use of physical countermeasures decreased detectability; the false negative rate for countermeasure subjects was 78 percent. However, examiners using a separate EMG analysis were able to detect the use of countermeasures 80 percent of the time.

Thus, the evidence, while limited, is that deceptive subjects who use physical countermeasures and who can distinguish nonrelevant from relevant questions (in a CQT or R/I test) can increase their chances of avoiding detection.

## Drugs

In contrast to physical measures, which potentially may be detected by an observant polygraph examiner by running multiple charts or by careful comparison of particular physiological measures, the use of various pharmacological agents is probably more difficult to detect. Not only may drugs be difficult to detect by observation, but they may also not be detected by multiple polygraph tests. Some theorists have suggested that such pharma-

cological agents have the potential to produce incorrect or uninterpretable polygraph records.

Research on drugs' factors is only beginning to be conducted. Recent research by Waid (197) indicates that the tranquilizer, meprobamate (Miltown<sup>®</sup>), permits subjects who are being deceptive to increase their ability to avoid detection in a polygraph examination. One feature of tranquilizers such as meprobamate is that they suppress autonomic activity which may not be accompanied by any observable psychomotor differences. In Waid, et al.'s, study a GKT was used in a polygraph test. Subjects were all male and divided into three groups: 1) a tranquilizer group; 2) a placebo group; and 3) a control group. Only 3 of 11 guilty subjects who had taken meprobamate were scored as deceptive.

It should be noted that because Waid, et al.'s, investigation involved GKT, the ability to generalize from the results is limited. According to Raskin (136), a different problem would be encountered by attempts to utilize tranquilizers to defeat an examination employing CQT. The use of such drugs in a CQT polygraph examination would be more likely to yield inconclusive findings, rather than errors, because the drugs would likely result in no difference between the responses to control and relevant questions. This interpretation is supported by the recent analog study of Gatchel, et al. (59), which found that the use of propranolol, a beta-blocking drug, resulted in a 32.2-percent inconclusive rate, although the overall error rate was low. An additional finding was that examiners could not tell which subjects had used the drug. Conclusions drawn from this study must be limited by the fact that subjects were students. Other studies using college students (e.g., 76,77) have also resulted in large numbers of inconclusive.

A recent study by Iacono, et al. (86), found that ingestion of neither 10 milligrams of diazepam (Valium<sup>®</sup>) nor 20 milligrams of methylophenidate (Ritalin<sup>®</sup>) affected the accuracy of detection. Results in both active drug conditions were more accurate than when subjects ingested a placebo (a capsule containing lactose).

Research on other psychoactive drugs has not been reported in the literature, although such

research is now being planned under the auspices of the National Security Agency and the Army Intelligence and Security Command. There are also no data as to the use of common drugs by actual polygraph examination subjects. Although examiners normally ask subjects to report use of medications or other drugs, blood samples or other detection means are typically not employed. It is thus difficult to assess the magnitude of drug use by subjects in previous research on the validity of polygraph testing.

In addition to drugs, there have also been reports of the use of various chemicals to confuse physiological recording (see 20). Placing antiperspirant powder, clear nail polish, or other agents on the balls of one's finger's may make EDRs less reliable. Such measures, however, should be detectable by a trained examiner.

### Hypnosis/Biofeedback

There is a substantial literature in psychology about the use of hypnosis and biofeedback to alter and condition physiological responses. There is some evidence (see 146) that hypnosis, for example, induces declines in skin conductance levels. A number of investigations have attempted to show that hypnotically suggested amnesia is an effective countermeasure. Such research seems to indicate that hypnosis is not effective (see 20).

Recent research by Corcoran, Lewis, and Garver (42) has examined the effects of biofeedback training on suppressing EDR. They found that both hypnosis and biofeedback groups were able to reduce detectability after training as compared to a control group. In another study, Rovner, Raskin, and Kircher (143) reported that subjects who received extensive information about the nature of lie detection and practiced using countermeasures were detected significantly less than subjects without such training. It seems clear that if hypnosis or biofeedback operate as countermeasures, especially with commonly used tests such as CQT, that extensive training would have to accompany their use.

### Mental

Another category of countermeasures involves those that get the subject to think differently about

the test. As noted earlier, most polygraph examinations rely on the subject's motivation to avoid detection rather than on any response directly connected with "telling a lie." Simple cognitive countermeasures include patterns of thinking that suppress responses to control or irrelevant questions. More complex cognitive countermeasures are based on knowledge of the results of the examination and lack of belief in some detectability.

