THE EFFECTS OF DIAZEPAM AND METHYLPHENIDATE ON THE ELECTRODERMAL DETECTION OF GUILTY KNOWLEDGE

by

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ABSTRACT

Sixty male undergraduate students participated in an experiment designed to investigate the effects of antianxiety and stimulant drugs on polygraphic interrogation. Subjects were randomly assigned to one of four groups. Three of the groups watched a 12 minute videotape depicting the burglary of an apartment through the eyes of the thief. Each subject was asked to imagine that it was he who was committing the crime and was given instructions to encourage his becoming absorbed in the videotape. Afterwards, they were accused of committing this crime. Each subject received one of three look-alike capsules containing a drug which, they were told, would help them to escape detection. Capsules for the first group contained 10 mg of diazepam; those for the second group, 20 mg of methylphenidate; a placebo was given to the third group. Subjects in the fourth group, the innocent control condition, viewed a 10 minute videotape sequence showing the interior of another apartment, this time with no crime committed. They did not receive any medication or placebo after they were accused of committing the crime.

After a one hour wait, all subjects were interrogated by the experimenter, who was blind to both their guilt or innocence and drug status. Skin conductance, heart rate and respiration were monitored; all charts were scored blindly. No drug effects were found in the guilt/innocence classification or in any of the physiological channels.
being monitored. The overall hit rate, including inconclusives, was 81.7%. A significant relationship between recall of guilty information and detectability was also found.
## TABLE OF CONTENTS

### CHAPTER 1 INTRODUCTION

- Major paradigms ................................................. 4
- Guilty Person Studies ........................................... 5
- Guilty Knowledge Studies ....................................... 9
- Methodological Issues ......................................... 15
- Physiological Measures ......................................... 20
- Experimental Tasks .............................................. 23
- Procedural Differences in the Interrogation Technique .... 30
- Personality Correlates ........................................... 36
- Attempts to Beat the Polygraph ............................... 39
- Aims of this Study ............................................... 42
- Review of Drug Literature ...................................... 43

### CHAPTER 2 METHOD

- Overview ............................................................ 52
- Preliminary Work: Phase 1 ....................................... 53
- Subjects .............................................................. 55
- Instruments and Materials ...................................... 55
- Design ............................................................... 57
- Procedure .......................................................... 59
- Physiological Measures ......................................... 67

### CHAPTER 3 RESULTS

- Descriptive Subject Data ......................................... 70
- Validation of Crime Film and
LIST OF TABLES

Table 1  Summary of Accuracy rates for Studies
Employing a Mock Crime..................................25

Table 2  Summary of Accuracy rates for Studies
Employing a Card Test.................................26

Table 3  Summary of Accuracy rates for Studies
Using Memorized Words.................................29

Table 4  Summary of Accuracy rates for Studies
Using Biographical Information.......................29

Table 5  Univariate F Tests.................................73

Table 6  Writing Style Classification.......................75

Table 7  Number of Subjects Found Guilty
or Innocent in Each Group.............................80

Table 8  Post-hoc Classification Table.....................94

Table 9  Correlations between Personality
Measures and Guilt Scores.............................96

Table 10 Correlations Between Personality Measures
and Number of Scorable Questions.....................97
LIST OF FIGURES

Figure 1 Experimental Design.................................58

Figure 2 Anxiety Measures (STAI)..............................71

Figure 3 DPQ Personality Scores..............................72

Figure 4 Laterality Scores.......................................76

Figure 5 Subjects' Confidence Ratings..........................77

Figure 6 Recall of Critical Knowledge..........................78

Figure 7 Heart Rate Prior to Each Question....................82

Figure 8 Respiration Time.........................................84

Figure 9 Skin Conductance Levels Prior to
Each Question......................................................85

Figure 10 Number of Scorables Questions......................86

Figure 11 Average SCRs to Innocent and
Guilty Alternatives..............................................87

Figure 12 Subjects' Ratings of Their Own Drug Status....90
Figure 13 Examiner's Ratings of Subjects' Drug Status...92
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CHAPTER 1
INTRODUCTION

Since its birth at the turn of the century, polygraphy has grown from an esoteric criminological specialty to a multi-million dollar industry. As of 1979, it is estimated that between 4,000 to 7,000 professional polygraphers ply their trade in the United States (Lykken, 1981). If one estimates a minimum number of 4,000 polygraphers each giving only one lie detection test per day, one is amazed to find that over one million Americans will undergo such a test in any given year.

Contrary to popular belief however, polygraphy's most lucrative field of endeavor is not the criminal interrogation. In fact, most polygraphers devote a great portion of their time to private sector work, screening potential employees for private firms or testing present employees. The latter is done either as a deterrent to white collar crime, or as a way of privately settling such crimes when they do occur. A recent survey (Belt and Holden, 1978) shows that 20% of the United States' major corporations and 50% of its retail companies make use of polygraphers' services either on an occasional or regular basis. Even though Canadians have been much less enthusiastic in their reception of polygraphers, such firms as Coinamatic nevertheless persist in hiring them ("Hiring questionnaire upsets minister", 1982).

The evolution of this discipline is marked with colorful characters and interesting incidents; there is also a healthy share of tragic stories about the effect
this rather simple machine has had on people's lives (Lykken, 1981). It is only in the past twenty years however, that psychologists have renewed their interest in this prodigal offspring and devoted some of their research energies to it. In fact, after having published his first two articles on the topic (Lykken, 1959 and 1960), Lykken found himself the author of 10% of the scientific literature published at this point on lie detection, thus making him, as he amusingly puts it, a leading authority worthy of being invited to participate in a conference on polygraphic interrogation sponsored by the Institute for Defense Analysis (Lykken, 1978).

Lykken (1974, 1978, 1981) has often urged fellow psychologists to do more research in this area since it involves two disciplines that are an integral part of psychology, psychometry and psychophysiology. A few psychologists have taken up this call and, over the past twenty years, have published valuable research in this area. Most of their work is reviewed in the following sections. Research published in journals other than those usually espoused by psychologists have been in great part excluded since they were not put to the stringent test of an APA-type editorial review board. More often than not, such studies tend to be anecdotal in nature, or less well controlled than their psychological journal counterparts. They do however have the advantage of being carried out in the field with real crimes and actual suspects, as opposed to most of the following studies which were carried out in
a laboratory settings with college students serving as subjects. This tends to limit the generalizability of the latter study's findings.

Major Paradigms:

One basic distinction that can be made for laboratory studies in the detection of deception is that between "Guilty Person" and "Guilty Knowledge" paradigms (Gustafson and Orne, 1964). In the Guilty Person paradigm, the task of the experimenter is to determine whether or not a subject is "guilty" of a certain crime or task. This is done by comparing the subject's physiological responses to the critical question (e.g., "Did you steal Mr. Brown's gold watch?") with his physiological responses to control and/or irrelevant questions (e.g., "Is your name really ...?"). Most field polygraphers employ techniques based on this paradigm. A rather exhaustive, if somewhat critical, review of these techniques can be found in Lykken (1981).

In the Guilty Knowledge paradigm, the experimenter attempts to determine if the subject possesses or recognizes certain knowledge that is specific to the crime and which only the guilty person and persons investigating the crime should know. This is done by asking several multiple-choice questions in which only one alternative per question is accurate; the other plausible alternatives serve the role of control questions (Lykken, 1959). A question relating to a stabbing death might look something like this:

"If you are guilty of John Doe's murder,
then you know what was used to kill him."
"Was it a rope?"
"Was it a gun?"
"Was it a hammer?"
"Was it a knife?"
"Was it an axe?"

Although research has been done with both paradigms, no direct comparisons have been made as to the relative efficacy of these two models. The results obtained from both types of study are presented separately.

**Guilty Person:** Gustafson and Orne (1964) tested 29 subjects using both the Peak-of-Tension and Relevant-Irrelevant tests (see Lykken, 1981 for a description of these and other techniques). They found that they could significantly distinguish between guilty and innocent subjects using both methods.

In 1965, while investigating the effects of subject's perceived role and role success, these same authors (Gustafson and Orne, 1965a) found that in their optimal group, 75% of subjects who perceived their task as being a deceptive one were detected during deception. In the same year, they investigated the effects of subjects emitting a verbal response (Gustafson and Orne, 1965b). In the optimum group, they detected 76% of their subjects using the Relevant-Irrelevant method of interrogation and 74% using the Peak-of-Tension method.

Bersh (1969) had polygraph records for 157 actual cases blindly rated by professional polygraphers using two
different techniques. A panel of four attorneys had previously arrived at unanimous judgements on these cases (guilty/not guilty). Decisions based on two methods of scoring polygraph charts agreed with the four-man panel 90% of the time. One might doubt if such results could be found when the panel could not reach a unanimous decision; it is in such cases though that the polygraph test could be of greatest practical use.

Horvath and Reid (1971) submitted 40 polygraph records to ten examiners. Twenty of these records had been verified as being truthful, twenty as being deceptive. The interrogations had been done using the Control Question technique. Accuracy scores ranged from 79% to 91%, with a mean of 87.8% accuracy. Once again, however, one must wonder if this high accuracy would be maintained in cases where the actual outcome (the validity criterion) is not so clear.

Cutrow et al., (1972) found that six measures, including cardiovascular, respiratory and electrodermal activity, could significantly (p<.05 to p<.01) detect deception in 63 male and female undergraduate students. Cards with either blanks or words were used as stimuli. Questioning was done using the Relevant-Irrelevant technique.

Hunter and Ash (1973) obtained 20 polygraph records from actual cases of theft, homicide, sexual assault, brutality and official misconduct. Half of these records had been verified as being truthful, half as being non-
truthful. Seven examiners judged these records once and unknowingly repeated this procedure three months later. Accuracy scores ranged from 82.5% to 90% (mean=86%); consistency scores ranged from 75% to 90% (mean=85%). Unfortunately one still cannot assess the possible influence of case selection bias in such archival studies.

Barland and Raskin (1975) had 36 subjects commit a mock crime, while 36 other subjects were assigned to an innocent group. Three charts per subject were generated using the Control Question interrogation format. A high degree of agreement was found between examiner judgements (86%). Overall classification was 53% correct, 12% incorrect, and 35% inconclusive. If one excludes the inconclusive cases from this calculation, 81% of the subjects can be considered as having been correctly classified.

Wicklander and Hunter (1975) also did an archival study with 20 polygraph records. Half of these records had been verified as being truthful, half as untruthful. The cases dealt with homicide, thefts, sexual assaults and official misconduct. The first time that the six judges viewed the records, they had no auxiliary information. Their accuracy was approximately 88%. Two months later, they viewed the same records, but this time they had access to auxiliary information: case history, subject data and verbal-nonverbal behavior during the interrogation. This time, their accuracy scores were slightly higher, 92.5%. Again though, the case selection
bias severely limits the generalizability of their findings.

Raskin and Hare (1978) conducted a mock crime study using prison inmates as subjects. Twenty-four of the 48 subjects were psychopaths. Using the Control Question technique of interrogation, judges succeeded in correctly classifying 88% of the subjects; 4% were incorrectly classified and 8% were judged inconclusive.

Waid et al., (1979) had 15 subjects memorize a list of six code-words while 15 "innocent" subjects engaged in a distracting task. Using the Control Question technique, 80% of subjects were correctly classified as truthful or untruthful. With the Peak-of-Tension technique, the figure dropped to 63%. The study was not designed to compare the two methods, however, so that no judgement as to relative efficacy can be made.

Dawson (1980) recruited 24 actors to take part in his mock crime study. Half were guilty of the mock crime, half were innocent. Two response modes were used with the Control Question technique: immediate and delayed response. With the immediate response, 75% of subjects were correctly classified, 12% were incorrectly classified and 12% had records judged to be inconclusive. With the delayed response, accuracy scores were very low when determined by the physiological responses to the answers (29%); they were good if the physiological responses to the questions themselves were scored (83%).

Waid and Orne (1980) invited a professional
polygrapher to interrogate 15 innocent subjects and 15 guilty subjects who had memorized a list of six code-words. They obtained a hit rate of 80%. Bradley and Janisse (1981) obtained similar results (84% hit rate) with 192 male undergraduate volunteers. Half of these subjects committed a mock crime. All subjects were interrogated using the Control Question procedure.

Szucko and Kleinmuntz (1981) obtained significant results (p<.01) when they performed a Hotelling $T^2$ analysis on various physiological measures obtained from 15 innocent and 15 guilty undergraduate psychology students.

Overall, these studies show a wide range of hit rates. In order to explain this variance in efficacy, one must assess the influence of methodological factors on the outcome of these studies. We will examine some of these major issues after the studies using the Guilty Knowledge paradigm have been reviewed.

**Guilty Knowledge:** The first study to be done using the Guilty Knowledge paradigm was done by Lykken (1959). Forty-nine college students were divided into four groups. One group committed a mock theft, another a mock murder, another both mock crimes and the last did not commit any mock crimes. Six Guilty Knowledge (i.e., multiple-choice format) questions were used for the mock theft and six more were used for the mock murder. Subjects were correctly judged as to their experimental condition (i.e., guilty of theft/ guilty of murder/ guilty of both/
innocent) in 89.8% of the cases. The guilt versus innocent classification yielded a 93.9% hit rate.

Twenty subjects filled out a biographical information form and were later interrogated so as to determine which form corresponded to which subject (Lykken, 1960). Since five questionnaires were used at a time during the Guilty Knowledge interrogation, probability for assigning a subject to the correct form was 20%. In this particular investigation, 100% of the subjects were correctly classified even though a tangible monetary reward had been offered to any subjects who could "beat" the test.

Gustafson and Orne (1963) induced high motivation to defeat the polygraph in 18 of their subjects and low motivation in another 18 subjects. On two successive trials, 67% and 61% of highly motivated subjects were unable to "beat" the test; for the unmotivated group the results on the two trials were 33% and 22% respectively. The same authors (Gustafson and Orne, 1964) found significant results (p<.01) when the Peak-of-Tension method of interrogation was used in a Guilty Knowledge paradigm.

While investigating the effects of three different levels of realistic stress, Kugelmass and Lieblich (1966) obtained hit rates of 44%, 53%, and 47% versus chance classification of 17%. Kugelmass, Lieblich and Bergman (1967) conducted a card test with 27 subjects. Subjects who answered "no" to each alternative were correctly classified 59% of the time; subjects who answered "yes" to
each alternative, 70% of the time. The difference between these two groups is not significant.

Davidson (1968) designed a study where 48 subjects played the "hunter" game. Twelve of the subjects actually carried out a mock murder. Another twelve attempted to commit the crime but were not successful. Another twelve were motivated to commit the crime but were not given the opportunity to attempt it. The last group of twelve subjects had no idea of the nature of the experiment. Five of the six guilty subjects with low motivation to beat the lie detection test were detected; all six in the high motivation group were detected. All thirty-six innocent subjects were correctly classified. This yields an overall hit rate of 98% versus 25% chance probability.

Thackray and Orne (1968) found that electrodermal measures could significantly discriminate better than chance when thirty undergraduate students engaged in a code-word deception experiment. Ben Shakhar, Lieblich and Kugelmass (1970) attempted a replication of Lykken's (1960) biographical information study. In the first experiment, 77% of their 27 subjects were correctly matched with their biographical information. In the second experiment, they used different cut-off points in their decision-making process. The optimal hit rate obtained in this second part of the study was 67%. Lieblich, Ben Shakhar and Kugelmass (1976) performed a similar task with 30 randomly selected prisoners from a Jewish maximum security prison. They succeeded in correctly matching 62%
of their subjects to the appropriate biographical information.

Waid, et al., (1978) conducted three similar experiments within one study. Words belonging to six different semantic categories were selected for memorization by subjects. Some subjects did not memorize any of these code words. Hit rates for both innocent and guilty subjects were 78%, 71% and 77% in the three experiments.

Balloun and Holmes (1979) selected 18 subjects out of 300 male undergraduate students who scored the highest on the MMPI Pd scale and 16 subjects who scored lowest on the Pd scale. Each of these subjects was put in a situation where experimental confederates induced them to cheat on a test. Approximately half of the subjects in the study cheated on that test. Two detection of deception tests were performed for each subject. On the first test, 61% of cheaters and 88% of non-cheaters were correctly classified. On the second test, 17% of cheaters and 94% of non-cheaters were correctly classified.

Waid, et al., (1979) had 15 subjects memorize a list of six code words and perform other tasks while 15 innocent subjects only performed the other tasks. The Guilty Knowledge interrogation used in this case helped the investigators obtain a 76% hit rate.

Giesen and Rollison (1980) selected 40 subjects out of 122 female undergraduate students who scored the highest on a palmar sweating scale. One half of these
subjects were then asked to perform a secret agent task while the other half were assigned to the innocent condition. All of the innocent subjects were correctly classified after the interrogation and only one guilty subject escaped detection. This yields an overall hit rate of 97.5%.

Waid and Orne (1980) conducted two experiments designed to investigate the role of electrodermal lability in the detection of deception. Code words were used in both parts of the study. In the first experiment, 75% of the 28 subjects were correctly classified as to guilt or innocence. In the second experiment, interrogation by a professional polygrapher yielded similar results for both the Guilty Knowledge and Guilty Person approaches to interrogation: an 80% hit rate.

Bradley and Janisse (1981) divided their 192 male undergraduate subjects into two equal groups. The first group was asked to steal some money from a waiting room while the other group was assigned to the innocent condition. With the Guilty Knowledge interrogation, 74% of the subjects were correctly classified as to guilt or innocence.

Finally, Waid, et al., (1981) assigned 11 subjects to their innocent group, and 33 subjects to their guilty condition. The guilty subjects had to memorize a list of six words. Thirty minutes prior to interrogation, 11 of the guilty subjects were given an anxiolytic medication while 11 others were given a placebo. The remaining 11
guilty subjects were not given anything. If one excludes the drug group from statistical analysis, 85% of the remaining 33 subjects were correctly classified as to guilt or innocence.

Although some of the accuracy rates obtained in both Guilty Person and Guilty Knowledge studies appear quite high, one must be wary of the actual chance probability that exists in each study. Thus, if one obtains a 60% hit rate in a study where the ratio of guilty subjects to innocent subjects is, say 1:4 (i.e., chance=25%), this is much more impressive than if one obtains the same hit rate in a study with equal numbers of guilty and innocent subjects (i.e., chance=50%). Also, when considering these results in a more applied frame of reference, societal values must be reconciled with actual false negative and false positive rates. A society based on the premise of "innocent until proven guilty" for example, will most likely be ready to lower its accuracy in order to reduce the amount of false positives. A more detailed discussion of Decision Theory and its application to detection of deception can be found in Ben Shakhar, et al., (1970) and Lieblich, et al., (1976). A thoughtful discussion of statistical versus clinical lie detection can be found in Szucko and Kleinmuntz (1981) and Kleinmuntz and Szucko (in press).

We will now examine some of the factors which can account for the wide range of results obtained in the preceding studies. These will include methodological
issues, the use of different physiological indices, the choice of experimental tasks and procedural differences in the interrogation technique.

Methodological Issues:

Ben Shakhar et al. (1970) make a distinction between studies employing "certain" or "uncertain" situations. In the former, a subject's involvement is certain, e.g., it is known that the person did pick a card from a deck of six cards and the experimenter's task is to determine which card was taken. In this case, the polygrapher will most likely look for a maximum physiological response to one of the possible alternatives. Using biographical information as the experimental stimulus, these authors succeeded in correctly matching 77% of their 27 subjects to their appropriate biographical information in a "certain" situation.

In an uncertain situation, the task is more complex since the experimenter does not know for sure if the subject's stimulus is actually included in the interrogation list. This corresponds more closely to a field situation where the polygrapher attempts to determine whether or not a person is actually involved in a given situation. The polygrapher is no longer solely concerned with maximizing correct identifications, he also must attempt to control misses and false alarms. In the same study, Ben Shakhar et al. (1970) performed a second experiment where it was not sure that any given subject's biographical information was included in the interrogation
of that particular subject. Using two different cut-off points, the experimenters obtained a 100% rate coupled with a proportion of 4:7 false alarms the first time, and a 19:26 hit rate coupled with 1:7 false alarms the second time.

Clearly, uncertain situations present a much more stringent efficiency test for polygraphic detection of deception. Although studies like that conducted by Timm (1979) help to deepen our understanding of the physiological detection of deception, their use of "all guilty" subjects deprives us of the added knowledge one would gain if they also included "innocent" subjects in their experimental design. In mock crime studies, this means the inclusion of an "innocent" group; with card studies, one can include a certain proportion of blank cards in the deck (e.g., Gustafson and Orne, 1965). This has also been done in studies using code words (e.g., Waid and Orne, 1980), where only some of the subjects are asked to memorize the list of words. Such studies are more pertinent to the field polygrapher because they help him understand what factors might possibly affect the proportion of false positives and false negatives that can be obtained in a given situation.

All too often, laboratory studies of detection of deception are criticized because they draw their subjects from the undergraduate populations of various colleges and universities. Even if one ignores the selection biases that accompany a volunteer sample (Kazdin, 1980), one is
still faced with the problem that an undergraduate population is probably quite different from the population with whom the field polygraphers work. Although no studies have attempted a direct comparison of such samples, a few researchers have drawn their subjects from more pertinent populations.

Kugelmas and Lieblich (1966) obtained hit rates of 53%, 44%, and 47% when interrogating Israeli policemen. Lieblich et al. (1976) succeeded in matching 62% of their 30 randomly selected prisoners to their appropriate biographical information. Raskin and Hare (1978) were more successful with their sample of 48 prisoners, half of whom were diagnosed psychopaths. In a mock crime situation, these authors classified 88% of their sample correctly; 4% were incorrectly classified and 8% were considered inconclusive. If one excludes these inconclusive cases, correct classification was obtained in 96% of the cases.

The influence of population choice in detection of deception studies is not a clear one. Although one group of investigators obtained less than impressive results, another group has obtained results comparable to some of the more successful studies using college students. More attention should be given to this facet of research. One possible line of research would be to make tasks more salient and challenging for the subjects (Hare and Cox, 1978).

Waid et al. (1978) investigated the effects of attention on electrodermal detection of information. They
operationally measured attention by testing subjects' subsequent memory for words they had previously over-learned. In one of the three experiments conducted by these authors, detection of critical words and memory for critical words were significantly correlated ($r = .48$, $p < .05$). Post-hoc analysis showed that there is a significant tendency for remembered words to have a higher electrodermal response probability than forgotten words ($p < .05$). Clearly then, an important component of any detection of deception experiment is the saliency of the task for the subject. Tasks that are not fully cognitively processed will undoubtedly be less easily remembered. Material that is not well remembered is not as likely to produce physiological responses and hence is not likely to lead to detection.

Another important factor in stimulus saliency is the degree of interest that the experimental task induces in the subject. Thus, studies where the experimental task is interesting will often encourage subjects to be more involved in the task and also increase their degree of motivation. It is interesting to note that studies offering a greater challenge to the subject, or a substantial reward for beating the test, tend to obtain better results (e.g., Lykken, 1960; Davidson, 1968).