### Controlling Thoughts

Any individual who understands the basic structure of a particular polygraph examination should be able to differentiate irrelevant and control from relevant questions (when an R/I or CQT examination is conducted). Given that when a CQT is employed, the questions are reviewed prior to their presentation, a subject intent on deception could try to alter cognitively responses to various questions (although, since the order of presentation is varied, this is made difficult during an actual test). The procedure would be to try to dissociate oneself from the relevant questions and heighten response to control questions. Various means of such mental dissociation have been described (cf. 20,108). They range from concentrating on an irrelevant object or by convincing oneself that the question means something different than intended.

There is little research evidence available to ascertain the potential of these techniques. Only one study on the use of such cognitive countermeasures appears to have been conducted, and it does not provide much information. In this study, Dawson (49) used as subjects actors trained in the "method" school of acting. Subjects were instructed to try to defeat the polygraph in a CQT examination. The results indicated that without exception the actors were detected and were not able to control their affective responses. It should be noted, however, that the actors in Dawson's study were merely told to "appear innocent" and were not told what would make them appear non-deceptive on a polygraph test.

### Knowledge of Results

Another set of countermeasures is based on subjects having knowledge of the results of their poly-



graph examination. In criminal situations, particularly when an inconclusive outcome is obtained or when the subject disagrees with the outcome of an initial polygraph test, subjects are retested. In noncriminal situations, individuals are often tested at the beginning of their employment and at a number of subsequent points. In addition, subjects who know that they will receive a polygraph examination may seek training in methods to avoid detection. For all of these reasons, it is important to understand how feedback about polygraph examinations affects validity and whether prior experiences represent a potential countermeasure.

In an early laboratory study (67), subjects were given a stimulation test and feedback concerning its outcome. Feedback was manipulated so that some subjects thought they had successfully avoided detection and others thought that they had not. Subjects were motivated on a subsequent trial to avoid detection (they were told, "only mature and stable individuals are able to fool the lie detector"). The results indicated that subjects who believed that they had avoided detection were much less detectable on the second trial (13 out of 16 were not detected, while only 1 of 16 in a control group were able to avoid detection). It should be noted that a stimulation test is a form of a concealed information test and the result may be due to lowered overall arousal. "Beating" a CQT represents a somewhat different problem.

A recent study, by Rovner, et al. (143), tested a similar hypothesis in a CQT examination. Several groups of subjects were placed in a mock crime situation. One group was given information about the nature of a CQT examination and information on what physiological reactions they should try to simulate. Another group was given information plus two practice tests involving actual physiological recordings after which they were told whether or not they had beat the polygraph. A third group served as a control and was given a typical polygraph examination. The results indicated that the information only and control group were not able to avoid detection; how-

ever, 25 percent of the guilty subjects in the information plus practice group were able to avoid detection. Raskin (136) maintains that this 25-percent error rate should be considered the "upper limit" because, in actual field situations, motivation would be much higher. Although Raskin is, perhaps, correct, it is also possible that in actual situations (where motivation is high), subjects might engage in more practice.

#### Belief in "Machine"

A final countermeasure is based on research about the bogus pipeline (87) and the role of the setting in inducing valid outcomes. If the validity of polygraph testing is dependent on the belief by subjects in the efficacy of the procedure, then a possible countermeasure would involve training subjects to believe that the polygraph does not work. This might be done, for example, by providing subjects with false feedback on a polygraph examination. Unfortunately there is little research in this area, and the two studies that have been conducted come to different conclusions about the effect of belief in the techniques' effectiveness. In one study, Bradley and Janisse (35) tested the hypothesis by rigging a stimulation test at various levels of effective detection. Depending on the condition, subjects were "detected" on one, two, or three trials to create the impression that the detection measures were ineffective, sometimes effective, or perfectly effective. For the EDR measure, the more effective the apparatus appeared to be, the more the innocent subjects scored as non-deceptive and the more the guilty subjects scored as deceptive. In an earlier study, however, Timm (162) found that feedback about the techniques' effectiveness had no effect on whether subjects' deceptiveness or nondeceptiveness could be detected. The theoretical support provided by research on the bogus pipeline indicates that subjects' belief in the technique may be important, and that additional research is needed to assess the effects of belief in the machine on actual polygraph tests.

## RESEARCH IMPLICATIONS OF FACTORS AFFECTING VALIDITY

If further research on polygraph testing is carried out, a number of research priorities can be identified on the basis of the present analysis. These priorities include research on the theory of polygraph testing, polygraph techniques, countermeasures, comparison with other techniques, and field-based studies.

### Theory

Polygraph testing is premised on the belief that lying produces reliable physiological reactions. Testing the efficacy of this assumption is an important research need. Basic research could examine the physiological reactions to different types of lies and under different conditions of arousal.