Gustafson and Orne (1963) induced a state of high motivation to deceive the polygrapher in 18 of their 36 subjects, while the other 18 subjects were told that the experiment was designed to measure their physiological
reactions to words and numbers. Both groups of subjects then selected a card from a deck of five and then listened to the list of all the cards while their physiological responses were being monitored. This was done twice, once with numbers and once with words. In the highly motivated group, 67% and 61% successful predictions were made on the two trials; in the control group, only 33% and 22% successful predictions were made.

These authors also looked at the possible interactions between the subject's perceived role and feedback that the subject obtains as to his performance in that role (Gustafson and Orne, 1965a). Thirty-two subjects were told that their role was to deceive the polygrapher during a card test. Half of these subjects were told after the first trial that they had succeeded in fooling the polygrapher; the other 18 were told that they had failed in their attempt. On a second trial 18.8% of the first group were detected (chance probability was 20%) while 93.8% of the second group were detected. Another 32 subjects were told that their task was to be detected by the polygrapher. After the first trial, 18 subjects were told that they had been successful in getting detected while the remaining 18 subjects were informed that they had not succeeded in getting detected by the polygrapher. On the second trial, only 25% of the former group were detected while 87.5% of the latter group were detected. In other words, subjects who perceived their task as an attempt to deceive the polygrapher were most easily
detected on the second trial when they were informed that they had been detected on the first trial. This finding gives empirical support to the field practice of giving individuals an accuracy demonstration before proceeding with the polygraphic interrogation. This study also shows that subjects who think that their task is to be detected by the polygrapher are more easily detected on a second trial if they are told after the first trial that they failed in their first attempt to be detected.

One final methodological issue is the question of chart scoring. Whereas field polygraphers employ a semi-objective method of analysis which is based on specific criteria but which also incorporates other pieces of information plus the polygrapher's experience, laboratory studies invariably employ a blind scoring approach based solely on pre-defined scoring criteria. Barland and Raskin (1975) compared both approaches in a study where 36 subjects were guilty of a mock crime and 36 subjects were innocent. These authors concluded that examiners who had access only to the charts and question categories had roughly the same accuracy rate as the examiners who conducted the examination.

**Physiological Measures:**

Some investigators have compared the effectiveness of different physiological measures in detecting deception. Kugelmass et al. (1966) found that although pulse rate did not lead to significant detection in card tests (where the experimenter attempts to determine which card the subject
picked from a small deck), galvanic skin response was a significant measure in that respect. These investigators also found a decreased efficiency for detection when blood pressure was measured along with GSR.

Thackray and Orne (1968) looked at a host of physiological indices: breathing amplitude, skin potential response, systolic blood pressure, oxygen saturation level, finger volume and pulse volume. They found that only three of these measures, galvanic skin response, skin potential response and finger volume, consistently discriminated better than chance. The electrodermal measures (GSR, SPR) were significantly more effective than the measure of finger volume.

Cutrow et al. (1972) looked at a similarly exhaustive list of physiological indices: breathing amplitude, breathing cycle time, eyeblink rate, eyeblink latency, finger-pulse volume, heart rate and palmar galvanic skin response. It is quite interesting to note the fact that all six variables were found to be significant discriminators; it is less surprising to find that the best measure was palmar GSR. A similar result was obtained by Barland and Raskin (1975): skin resistance was the best measure even though they obtained significant results with respiration and cardiovascular measures.

In a comparison of skin conductance, respiration and cardiovascular activity, Podlesny and Raskin (1978) found that only skin conductance and respiration were significant discriminators. In an unpublished
dissertation, Timm (1979) states that the level of detection for all four physiological indices measured (respiration, GSR total length, GSR amplitude, GSR maximum height) were significantly greater than chance levels.

Dawson (1980) obtained good results using electrodermal and cardiovascular measures, but not with respiration. Again, the electrodermal measure was found to be superior to the other physiological indices. Szucko and Kleinmuntz (1981) found that a simple linear combination of the four indices measured in their study (galvanic skin response, blood pressure, abdominal respiration and thoracic respiration) consistently outperformed the judgements made by six qualified and experienced interpreters. Unfortunately, their analysis does not permit a comparison of the salience of these different measures.

Bradley and Janisse (1981) looked at three dependent measures (heart rate, skin resistance and pupillary response) with two types of questioning procedures. Whereas only skin resistance and heart rate were found to discriminate between guilty and innocent subjects under a Control Question paradigm, all three measures were successful in a Guilty Knowledge test. Two other independent variables were investigated in this study. First, it was found that the effectiveness demonstration interacted with the guilt score derived from skin resistance scores in the Control Question paradigm so that the more effective the apparatus appeared, the more
innocent subjects scored in the innocent direction, and the more guilty subjects scored in the guilty direction. Secondly, heart rate was significantly affected by threats of shock in the Control Question paradigm: subjects not threatened with shocks tended to score more in the innocent direction than those threatened with shock.

Finally, Waid et al. (1981) found that electrodermal response, but not cardiovascular or respiratory measures were effective in successfully discriminating between deceptive and non-deceptive subjects. Clearly, the question of which physiological indices are the most useful in the detection of deception has yet to be settled. Conflicting results need to be compared so as to determine whether the differences are solely a function of technique or whether the actual procedures of the studies (e.g., realism of stimuli, degree of threat actually experienced) are confounding the issue. Until this issue can be resolved, the choice of physiological indices to be used will often be one made on the basis of past experience (e.g., the relative success of electrodermal measures) and simple practicality (e.g., heart rate and respiration versus pupillary response).

Experimental Tasks:

There exists a variety of experimental tasks in the laboratory study of detection of deception. These include mock crimes, memorized code words, card tests and the use of biographical information. Investigators often adopt one of these tasks without stating the reasons for their
choice. We will examine some studies employing these experimental tasks and attempt to determine whether any method is more appropriate than the others.

A lot of studies use the mock crime as an experimental task. The mock crime has the advantage of resembling a field situation in that it requires the examiner to make a decision as to whether or not a given subject has committed a certain crime. Mock crimes can be difficult to set up and because of ethical constraints, their nature is sometimes so benign that they may lose that touch of realism which the experimenter wants to convey to the subject. One can even fear that the subject will perceive the task as being so simple that s/he will not take the experiment seriously. Table 1 summarizes the results obtained from different studies employing mock crimes as the experimental task. As one can see, hit rates tend to be fairly high in studies employing mock crimes as the experimental task.

Another popular experimental task is the card test. A deck of five or six cards is placed in front of the subject. The cards either have words or numbers written on them. In an "uncertain" situation, some of the cards may be blank, thereby introducing the possibility of some subjects being innocent. Although the card test is not as challenging to the subject as the mock crime and offers the examiner less flexibility in his interrogation (very few questions can be asked), it does have the advantage of being quick and simple to carry out. The experimenter does
### TABLE 1
Summary of Accuracy Rates for Studies Employing a Mock Crime

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Hit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lykken (1959)</td>
<td>49</td>
<td>93.9%</td>
</tr>
<tr>
<td>Davidson (1968)</td>
<td>48</td>
<td>98.0%</td>
</tr>
<tr>
<td>Barland and Raskin (1975)</td>
<td>72</td>
<td>(including inconclusives) 53.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(excluding inconclusives) 81.0%</td>
</tr>
<tr>
<td>Raskin and Hare (1978)</td>
<td>48</td>
<td>(including inconclusives) 88.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(excluding inconclusives) 96.0%</td>
</tr>
<tr>
<td>Timm (1979)</td>
<td>270</td>
<td>(approx.) 60.0%</td>
</tr>
<tr>
<td>Balloun and Holmes (1979)</td>
<td>34</td>
<td>73.5%</td>
</tr>
<tr>
<td>Dawson (1980)</td>
<td>24</td>
<td>(first condition) 75.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(second condition) 83.0%</td>
</tr>
<tr>
<td>Giesen and Rollison (1980)</td>
<td>40</td>
<td>97.5%</td>
</tr>
<tr>
<td>Bradley and Janisse (1981)</td>
<td>192</td>
<td>(CQT) 84.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(GKT) 74.0%</td>
</tr>
<tr>
<td>Szucko and Kleinmuntz (1981)</td>
<td>30</td>
<td>(discriminant function) 80.0%</td>
</tr>
</tbody>
</table>
## TABLE 2

Summary of Accuracy Rates for Studies Employing a Card Test

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Hit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gustafson and Orne (1963)</td>
<td>18</td>
<td>(motivated) 64.0%</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>(unmotivated) 28.0%</td>
</tr>
<tr>
<td>Gustafson and Orne (1964)</td>
<td>24</td>
<td>(R/I) 69.0%</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>(POT) 56.0%</td>
</tr>
<tr>
<td>Gustafson and Orne (1965a)</td>
<td>75</td>
<td>64.0%</td>
</tr>
<tr>
<td>Gustafson and Orne (1964)</td>
<td>83</td>
<td>(R/I) 67.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(POT) 62.0%</td>
</tr>
<tr>
<td>Kugelmass and Lieblich (1966)</td>
<td>36</td>
<td>44.4%</td>
</tr>
<tr>
<td>Kugelmass, Lieblich &amp; Bergman</td>
<td>27</td>
<td>27.0%</td>
</tr>
</tbody>
</table>
Not have to worry about how well the subject has processed the information since little effort is needed to memorize one word or number on a card. Table 2 summarizes the findings from studies employing a card test as an experimental task. As we can see, the hit rates tend to be lower than those for mock crimes. This might be because the probability of making the right decision by chance is often lower in these studies (usually 20%, c.f., 50% in many mock crime studies).

A variation of the card test is the code word test. A list of six code words is given to subjects for memorization. In an "uncertain" situation, some subjects will not get a list, thereby making them "innocent". Often, to increase examiner blindness, the actual list of words may vary from subject to subject. A typical study would have six semantic categories with six words in each category. A subject receives a list of six words drawn randomly from each of the semantic categories. The examiner then interrogates the subject by asking questions about the total sample of 36 words. In this way, the examiner does not know which of the code words are the critical items for any given subject. Table 3 summarizes some results obtained in studies using memorized words as the experimental stimuli. Even though these studies incorporate the same low chance probability of correct guessing by the examiner as the card test studies, their hit rates tend to be higher. This might be because it is easier to make the memorization of a list of words a
challenging task, e.g., one can pretend that this task is part of a secret agent's mission.

Finally, there are studies which use a biographical questionnaire as a source of interrogation material. Subjects fill out a questionnaire which contains some biographical items (e.g., parents' first names, place of birth, etc) which cannot be readily known by the interrogator. The answers taken from these questionnaires are then combined together five at a time to make up the interrogation protocol. The examiner attempts to match the biographical information with the subjects. If one wishes to set up an "uncertain" situation, this can be done by making the selection of protocol answers a random one from all of the questionnaires. In this way, there is a given probability that a subject's questionnaire will be included in his own interrogation, but in some cases, it will not be part of the interrogation protocol. Table 4 summarizes the results found in some studies using biographical information in the construction of interrogation protocols.

Although these results tend to be good, this method seems to have less external validity than the previously described methods. Biographical information tends to be processed quite deeply and is not easily forgotten. It does not refer to specific events, as a rule, but rather to facts which are an integral part of one's life. This is quite different from the typical polygraphic situation where one attempts to determine whether a person was
### TABLE 3
Summary of Accuracy Rates for Studies Using Memorized Words

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Hit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waid, Orne, Cook, Orne (1978)</td>
<td>40</td>
<td>77.5%</td>
</tr>
<tr>
<td>(1st study)</td>
<td>28</td>
<td>71.4%</td>
</tr>
<tr>
<td>(2nd study)</td>
<td>30</td>
<td>76.7%</td>
</tr>
<tr>
<td>Waid and Orne (1980)</td>
<td>28</td>
<td>75.0%</td>
</tr>
<tr>
<td>(1st study)</td>
<td>30</td>
<td>80.0%</td>
</tr>
<tr>
<td>Waid, Orne, Cook, Orne (1978)</td>
<td>44</td>
<td>84.8%</td>
</tr>
<tr>
<td>(no drugs)</td>
<td>37</td>
<td>37.5%</td>
</tr>
<tr>
<td>(with meprobamate)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 4
Summary of Accuracy Rates for Studies Using Biographical Information

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Hit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lykken (1960)</td>
<td>20</td>
<td>100.0%</td>
</tr>
<tr>
<td>Lieblich &amp; Kugelmass (1970)</td>
<td>27</td>
<td>(1st study) 77.0%</td>
</tr>
<tr>
<td>(1st study)</td>
<td>33</td>
<td>(2nd study) 87.8%</td>
</tr>
<tr>
<td>Lieblich, Ben Shakhar, &amp;</td>
<td>30</td>
<td>62.0%</td>
</tr>
<tr>
<td>Lieblich</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Involved in a specific event or series of events. In this sense, this method may be considered the less appropriate method to study detection of deception in a laboratory situation.

Summarizing then, the mock crime appears to be the most valid approach to the laboratory study of detection of deception. If one wishes to avoid the difficulties associated with the organization of a mock crime, the use of memorized code words is a solid alternative. Attempts could be made, however, to improve the saliency of mock crime studies by making the crimes more realistic and more detailed. To ensure standard content across subjects, the material could be presented in an automated fashion. This will be presented in greater detail in later sections.

**Procedural Differences in the Interrogation Technique:**

**Accuracy Demonstrations:** Polygraphers not only vary as to the interrogation techniques and experimental task they use, they also employ different procedures during the actual interrogation. It is therefore important to look at procedural differences and the way they might influence the outcome of the test. Quite a few polygraphers give subjects an accuracy demonstration to increase the subject's confidence in the test. This usually involves having the subject pick a card from a deck of identical or marked cards and persuading the subject that the polygrapher can determine which card was chosen by looking at the subject's physiological responses to the polygrapher's questions. It is thought that innocent
subjects will then relax knowing that they have nothing to fear and that conversely, guilty subjects will become increasingly anxious. This would in turn increase the test's efficiency by lowering the number of false positives and false negatives.

Although the cognitive consequences of the accuracy demonstration have never been tested, a few investigators have attempted to determine whether or not accuracy demonstrations do increase the efficiency of detection of deception tests. In a study previously described, Gustafson and Orne (1965a) showed that subjects who were told that their task was to deceive the experimenter were most easily detected on a second trial if they were told that they had failed to deceive the examiner on the first trial. On the other hand, subjects who were told that their task was to be detected by the examiner were most easily detected on the second trial if they were told after the first trial that they had not been detected. This interesting interaction between motivational state and the nature of the feedback seem to support the premise that the accuracy demonstration is an important part of the interrogative procedure.

Barland and Raskin (1975) manipulated the type of feedback given to subjects after a card test: one group received feedback stating that the lie on the card test was detected; a second group were told that no lie had been detected; a third group received no card test and hence, no feedback. These investigators found that the
treatment had no apparent effects on outcome, but they caution that this should not be interpreted as an indication that the subject's confidence in the test is not an important factor in test results.

Timm (1979) did a similar manipulation; all subjects participated in the card test though. One third of the subjects were told that they had successfully deceived the examiner, another third were told that they had failed to deceive him and a final third of the subjects were not given any feedback. The investigator did not obtain a significant effect from this manipulation.

Finally, Bradley and Janisse (1981) led subjects to believe that they had been detected in either none, one, two or three trials of an accuracy demonstration. This manipulation did not yield clear results with the Guilty Knowledge technique. With the Control Question technique, however, it was found that detectability of subjects increased concommitantly with level of demonstrated effectiveness.

Only one pattern seems to emerge: the accuracy demonstration seem to have less effect on the Guilty Knowledge test than on other techniques. Whether this is due to the nature of the test itself, or rather to the context of the studies (analog versus field) remains to be determined. One interesting issue that has yet to be addressed is the effect of veridical feedback: giving subjects actual feedback on their performance on a warm-up test. Obviously, field polygraphers might object to using
this procedure. The information obtained from such a study in a laboratory context, however, would undoubtedly help to explain the role, if any, of accuracy demonstrations and feedback.

Role of Threat: In order to approximate the threat of punitive consequences that are inherent to field tests, some investigators have used shocks and/or threats of shock in response to detected lies, e.g., Lykken (1959), Waid and Orne (1980). Only one study has looked at the effects of such threats. Bradley and Janisse (1981) concluded that threat of punishment did not affect detection results with the Control Question or Guilty Knowledge tests. They did find that threats affected heart rate in such a manner as to increase guilt scores regardless of whether the subjects were innocent or guilty.

Verbal Responses: Polygraphers differ in the response they require their examinees to make during a polygraphic interrogation. Since a good proportion of professional polygraphers are in fact looking for a "lie response" to the critical and control questions, they normally have subjects respond "no" to their questions. Users of the Guilty Knowledge technique aren't interested in a "lie response" per se, but rather in detecting the recognition of guilty knowledge. Therefore, they have more latitude in this matter: some do not require a verbal response, others require a simple "no" or shake of the head, while others ask the person to completely answer the question in the
negative, e.g., "No, it wasn't a .45 caliber revolver."

Only two studies have addressed this question of the role of verbal responses. Gustafson and Orne (1965) had subjects respond in one of three modes. The first group remained mute, the second voiced "convincing 'no's" and the third group was instructed to generate free associations. No difference was found between the Relevant-Irrelevant and Peak-of-Tension techniques in this study. The authors used a card test as the experimental task. They found that detection was highest for the "no" group (76%) than for the mute group (50%) and the free association group (30%). The authors recognized however that the free association group did not constitute a solid control group as this task could have been distracting, thereby weakening the power of the interrogation.

Kugelmass et al. (1967) addressed this issue in a more direct manner. In a Guilty Knowledge card test, they had one group of subjects answer "no" to every alternative, thereby generating one lie per subject. Subjects in the second group answered "yes" to every alternative, thereby telling four lies. Whereas the hit rate for both conditions was significant, the difference in hit rates between the two conditions was not significant. Hence, one is tempted to question the role of "lying" in polygraphy, unless one wants to postulate that the absence of a specific lie response to only one alternative in the "yes" group led to a significant hit rate.

In a previously described study, Waid et al. (1978)
showed that remembered words had a significantly higher probability of electrodermal response than forgotten words. Deceptive subjects who were misclassified showed significantly less recall than those who were correctly classified. The authors conclude that it is not only important to make sure that subjects have sufficiently processed the experimental stimuli, but one should also attempt to enhance the subject's attention during the interrogation by requiring the subject to repeat the questions and answer them aloud.

Repeated Examinations: Some polygraphers prefer to give more than one interrogation, believing that this will lead to greater reliability of results. Balloun and Holmes (1979) found, however, that on a second interrogation, the difference in detection scores between guilty and innocent subjects was greatly diminished. If one considers the detection of deception as a paradigm where one tests the saliency of a given item of information for a particular subject, then results like the one just cited can easily be explained by the phenomenon of habituation. As a subject is tested more than once, his physiological reactions tend to habituate. It would be interesting to find out if a similar phenomenon occurs during a long interrogation, even if no items are repeated. One could therefore engage in research to determine the optimum length of an interrogation protocol.

Individual and Group Interrogation: Waid and Orne (1980) interrogated some of their subjects in groups
composed of three to seven subjects. Although they report no difference in detection rates between this group and a group of subjects interrogated on an individual basis, there does not seem to be a need, either in field practice or in laboratory research, to forsake the individual interrogation for group interrogation.

Summarizing, then, the accuracy demonstration appears to be more useful in a Guilty Person context, than in a Guilty Knowledge one. Threats have not been found to enhance results in any way, and there appears to be no advantage to giving the subject more than one interrogation. There does appear to be a need to enhance the subject's retention of the experimental stimuli and to maintain his attention during the interrogation. This can be done by having the subject repeat the questions before answering them.

Having looked at ways of enhancing results obtained in detection of deception studies, we will now focus on some factors which might possibly have deleterious effects on hit rates. First, we will look at some possible personality factors which may be associated with detectability. Afterwards, we will focus on ways people voluntarily try to influence the outcome of a detection of deception test.

**Personality Correlates:**

Studies have been conducted in order to determine which personality variables, if any, might influence the detection of deception. Waid and Orne (1980) demonstrated
that deception by electrodermally stabile individuals was detected less frequently than that by electrodermally labile individuals. They also found that truthful labile individuals were falsely detected more often than truthful stabile individuals.

Giesen and Rollison (1980) found that subjects with high self-reported trait anxiety showed greater responsivity than subjects with low self-reported trait anxiety. This did not affect the classification of subjects into deceptive and non-deceptive groups because information from individual subjects, not information averaged across subjects, was used in the decision-making process. This effect thus appears to be minimized when information is used within a subject rather than across subjects.

Kugelmass and Lieblich (1966) subjected individuals to three different levels of stress prior to a lie detection test. The policemen undergoing the tests were told one of three things: that the purpose of the test was to calibrate the equipment; that the purpose of the test was to see if they were easily detectable; or that the purpose of the test was to determine whether they were good policemen with attributes necessary for advancement. Their results indicated no significant differences across conditions for pulse rate. They also found that the electrodermal detection results under stress were similar to those in less stressful situations.

Waid, Orne and Wilson (1979) investigated the effects
of level of socialization, as measured by the California Psychological Inventory, on the detection of deception. After subjects had completed the experiment, they were asked to fill out the socialization scale of the CPI, along with other debriefing questionnaires. On both Guilty Knowledge and Guilty Person tests, deceptive subjects who weren't detected scored significantly less on the socialization scale than those who were detected. Similarly, among innocent subjects, the more highly socialized individuals were more responsive electrodermally throughout the test.

Raskin and Hare (1978) conducted a study with prison inmates, half of whom were diagnosed psychopaths. A Control Question interrogation format was used. Electrodermal, respiratory and cardiovascular measures were evaluated using both quantitative and field scoring techniques. Psychopaths were as easily detected as non-psychopaths.

Similarly, Balloun and Holmes (1979) found that subjects who scored high on scale 5 (Pd) of the MMPI (mean t score=71) were detected just as easily following an in-laboratory cheating incident as were subjects who scored low on this same scale (mean t score=40). One might wonder, though, if these subjects scoring "high" on the Pd scale actually represent as statistically a deviant group as Raskin and Hare's (1978) subjects did.

It seems apparent that much more research needs to be done on the possible influences of personality correlates
on the detection of deception. Few studies have been done in this regard, and fewer replications have been attempted. Clearly, this still represents unchartered territory for polygraphers.

Attempts to Beat the Polygraph:

It is only natural to expect people to search for ways to "beat" a lie detection test. Individuals may do this in an attempt to disguise their guilt or simply as a way of ensuring their exoneration if they are innocent. Surprisingly though, little research has been devoted to this topic.

Lykken (1960) instructed his subjects on ways to produce electrodermal responses. He did not instruct them, however, on ways to reduce or eliminate responses. In this study he used biographical information in his questioning of subjects. He succeeded in correctly matching 100% of the subjects to their appropriate biographical information. One might ask if such a good hit rate would have been possible if Lykken had not taught his subjects how to fabricate responses. In doing this, he limited the range of ways people might attempt to fool the examiner.

Dawson (1980) recruited 24 Stanislavsky-trained actors. Half of the subjects committed a mock theft, the other half didn't. Dawson offered a $5.00 reward for all subjects that appeared innocent. The attempts by the guilty subjects to appear innocent were totally ineffective; depending on the response style required of the subject (immediate versus delayed), hit rates were 75%
and 83%.