### Scoring

Research is currently being conducted by the U.S. Army on development of computer scoring systems and more reliable measures of physiological arousal. There is some evidence (e. g., 92) that the validity of polygraph examination decisions is improved if the clinical judgment of examiners is removed (see also, 27) and related evidence that numerical scoring is more accurate (91,133) than nonnumerical scoring. Research should proceed on developing analogs to digital scoring systems. Such research, however, would not address the impact of examiner-examinee interaction, and this area also needs further study.

### Question Techniques

Another research priority is to develop additional protocols for question development. Perhaps the most important research need in this regard is to develop and field-test the concealed information test. Basic research and theory (see, e.g., 27,108, 136) suggests that such examinations have the highest likelihood of detecting deception, although no field research has yet been conducted to examine their use. Such research should both establish means of constructing GKTs and their validity in actual use.

An additional priority is to develop and test question techniques that may be employed in screening situations. Some examiners for example claim to use a version of CQT for screening examinations (see ch. 2). This application of CQT has not been subjected to scientific tests of validity. In addition, efforts should be devoted to testing the use of CQT with different subject groups and in national security investigations.

### Countermeasures

If polygraph testing is to be more widely employed in national security investigations, there is an urgent need for research on countermeasures. Particular priorities would be research on drugs, biofeedback training, and subject gullibility, and motivation. Such research needs to be carried out both in field situations and in the laboratory.

There are a number of drugs that are suspected of lowering ANS arousal and that theoretically may be able to invalidate the results of a polygraph examination or compel an "inconclusive" finding. A first priority is to extend Waid, et al. 's (197), research on meprobamate (which reduced detectability) to other psychoactive drugs.

Biofeedback training, as well as other forms of training have not been investigated, yet their effects on polygraph examinations may be substantial. Subjects' beliefs about the accuracy of the polygraph may also be critical. As suggested by the research on the "bogus pipeline," individuals who believe their underlying thoughts are detectable are more likely to provide truthful responses. The reverse phenomenon seems feasible and it would seem possible to train individuals to believe that the polygraph is ineffective. Such training might be accomplished by providing individuals with false feedback on the polygraph as well as by specific instructions during simulated polygraph examinations. Similarly, subjects who can be easily trained to beat the polygraph may be more desirable as intelligence agents.

## Comparison With Other Techniques

Only one study in the available literature (207) systematically compares the polygraph with other investigatory tools. There is a need to examine whether the polygraph provides independent or corroborative evidence and whether the judgments made by polygraph examiners are merely a function of their clinical judgment as investigators, or whether it is a function of the polygraph examination itself.

A complication with this research is that the polygraph functions, in many situations, as a threat. Individuals' fear of taking the examination, in many instances, may lead them to confess or provide incriminating evidence. The threat potential, however, is in part a function of theirs and others' knowledge of research results. If, for example, it became widely known that the polygraph was "beatable," it is likely that this threat would be reduced and, hence, the validity (and utility) of the polygraph would be reduced.

## Field Studies

As described in chapters 3, 4, and 5, there are numerous problems with the available field and analog evidence. Field studies are problematic be-

cause they can only be conducted where an independent criterion of guilt or innocence is available. As such, these studies may represent a select sample of cases (e. g., where guilt is overwhelming) and a select set of examiners. Analog studies have a different set of problems and have not adequately motivated subjects or may not have the appropriate number of cases. What is needed is research which deals with the problems of the available field and analog studies.

One "theoretical" solution to the problem of conducting systematic field studies is to conduct "ABSCAM"-like investigations using bogus unauthorized disclosures (instead of bribes) that would enable investigators to set up situations where they have knowledge of who is guilty or innocent. The polygraph could be used to select guilty from innocent with a known base rate and ground truth. Such methods, of course, raise a number of ethical, legal, and pragmatic questions, and it is not clear whether they could provide definitive answers. They could not be used frequently nor with a wide range of techniques/situations. Conducting polygraph research presents serious conceptual and methodological problems; in the absence of such research, however, it will not be possible to develop fully an assessment of the validity of polygraph examinations.

## CONCLUSIONS

The description in this chapter of factors affecting validity and potential countermeasures suggests that there is a great deal more to understand about polygraph tests before one can be assured of their validity. Despite our lack of full understanding, however, several factors that affect validity are known. In part, the history of polygraph development over the past 15 to 20 years has been to systematize and improve polygraph testing procedures based on these factors. One

central problem, not adequately addressed by either the literature on improvements in validity or countermeasures, is the extent to which these factors affect false negative and positive error rates or affect numbers of inconclusive. For policy purposes, clearly such distinctions and a sense of the magnitude of false decisions is needed. Substantial research, beyond what is currently available, would have to be conducted in order to answer such questions.