Germann (1961) selected five subjects on the basis of hypnotic deep trance capability. He found that despite a post-hypnotic suggestion of amnesia, subjects were detected 8 times out of 15 on a card test, the other 7 trials having inconclusive results.

Weinstein et al. (1970) also attempted to influence the outcome of a detection of deception test using hypnosis. Six students who were known to be easily hypnotized were used in this study. Three of these students committed a mock crime. These three guilty subjects were hypnotized to induce amnesia while the three innocent subjects were hypnotized to induce guilt (by telling them the details of the crime). Innocent subjects were classified as guilty and guilty subjects were classified inconclusive. This study, like the one previously described is very weak methodologically. One possible explanation for these results could be found in the Guilty Knowledge paradigm, where the innocent subjects, now possessing the guilty information, would therefore be just as easily detected as the guilty subjects.

Timm (1979) assessed the effects of placebo expectations on 270 subjects. All subjects committed a mock murder (shooting a loaded pellet gun at the picture of the victim) and were questioned using the Guilty Knowledge technique. All subjects were given placebo pills prior to the interrogation. One group was told that the
pill that they received contained a tranquilizing agent which would lower their physiological responses. Another group was told that the pill contained an adrenergic substance that would increase their physiological reactivity. The third group was not told anything about the placebo pill that they ingested. The author did not find any effect associated with this placebo manipulation.

Waid et al. (1981) found that 400 mg meprobamate taken orally 30 minutes prior to an interrogation significantly reduced the accuracy of physiological detection of deception. Forty-four subjects participated in this experiment. One group of 11 subjects served as the innocent group. The other 33 subjects memorized a list of six code words. Eleven of these subjects were given the 400 mg meprobamate and told that it would help them relax during the interrogation. Another eleven subjects were given a placebo pill but were given the same expectations for their pills as the meprobamate group. Finally, the remaining 11 guilty subjects were not given anything. The examiner, who was blind to experimental conditions, attempted to rate subjects on whether or not they had ingested the meprobamate pills. This attempt was not successful: all subjects in the meprobamate group were judged as not having ingested a pill, while 2, 5, and 3 of the innocent, no pill and placebo groups were judged as having ingested the meprobamate. All 11 innocent subjects were correctly classified. Nine and eight out of 11 subjects were correctly classified in the no pill and
placebo groups, respectively. Only 3 out of 11 subjects in the meprobamate group were classified guilty. This study suggests that doses of tranquilizing agents which are not apparent behaviorally (i.e., the examiner cannot tell that the individual has taken some type of drug) can have a strong enough effect to influence the outcome of a lie detection test. These findings are truly alarming in that, if they are supported by replication, then conventional lie detection tests could no longer be carried out without first asking the individual to take a blood test.

Aims of this Study:

The purpose of this study is to attempt a "constructive" replication (Lykken, 1968) of the Waid et al. (1981) study. The first aim is to incorporate some changes to the basic design of traditional laboratory detection of deception studies. These changes are inspired by the preceding review of the literature. Firstly, a crime videotape, filmed from the perpetrator's point of view, will serve as the crime stimulus. It is hoped that this type of stimulus will appear more realistic to subjects, and that consequently they will become more absorbed in their task and process more information related to the crime. Secondly, we will attempt to validate the construction of the interrogation protocol. We plan to do this in order to demonstrate that the critical items in the interrogation protocol are not transparent to innocent subjects, but are nevertheless well remembered by guilty subjects.
The second aim of this study is to attempt the replication of the Waid et al. (1981) study, but using different drugs. We feel that more can be learned from this replication if a different anxiolytic medication and a stimulant drug are used. In this way, one may determine if the effects found by Waid et al. are specific to the drug they used (meprobamate), to the class of drug they used (anxiolytics) or is simply a general drug effect (i.e., any attempt to alter the existing arousal state of the autonomic nervous system can produce deleterious effects for detection of deception). We were also interested in a closely related question: If an anxiolytic medication reduces only the guilty physiological responses, will a stimulating medication also have such a selective effect, or will its action be more general?"

In order to better understand what one can expect from the use of these medications, a short review of the existing literature on our two chosen medications (diazepam and methylphenidate) follows. Studies describing drug metabolism and effects are cited. Normal adult drug doses are also quoted.

**Review of Drug Literature:**

Waid et al. (1981) report that subjects who had ingested meprobamate did not differ in mean electrodermal response amplitude from other subjects, but they did show a significant tendency to give smaller EDRs as the test progressed. These subjects therefore showed a decrease only in the EDRs associated with the critical items in the
interrogation. Although these authors attempted to discriminate between innocent and guilty subjects using respiratory and cardiovascular measures, they do not report any analyses on possible drug effects with these measures. In order to determine whether the results obtained by these authors are to be expected, we will examine the drug literature.

First we will look at studies that have investigated the effects of diazepam. Diazepam, like meprobamate, is an anxiolytic medication. Nowadays, it is prescribed more often than meprobamate, in part because of its quicker action. Appleton and Davis (1980) state that diazepam was reported better than placebo in 89% (18) of studies reviewing its efficacy as an anxiolytic agent, better than barbiturates in 80% (5) of studies and better than meprobamate in 50% (2) of studies. Also there is a black market for this drug, so that it is widely available to the general population. It therefore becomes a prime candidate for individuals who might want to ingest a tranquilizing drug prior to a lie detection test.

Dose levels: Marjerrison et al. (1973) tested 26 subjects who had ingested 10 mg diazepam and found significant effects in their EEGs. Danielsen et al. (1975) found significant changes in heart rate after administering 10 mg diazepam to 9 subjects. Holder et al. (1975) found significant changes in subjects' EEGs after these subjects had ingested 10 mg diazepam. Gaillard and Truman (1976) also used 10 mg diazepam to study the
effects of this drug on EEG.

From these studies, it seems that an oral dose of 10 mg diazepam should be sufficient to produce the subtle effect that is desired in this study. Levinsen (1981) gives the daily dose range for diazepam as 5-60 mg and for meprobamate as 800-3200 mg. Similarly, Appleton (1982) gives a daily dose for diazepam of 4-40 mg and for meprobamate of 800-3200 mg. Thus, by choosing an oral dose of 10 mg we should obtain a drug effect as strong as that obtained by Waid et al. (1981) since they used 400 mg meprobamate, which is less than the minimum daily dose for this drug. Unfortunately, no equivalency tables exist for these drugs; it is therefore impossible to compare a priori a dose of 10 mg diazepam to a dose of 400 mg meprobamate. We can only assure ourselves of the fact that our dose is as strong as the one Waid et al. used. We do not know how much stronger it is though.

Metabolism: Marjerrison et al. (1973) tested 26 subjects at 1, 2, 4, and 6 hours post-ingestion of 10 mg diazepam. EEG effects peaked at one hour post ingestion. Greenblatt and Shader (1964) state that diazepam given orally or intravenously peaks within two hours. Holder et al. (1975) found significant changes in their subjects' EEGs one hour after the ingestion of 10 mg diazepam. Gaillard and Trumbo (1976) collected EEG data on 13 subjects for two hours after they had ingested 10 mg diazepam. These authors found that most subjects peaked within two hours of the oral ingestion. Wretlind et al.
(1977) gave 7 subjects 5 mg diazepam and found that peak serum concentration was attained within 45 minutes of oral ingestion. Hillestad and Hansen found that peak serum concentration occurred 30 minutes after oral ingestion of 20 mg diazepam in healthy subjects.

These studies indicate that a post-ingestion waiting period of one hour should be sufficient to allow the 10 mg oral dose of diazepam to start having an effect on our subjects.

**Drug Effects on the Autonomic Nervous System:** Masuda and Bakker (1966) found that diazepam lowered mathematical performance and increased skin resistance (i.e., lowered skin conductance). Clemens and Selesnick (1967) showed a stressor film twice to 36 subjects. During the week separating the first and second showing of the film, one half of the subjects took 5 mg diazepam four times a day while the other half were given placebo. During the second showing of the stressor film, subjects who had been taking the diazepam for one week showed marked adaptation in their skin conductance and respiration. Greenblatt and Shader (1974) state that even large doses of diazepam only have benign depressive effects on circulation and respiration. Danielsen et al. (1975) found an increase in heart rate in subjects who had taken 10 or 20 mg diazepam. They found that 10 mg increased GSR amplitude but 20 mg decreased GSR amplitude. Levinsen (1981) states that the major effects of diazepam occur at the subcortical level, mostly within the limbic system.
If one looks at this literature, diazepam does not seem to have any specific effect on the autonomic nervous system. The same is true of meprobamate (Appleton and Davis, 1980). Clearly then, if diazepam is to have an effect on the detection of deception, this effect will be mediated centrally. One possible explanation for Waid et al.'s findings is that the meprobamate reduced fear of detection and thus reduced detectability. Thus, an anxiolytic medication, even though it has no direct effect on the autonomic nervous system, could reduce electrodermal detectability by acting on some cognitive variables. Nervous system.

We will now look at studies investigating the effects of methylphenidate. Because methylphenidate is used more often clinically with hyperactive children than with adults, it follows that these studies should be interpreted with care. Until more is known about the hyperkinetic syndrome, we cannot assume that what is true for these children is necessarily true for adults.

**Dose Levels:** Goodman and Gilman (1975) state that the normal adult dose is 10 mg two to three times per day. A more general rule of thumb that applies to both adults and children is 0.3mg/kg of body weight (Aman and Werry, 1975). Basing ourselves on these two approaches, an oral dose of 20 mg methylphenidate should be appropriate for the purpose of this study.

**Metabolism:** Satterfield and Dawson (1971) waited one hour after ingestion of either methylphenidate or d-
amphetamine before testing subjects. Aman and Werry (1975) obtained results which suggest that methylphenidate takes effect within 0.75 to 1.0 hours after oral ingestion. Zahn et al. (1975) tested their 54 subjects one to three hours after oral ingestion of methylphenidate and found significant physiological effects.

From the few studies reviewed, a one-hour waiting period post-ingestion would seem to be sufficient in order to observe methylphenidate effects in subjects. This is also a convenient waiting period since it coincides with that needed for diazepam and thus helps to ensure equality of treatment among groups.

**Drug Effects on the Autonomic Nervous System:** Cohen et al. (1971) found that methylphenidate increased basal skin conductance levels and heart rate during relaxation, and increased basal skin conductance during periods of stimulation with hyperactive children. Satterfield and Dawson (1971) found that methylphenidate increased skin conductance level and non-specific skin conductance responses in hyperactive children. Spring et al. (1974) compared hyperactive children on methylphenidate with hyperactive children who were having their methylphenidate withheld. He found that methylphenidate increased the frequency of non-specific electrodermal responses and also the number of trials required to attain habituation. Aman and Werry (1975) concluded that with children aged 73-135 months, daily physiological stresses like digestion produced a greater effect on heart rate and blood pressure.
than did doses (0.3mg/kg of body weight) of methylphenidate.

Ballard et al. (1975) found with the 46 children they studied that methylphenidate therapy significantly increased heart rate and blood pressure. Butter and Lapierre (1975) found no differences in mean heart rate between methylphenidate and placebo treated groups during a ten minute relaxation period. They did find that while the children were attending to visual and auditory stimuli, those receiving methylphenidate had a decreased heart rate (i.e., enhanced reception and processing of the stimuli). Goodman and Gilman (1975) state that the effect of methylphenidate is more mental than motoric. Greenberg and Yellin (1975) compared the effects of imipramine and methylphenidate on 47 children. They did not find any significant changes in heart rate or blood pressure associated with the methylphenidate, though they did find that children on methylphenidate tended to lose weight.

Zahn et al. (1975) found that both methylphenidate and d-amphetamine increased skin conductance levels and reduced electrodermal responsivity in 54 children. Zahn et al. (1980) waited 40 minutes after giving 6-12 year old boys 0.5 mg d-amphetamine/kg of body weight. They found that heart rate increased and skin temperature (i.e., peripheral vasoconstriction) decreased. The children did not show an increase in skin conductance levels or in frequency of spontaneous skin conductance responses.
Although there are more studies investigating the autonomic effects of methylphenidate than there are for diazepam, there still aren't any clear results. One can only say that if methylphenidate does influence the outcome of a detection of deception test, there are better chances that this effect is mediated through the autonomic nervous system than there might be if such an effect is found for diazepam. It is therefore important that these physiological indices be measured over the course of the interrogation for all subjects.

After reviewing the literature, it seems quite plausible to assume that these drugs are more likely to affect detection by acting on some cognitive variables. In other words, they might increase or decrease fear of detection, anxiety, guilt or any other cognitive variable which might play a role in detection tasks.
CHAPTER 2
METHOD

Overview

In order to attain the specific goals of this study, two separate phases were planned. The first phase was devoted to the preparation of a crime videotape and a validated Guilty Knowledge-type interrogation questionnaire. The second phase comprised the actual testing of this validated interrogation questionnaire on innocent subjects, as well as on guilty subjects who had ingested either diazepam, placebo or methylphenidate.

In the first phase, two videotapes were prepared: one contained guilty stimulus material (depiction of a crime); the other, similar but non-guilty stimulus material. The investigators generated a series of questions pertaining to the material in the crime videotape. These were then validated on two samples of subjects. The ten best items were then assembled to form the Guilty Knowledge interrogation protocol that was used in Phase 2.

During the second phase of the study, sixty male subjects underwent a Guilty Knowledge test for detection of deception. Fifteen of these subjects had seen the control videotape, not the crime videotape. Of the forty-five subjects who had seen the crime videotape, fifteen ingested 10 mg of diazepam one hour before the interrogation, fifteen had ingested 20 mg of methylphenidate and the remaining fifteen ingested a placebo capsule. All subjects were blind to the content of their ingested capsule and the experimenter did not know
which subjects had seen either of the videotapes, or which subjects had indeed ingested a capsule. The charts obtained from these interrogations were then scored blindly as to experimental condition. The resulting analysis was used to assess the benefits of using a validated Guilty Knowledge interrogation protocol in conjunction with a crime videotape in studies of this type. The analysis was also used to test the effects of innocence versus guilt and the possible effects that the drugs might have on detection hit rate.

Preliminary work: Phase 1

A videotape depicting the theft of several items from a bachelor apartment was filmed from the perpetrator's point of view. In other words, a person viewing the videotape would see things exactly as the perpetrator sees them while committing the crime. The film started with the actual breaking into the apartment, showed a few acts of vandalism and the theft of various objects, and ended with the criminal leaving the apartment with his loot. There was no soundtrack for this part of the videotape. This segment lasted approximately twelve minutes.

A second videotape was filmed depicting the interior of a one-bedroom apartment. This was also filmed from the "perpetrator's" point of view, but this time, no crime was committed. The film simply consisted of a detailed visit of this apartment. Again there was no soundtrack for this part of the videotape which lasted approximately ten minutes. The purpose of this film was to provide a
stimulus for innocent subjects which was essentially equivalent in length and quality to the crime videotape, but without the crime dimension.

Twenty-two Guilty Knowledge-type questions (i.e., multiple-choice format) relating to the crime videotape were then generated. These dealt with details of the crime and specific characteristics of the burglarized apartment (Appendix A1). This 22-item questionnaire was then administered to twenty second-year psychology students who had not seen the crime videotape. These subjects were asked to try to guess which were the right answers to each of the questions. This provided a transparency test for the multiple-choice alternatives (Appendix A2). It is quite interesting to note at this point that certain items which had initially appeared quite good had to be modified or dropped as a result of this transparency test (e.g., questions 1, 10, 13, 19).

A twenty-item open-ended version of this test was then produced (Appendix A3). It essentially asked the same questions, but did not provide any alternatives to choose from; subjects had to generate their own answers. Thus, for a person having seen the crime videotape, it provided a much more powerful test of item saliency since it tested absolute recall, not recognition. Thirty-six third-year psychology students viewed the crime videotape and were tested with this open-ended questionnaire (Appendix A4).

A final ten-item questionnaire was assembled by
choosing from the original pool those items that were most easily recalled, but not transparent in a multiple-choice format (Appendix A5). This final multiple-choice questionnaire was used for the Guilty Knowledge interrogation in the second, major phase of this study.

**PHASE 2**

**Subjects:**

Sixty male subjects were recruited from undergraduate psychology classes and the student manpower center on campus. Upon volunteering, students filled out an availability form and a medical survey (Appendix B). The medical surveys did not contain the name of the subjects, but rather a coded number. The coded surveys were then passed on for screening by a psychiatrist. This information was kept confidential and in a locked office.

Of the sixty selected subjects, six individuals were not included in the detection data because of low electrodermal responsiveness; field polygraphers would refer to such cases as "inconclusives" (Arthur, 1977). Subjects ranged in age from 19 to 28; their mean age was 22.8. All subjects gave informed consent and were paid for their participation in this two hour session.

**Instruments and Materials:**

Physiological activity was recorded on a four-channel Beckman Type R612 Dynograph. Skin conductance was recorded from Beckman one-centimeter biopotential Ag/AgCl electrodes attached to the distal phalanges of the first and second finger of each hand. The electrolyte consisted
of physiological saline mixed with Unibase following the recipe provided in Lykken and Venables (1971). To ensure that the surface of skin in contact with electrolyte was similar for each finger and both hands, two electrode collars were used to attach each electrode. The first collar, which had a 1.1 cm diameter, was attached to the subject's skin after first aligning the center of the collar with the center of the fingerprint. The second collar, which was also 1.1 cm in diameter, was affixed to the electrode. Then the two collars were aligned and the electrode attached. This procedure guaranteed that there was no leakage between the electrode collar and the skin and that the area of skin in contact with the electrolyte was about 0.95 squared-centimeters. Conductance was recorded using two Beckman Type 9844 skin conductance couplers. Maximum sensitivity was 1 umho/cm of chart deflection.

Three Ag/AgCl electrodes were attached in a Type II lead (Andreassi, 1980) to monitor heart rate. A cardiotachometer coupler (Beckman Type 9857) converted raw electrocardiogram measurements to heart rate. The sensitivity used was twenty beats per minute per 1 cm of chart paper, with a minimum of 40 beats per minute and a maximum of 120 beats per minute. Thoracic respiration was recorded using a strain gauge positioned around the subject's chest and connected to a voltage/pulse/pressure coupler (Beckman Type 9853H).

Two standardized pencil and paper questionnaires were
employed in the study. All subjects completed the State Trait Anxiety Inventory (Spielberger, 1968) and the Differential Personality Questionnaire (Tellegen, 1976). Subjects also filled out a scale designed to assess hand dominance (Appendix C1). In addition, other scales were devised to assess the impact of the experimental manipulations. These include: a Rating of Drug Status (Appendix C2); a 15-item open-ended test of Recall of Critical Knowledge for guilty subjects a multiple-choice test on the interrogation items plus a 10-item open-ended test of Recall of Critical Knowledge for subjects viewing the innocent videotape (ROCKB, Appendix C4); and finally, a series of questions assessing the subject's perception of the experiment and the subject's rating of his own drug status (EAR, Appendix C5).

The other stimulus materials used are the two videotapes, videotape A being the crime stimulus, videotape B, the innocent stimulus, and the Guilty Knowledge Interrogation.

The capsules given to the subjects were all identical in appearance. They were prepared at the University of British Columbia pharmacy and contained either 10 mg diazepam, xx mg lactose, or 20 mg methylphenidate.

Design:

Subjects were randomly assigned to one of four conditions (Figure 1). In the first condition, fifteen subjects viewed the guilty videotape, ingested a capsule
EXPERIMENTAL DESIGN

Subjects N = 60

Guilty n = 45

Placebo n = 15

Ritalin n = 15

Valium n = 15

INTERROGATION:
- SCL, SCR
- HR
- Respiration
N = 60

Innocent n = 15

Guilt Manipulation

Drug Manipulation
Containing 10 mg of diazepam and after a one-hour waiting period, underwent a Guilty Knowledge interrogation. The second and third conditions were identical to the first, except that subjects ingested capsules containing lactose and 20 mg methylphenidate respectively. In fourth condition, subjects viewed the innocent videotape and did not ingest a capsule. They did however undergo the Guilty Knowledge interrogation after a one-hour waiting period.

Procedure:

In order to facilitate the understanding of a rather lengthy procedure (approximately two hours per subject), the description of the procedure has been broken down into five parts. The experiment was carried out in two rooms: an office and a room containing a shielded booth with the interrogation equipment. All parts of the study, except the fourth, were carried out in the office.

1. Introduction: When first contacted to set up an appointment, subjects were asked to abstain from drugs and alcohol for the twelve hours prior to the experiment. They were also asked not to eat during the two hours immediately preceding the appointment. Upon presenting himself to the office, a subject was greeted by the experimenter. The experimenter then asked the subject to read a consent form (Appendix D) and request any appropriate clarifications before signing the consent form. The experimenter would then explain that this study was being run as a double-blind, meaning that he, the experimenter, would not know which of the two films the
subjects would see or whether or not the subject ingested a capsule (or the contents of the capsule) until the end of the session. Similarly, even though the subject would know which film he saw and whether or not he did indeed take a capsule, he would not know the contents of the capsule until the experiment was finished two hours later. The blind would be broken at that time when a sealed envelope containing these details would be opened.

Once the experimenter was sure that this was clear to the subject, he took out a large brown envelope which contained three sealed envelopes, as well as the necessary paper and pencil measures, already coded with a four-digit identification number. The experimenter then took out the first envelope and said to the subject:

"Do you see that plastic bag on top of the television set? Inside that plastic bag there are two boxes: one of them is labelled 'Tape A', the other, 'Tape B'. Inside this envelope that I am about to give you, there is a card which tells you which of these two tapes to choose. I'm going to leave the room while you open the envelope. During that time, you will go over to the bag, take out the box that the card in the envelope tells you to choose and take the unmarked tape out of the box. You will then put back the box in the plastic bag so that I will not know from which box the unmarked tape was taken."
For the same reason, you will discard the envelope and the card into this wastebasket. After you have done this, you will call me back into the office, so that I can set the tape up for you to view on the television monitor. Do you have any questions?"

The experimenter then clarified any questions about this and then left the room while the subject retrieved the appropriate tape from the plastic bag. Upon returning to the office, the experimenter had the subject remove the second sealed envelope from the large brown envelope. The experimenter then gave the subject the following instructions:

"That envelope you have just taken out of the large brown envelope is for you to open after you have finished watching the videotape. Right now, I am setting up the tape on this videotape machine, so that when I leave, all you will have to do to watch the tape is to turn this switch to 'Forward' (points to switch). The volume is preset on the television, so you don't have to worry about that. Once the film is finished, all you have to do is turn the same switch back to 'Off' (points to switch). So, basically, all you have to do is turn the videotape machine on, watch the videotape carefully, and when the tape is finished in about
fifteen minutes, turn the machine off. While you are doing this, I will be in the coffee room, which is two doors down to the right."

"Once the tape is finished, I want you to open that sealed envelope and follow the instructions that are inside. It won't be anything complicated. Just before you got here, I brought in a fresh glass of water and put it here, next to the chair you'll be sitting in when you watch the tape. So, if you get thirsty, or if you have to take a capsule, there's plenty of water for you right here."

"Once you have watched the tape and done whatever the instructions inside the envelope tell you to do, come and get me in the coffee room, which is two doors down to the right. We will come back in here so that you can fill out a few personality questionnaires. Do you have any questions?"

The experimenter then answered any questions relating to these instructions and then left to go wait in the coffee room.

**Experimental Manipulations:** During the second part of the experiment, subjects viewed either the innocent or the guilty videotape. Subjects watching the innocent videotape were provided with instructions on the tape designed to increase their retention of the videotape (Appendix E1).
This was done by stating that there would be a test of recall for this material later on in the experiment. After the film showing the inside of the apartment was finished, the subjects saw and heard a second set of instructions on the tape (Appendix E2) which informed them that they had just been mistaken for another person and were being accused of theft. It told them how to best react to this unfortunate situation. It also told them to turn off the videotape machine and read the instructions in the envelope.

The instructions in the envelope for the innocent people were designed to ensure blindness on the part of the experimenter by urging the subject not to ask any questions at this point (Appendix aE3). They also indicated to these subjects that it was time to go get the experimenter in the coffee room.

Subjects viewing the guilty videotape were also presented with visual and auditory instructions at the beginning of their tape (Appendix E4). These were designed to give them an imaginary motive for participating in a burglary. They were also designed to increase their motivation to remember details from the film they were about to watch. Similarly, after the videotape showing the theft was finished, further instructions on the tape explained that they were being accused of the crime which they had just committed. The taped instructions explained that if they managed to fool a lie detection test, they would be completely exonerated (Appendix E5). They were
also asked to turn the videotape machine off and read the instructions in the envelope.

The envelope contained, along with some instructions, a yellow capsule containing either the diazepam, the placebo, or the methylphenidate. The instructions explained that the capsule might help them fool the lie detection test (Appendix E6). They also helped to ensure experimenter blindness by urging subjects not to ask any questions at this point. Finally, they asked the subject to get the experimenter in the coffee room.

Waiting Period: After the subject had gone to the coffee room to get the experimenter, they both returned to the office. At this point, the experimenter set a timer for 50 minutes. He asked the subject to sit at a desk and then read the instructions for the State Trait Anxiety Inventory (Spielberger, 1968) to him. He waited while the subject completed both forms of this inventory and then read the instructions for the Differential Personality Questionnaire (Tellegen, 1976) to him. He informed the subject that he had the remaining time (usually 45 minutes) to complete this questionnaire. If the subject finished before the timer rang, he was to sit quietly till the experimenter indicated that it was time for the interrogation. During this part of the session, the experimenter kept verbal contact with the subject at a minimum in order to ensure completion of both questionnaires, and also to ensure equality of conditions across subjects.
Interrogation: As soon as the 50-minute waiting period had elapsed, the experimenter asked the subject to follow him to the shielded booth. The experimenter took a detour to a stairwell where he asked the subject to go down and climb back up two flights of stairs (40 steps). This was done to ensure approximately equivalent amounts of physiological arousal prior to the interrogation. He then led the subject to the shielded booth where he attached the thoracic respiration belt and the electrodes for cardiac and electrodermal activity to the subject. During that time, the experimenter explained the interrogation procedure:

"I am going to ask you a series of questions which are very much like multiple-choice questions. Your task is going to be quite simple. At the beginning of each question, I will make an opening statement, e.g., 'If you are guilty of killing John Doe, then you know what was used to kill him.' Now you just listen to that part of the question, you don't say anything."

After that, however, I will go through a list of alternatives. After each one, I want you to say: 'No, it wasn't...' and repeat the alternative that I have just mentionned. Whatever the alternative is, your answer should always be 'no'. Now, if we were continuing with that example of John
Doe's murder, I might ask you: 'Was it a knife?' You would answer: 'No, it wasn't a knife.' I might then ask you: 'Was it poison?' and you would answer: 'No, it wasn't poison.' I might then ask you: 'Was it a rope?' You would answer: 'No, it wasn't a rope.' So, what would you answer if I asked you: 'Was it a gun?' (waits for subject's answer). Good. Do you have any questions about this procedure before we start?'

Once he was sure that the subject fully understood the interrogation procedure, the experimenter filled out the Rating of Drug Status (Appendix C2). After that, he asked the subject to take and hold a few deep breaths. This was done to calibrate the respiration channel and also to promote electrodermal responding. The experimenter then proceeded with the interrogation (Appendix A5). Once the interrogation was finished, the experimenter filled out the second Rating of Drug Status (Appendix C2), disconnected the electrodes, and escorted the subject back to the office. He asked the subject to refrain from asking any questions for another few minutes.

Debriefing: Upon returning to the office, the subject filled out the questionnaire assessing his perception of the experiment and rated himself on his own drug status (Appendix C5). He also filled out the appropriate recall scale: ROCKA (Appendix C3) for subjects who had seen the
guilty videotape; ROCKB (Appendix C4) for those who had seen the innocent videotape. Subjects also filled out the state form of the State Trait Anxiety Inventory (Spielberger, 1968) and the hand dominance scale (Appendix C1).

During this time, the experimenter scored the subject's DPQ and filled out a feedback form (Appendix F). After the subject had filling out the debriefing forms, the experimenter showed him his polygraph charts and explained what each channel measured. He then opened the third sealed envelope which revealed the subject's true experimental condition (innocent/guilty, valium/placebo/ritalin). After this, he gave the subject the DPQ feedback form (Appendix F) and explained to the subject how to interpret it. Finally, the experimenter paid the subject, answered any questions he had about the whole experiment and thanked him for his participation.

Physiological Measures:

Skin conductance response was measured as the difference between the maximum reached following stimulus onset and the prestimulus level. Guilt scores were computed according to Lykken (1960). All skin conductance responses except those associated with buffers (the first alternative to every question) were rank ordered according to magnitude. If the skin conductance response to the critical alternative had the highest magnitude of the four responses, then it got a score of 2. If it was second highest, it got a score of 1. Ties were handled in the
usual manner, splitting the rank score among tied responses. The actual Guilt score for an individual was determined by summing up his 20 individual rank scores (10 questions X 2 hands), and dividing this total by the number of scorable questions that subject had shown. A question was considered scorable if at least one alternative other than the buffer elicited a skin conductance response greater than, or equal to 0.03 umhos.

Subsequent to this, skin conductance response amplitudes were collapsed across both hands. Similarly, tonic skin conductance levels, which were defined as the skin conductance levels immediately preceding the onset of each of the ten questions, were also collapsed across hands.

Heart rate was defined as the average heart rate during the 5 seconds immediately preceding the onset of each of the ten questions. Respiration was quantified by counting the number of seconds taken to complete 15 cycles during the first question and by repeating this calculation for the last 15 cycles during the tenth and final question.
RESULTS

In this chapter, results obtained from the statistical analysis of the data will be presented. First, general descriptive data on the subjects will be presented. These include the results of the personality measures used in the course of the study. Data relating to the crime film and its associated interrogation protocol will follow. Thirdly, the results of the guilty/innocent classification will be given. Afterwards, we will investigate possible effects resulting from the guilt/innocence manipulation. A similar analysis for possible drug effects then follows. Finally, post hoc tests of interest will be presented.

Descriptive Subject Data:

Descriptive data was gathered on all subjects during the waiting period before the interrogation and during the debriefing period after the interrogation. Figure 2 depicts the results of the measure of trait anxiety from the STAI (Spielberger, 1968). The results from the seventeen scales of the DPQ (Tellegen, 1976) can be found in Figure 3. These variables (STAI, DPQ) were tested in a multivariate analysis of variance (SPSS:9, 1982). The overall contrast of the four groups was not significant \( F(s=3,m=7,n=18.5)=1.32, p=0.108 \). These results, as well as the univariate tests for each variable are given in Table 5. As can be expected, subjects in the four groups did not differ from one another along these dimensions.

Subjects' hand dominance was also assessed (Appendix
DPQ PERSONALITY SCORES

RAW SCORES

SCALES

INNOCENT

PLACEBO

VALIUM

RITALIN

FIGURE 3
Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>F Ratio</th>
<th>F Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trait Anxiety (STAI)</td>
<td>2.018</td>
<td>0.1219</td>
</tr>
<tr>
<td>DPQ #1</td>
<td>1.001</td>
<td>0.3991</td>
</tr>
<tr>
<td>DPQ #2</td>
<td>1.293</td>
<td>0.2858</td>
</tr>
<tr>
<td>DPQ #3</td>
<td>0.303</td>
<td>0.8229</td>
</tr>
<tr>
<td>DPQ #4</td>
<td>0.600</td>
<td>0.6174</td>
</tr>
<tr>
<td>DPQ #5</td>
<td>1.706</td>
<td>0.1762</td>
</tr>
<tr>
<td>DPQ #6</td>
<td>0.554</td>
<td>0.6477</td>
</tr>
<tr>
<td>DPQ #7 (Hard Work)</td>
<td>4.910</td>
<td>0.0042</td>
</tr>
<tr>
<td>DPQ #8</td>
<td>1.677</td>
<td>0.1824</td>
</tr>
<tr>
<td>DPQ #9</td>
<td>0.260</td>
<td>0.8537</td>
</tr>
<tr>
<td>DPQ #10</td>
<td>0.761</td>
<td>0.5207</td>
</tr>
<tr>
<td>DPQ #11</td>
<td>1.675</td>
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</tr>
<tr>
<td>DPQ #12</td>
<td>1.966</td>
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<td>DPQ #13</td>
<td>1.598</td>
<td>0.2002</td>
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<td>DPQ #14</td>
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<td>DPQ #15</td>
<td>1.152</td>
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<tr>
<td>DPQ #16</td>
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</tr>
<tr>
<td>DPQ #17</td>
<td>0.831</td>
<td>0.4826</td>
</tr>
</tbody>
</table>

All F Tests with 3 degrees of freedom (4-1).
C1). A classification table for writing style appears in Table 6. The numerical scale for hand preference was subjected to a one-way analysis of variance (SPSS:9,1982). There were no significant differences among the four groups (F(3)=0.126, p=0.9438). The results are depicted in Figure 4.

Finally, the subjects' perception of the experiment was assessed by the first three questions of the EAR scale (Appendix C5). A one-way analysis of variance revealed that subjects did not differ significantly in their confidence in lie detection (F(3,56)=0.920, p=0.4371), in their confidence in the examiner (F(3,56)=3.523, p=0.0207) of their belief that the experimenter was truly blind to experimental conditions (F(3,56)=0.542, p=0.6563). The mean confidence ratings are depicted in Figure 5.

Overall, then, subjects did not show any between group differences on the above-mentioned variables. These can therefore be discounted as an possible explanation for future between-groups differences.

Validation of Crime Film and Interrogation Protocol: As previously stated, we wanted to make sure that the guilty subjects would remember the details of the crime film. Figure 6 depicts the frequency of correct responses to the 10 questions of the ROCKA that were in the interrogation protocol for all three guilty groups and the frequency of correct guesses by the 15 innocent subjects on the same 10 questions from the multiple-choice format of the ROCKB questionnaire. As we can see, not only did the guilty
<table>
<thead>
<tr>
<th>Writing Style</th>
<th>Innocent</th>
<th>Valium</th>
<th>Placebo</th>
<th>Ritalin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Inverted</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Left Normal</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Right Inverted</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Right Normal</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Chi-Square(9) = 6.97228, p = 0.64
FIGURE 4

LATERALITY SCORES

Right 50

45

40

35

30

25

20

15

10

5

Left

innocent placebo valium ritalin
Ss' CONFIDENCE RATINGS

very 5

not at all 1

"in lie detection" "in E's skill" "in E's blindness"
FIGURE 6
RECALL OF
CRITICAL KNOWLEDGE

INNOCENT
PLACEBO
VALIUM
RITALIN

FREQUENCY

ITEMS
Subjects do a good job of remembering the appropriate details, but the innocent subjects did not fare too well in their guessing, except for question 10.

Despite the small variance in recall displayed by the guilty subjects, a Pearson product-moment correlation calculated between their total recall score on the 15 items of the ROCKA and their guilt score was very significant \((r=0.53, \ p=0.00008)\). In other words, guilty subjects who remembered more details of the crime film tended to score more in the guilty direction.

Finally, the internal consistency of the interrogation was assessed using the SPSS Reliability procedure (SPSS;9, 1982). The internal consistency, as estimated by Cronbach's alpha, was 0.896.

**Classification Results:** Six subjects were excluded from this analysis because they did not meet the criterion of ten or more scorable questions. Since guilt scores ranged from 0 to 2, the cutoff score was set at 1 (Lykken, 1960). Any subject scoring below 1 was classified innocent, while any subject scoring between 1 and 2 was classified guilty. This data is presented in Table 7. A Yates corrected chi-square test performed on this classification was very significant \((p<0.001)\). The overall hit rate was 81.7% including inconclusives, and 90.7% excluding the inconclusive subjects. No false positives occurred, and less than 10% false negatives were present.

**Guilt Effects:** Since the three guilty groups were equivalent on most measures (see following section), only
### TABLE 7

Number of Subjects Found Guilty or Innocent In Each Group

<table>
<thead>
<tr>
<th>Classification</th>
<th>Innocent</th>
<th>Valium</th>
<th>Ritalin</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guilty</td>
<td>0</td>
<td>13</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Innocent</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Yates corrected $\chi^2(3) = 29.41$, $p < .001$
The placebo group was used in the contrast with the innocent group. In this way, both contrast groups had equal cells which facilitates statistical analysis and provides valuable insurance when some basic statistical assumptions are violated. Since most of the dependent measures were repeated measures, the BMD P2V program for analysis of variance was used (BMD, 1981). This program has the advantage of making the Greenhouse Geisser correction for repeated measures. When several repeated measures are taken, the number of degrees of freedom becomes spuriously high. The Greenhouse Geisser procedure circumvents this problem by calculating the correlation between each repeated measure and applying a corresponding correction to the degrees of freedom used in the F test. The uncorrected degrees of freedom and the epsilon (e) correction are given.

The average heart rate prior to each of the ten questions is presented for all four groups in Figure 7. The repeated measures analysis of variance did not yield a significant group effect ($F(1)=0.60, p=0.4464$). There was, however, a question effect ($F(9)=2.70, e=0.7183$, Greenhouse $p=0.0051$). This can be attributed to between question variability in heart rate. No significant interactions were present.

A similar analysis was performed on respiration time (seconds to complete 15 cycles of breathing) measured during the first and the tenth question. Neither the group effect ($F(1)=0.11, p=0.7399$) nor the question effect
HEART RATE (5 BEAT AVERAGES) PRIOR TO EACH QUESTION

- INNOCENT
- PLACEBO
- VALIUM
- RITALIN

BEATS PER MIN.

Q1 2 3 4 5 6 7 8 9 10
(F(1,28)=0.54, p=0.4680) were significant. Once again, there was no significant interaction. The data are presented graphically in Figure 8.

Tonic skin conductance level was measured prior to the onset of each of the ten questions. Figure 9 depicts the results for all four groups. There was no significant group effect (F(1)=0.29, p=0.5959) nor was there a significant question effect (F(9)=0.29, e=0.20, Greenhouse p=0.7287). There was also no interaction effect.

The number of scorable questions (maximum= 20) a subject obtained was also used as a dependent variable. An SPSS One way analysis of variance (SPSS:9, 1982) between the innocent and placebo groups did not yield significant results (F(1,28)=0.956, p=0.3367). The average number of scorable questions per group is presented in Figure 10.

A final contrast between the placebo group and innocent group was performed to compare levels of state anxiety (Spielberger, 1968) in both groups. The between groups effect was not significant (F(1)=0.00, p=0.9655) but the time effect was significant (F(1)=11.11, p=0.0024). This means that both groups experienced a decrease in state anxiety from the beginning of the experiment to the end (see Figure 2). No interactions were present.

One contrast was made solely between guilty groups. The average skin conductance response to the critical item for each question was plotted for each group versus the average of the three non-critical, non-buffer items for
RESPIRATION TIME
(SECONDS TO COMPLETE 15 RESPIRATION CYCLES)

Q1  Q1O

INNOCENT
VALIUM
PLACEBO
RITALIN
SKIN CONDUCTANCE LEVELS
PRIOR TO EACH QUESTION

- INNOCENT
- VALIUM
- RITALIN
- PLACEBO

QUESTIONS

1 2 3 4 5 6 7 8 9 10
No. OF SCORABLE "ITEMS"

Fig 10

- Innocent
- Valium
- Placebo
- Ritalin
AVERAGE SCRs TO INNOCENT AND GUILTY ALTERNATIVES

INNOCENT ALTERNATIVES
- VALIUM
- PLACEBO
- RITALIN

GUILTY ALTERNATIVES
- VALIUM
- PLACEBO
- RITALIN

QUESTIONS 1 to 10

UMHOS
Each question for each group. The data is presented in Figure 11. A repeated measures analysis of variance on this data yielded very interesting results. First, there was no difference associated with the group effect \( (F(2)=0.29, \ p=0.7477) \). There was however a significant effect for the type of alternative (i.e., critical or irrelevant) being measured \( (F(1)=53.11, \ p<0.0001) \). In other words, there was a significant difference between the average skin conductance responses to critical and irrelevant alternatives. There was also a significant effect for questions \( (F(9)=15.17), \ \text{Greenhouse Geisser} \ \ p=0.0 \). Finally, there was also a significant interaction between the type critical/irrelevant alternative effect and the question effect \( (F(9)=4.15, \ \text{Greenhouse Geisser} \ \ p=0.0005) \). If one looks at Figure 11, one can see that the sharp distinction between critical and irrelevant alternatives fades over time, especially after question 5. Neither the three-way interaction nor the other two way interactions proved to be significant.

**Drug Effects:**

While examining drug effects we will look at both paper and pencil data and physiological measures. Contrasts will be made between the three guilty groups: subjects who viewed the crime videotape and took either 10 mg. Diazepam, 20 mg. Methylphenidate or a placebo capsule. First we will look at state anxiety as measured by the STAI (Spielberger, 1968). The repeated measures analysis of variance on this data yielded two significant findings. As
with the guilt/innocence contrast, there was a significant time effect \( (F(1)=6.17, p=0.0170) \). Both the valium and the placebo groups showed decreases in state anxiety from the beginning of the experiment to the end (see Figure 2). The methylphenidate group, however, showed an increase in state anxiety from the beginning of the session to the end. This led to a significant time by group interaction \( (F(2)=4.64, \ p=0.0151) \). There was no significant effect between groups \( (F(2)=0.31, \ p=0.7386) \).

A oneway analysis of variance was performed on all three ratings the subjects made during the debriefing part of the experiment. Subjects rated the probability that they had taken some drug (either diazepam or methylphenidate), some diazepam, and some methylphenidate (see Figure 12). The rating for some drug had a significant group effect \( (F(2,31)=9.540, \ p=0.0006) \) as did that for the diazepam \( (F(2,31)=13.981, \ p<0.0001) \). Multiple comparisons using the Scheffe procedure (SPSS:9, 1982) revealed that the diazepam group was responsible for this difference. Subjects in this group were more likely to judge themselves as having taken some drug, and having taken some diazepam. The methylphenidate rating did not yield significant results \( (F(2,31)=1.672, \ p=0.2043) \).

The experimenter also rated the subjects on a similar scale at two points: before the interrogation began and at the end of the interrogation. A repeated measures analysis of variance was performed on this data. The first rating ("some drug") had significant effects for group


SUBJECTS' RATINGS OF THEIR OWN DRUG STATUS

'NO' 5
4
3
2
1

'YES'

V P R

"I HAVE TAKEN SOME DRUG"

V P R

"I HAVE TAKEN SOME VALIUM"

V P R

"I HAVE TAKEN SOME RITALIN"
(F(3,56)=8.79, p=0.0001), for time (F(1,56)=34.57, p=0.0001) and for the group by time interaction (F(3,56)=4.81, p=0.0047). This means that there was a difference in ratings between the four groups (ostensibly, the innocent group versus the three guilty groups), that the examiner's ratings drifted in the "probably some drug" direction over time, but that this was not done evenly for all groups: the diazepam group showed the sharpest increase in this respect, followed by the placebo group. The methylphenidate and innocent groups showed relatively little change (see Figure 13).

Turning to the physiological data, we can start by looking at heart rate again (Figure 7). This time the repeated measures analysis of variance was performed on the three guilty groups. The group effect approached significance but did not attain it (F(2,42)=2.59, p=0.0869). There was again a question effect (F(9,378)=2.05, e=0.8457, p=0.0429) which probably reflects the question to question variations in heart rate. The question by group interaction was not significant.

The respiration data (see Figure 8) was also put to a repeated measures analysis of variance for the three guilty groups. The group effect was not significant (F(2,42)=1.16, p=0.3247). The time effect was also not significant (F(1,9)=0.98, p=0.3272). There was however a time by group interaction (F(2,42)=3.44, p=0.0415) which can be explained by noting that the methylphenidate group
E's RATINGS OF Ss' DRUG STATUS

--- innocent
--- valium
--- placebo
--- ritalin

no

yes

pre post

"some drug"

pre post

"valium"

pre post

"ritalin"
Slowed down its breathing time, while the placebo group remained relatively stable and the diazepam group slightly quickened its respiration.

The analysis of the skin conductance levels for all three groups prior to each question did not yield any significant results for group effect \((F(2,42)=1.44, p=0.2494)\), question effect \((F(9,378)=2.71, e=0.25, p=0.0645)\) or group by question interaction \((F(18,378)=0.71, e=0.2530, p=0.6066)\). This data can be found in Figure 9.

The number of scorable questions (see Figure 10) was subjected to a one-way analysis of variance. The group effect was not significant \((F(2,42)=1.149, p=0.3268)\).

Finally, as was stated in the previous section, the contrast of skin conductance responses to irrelevant and critical alternatives for each question was also subjected to a repeated measures analysis of variance. The group effect was not significant \((F(2,42)=0.29, p=0.7477)\).

Post-hoc Analyses: Because of the preceding results, a new guilt score was tabulated, using only the responses to the first five questions of the interrogation protocol. The results are tabulated in Table 8. Although several guilt scores were changed considerably because of this manipulation, the dichotomous classification of guilt/innocence wasn't very much altered. The hit rate including inconclusives is now 85% and without inconclusives, 91%.

An attempt was made to correlate all of the
### TABLE 8

Post-hoc Classification Table

<table>
<thead>
<tr>
<th>Classification</th>
<th>Innocent</th>
<th>Valium</th>
<th>Placebo</th>
<th>Ritalin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innocent</td>
<td>12</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Guilty</td>
<td>1</td>
<td>11</td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
</table>
Personality variables with subjects' guilt scores and with the number of scorable questions each subject emitted. This was done because it is important to determine at some future time, which personality parameters, if any, influence the outcome of this type of test. The results can be found in Tables 9 and 10.

All of the preceding results are discussed in the next chapter. The significance of these findings and their possible interpretations and implications are presented there.
TABLE 9

Correlations between Personality Measures and Guilt Scores

<table>
<thead>
<tr>
<th>Personality Scale</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Anxiety (beginning)</td>
<td>-0.0989</td>
<td>0.259</td>
</tr>
<tr>
<td>State Anxiety (end)</td>
<td>-0.0952</td>
<td>0.267</td>
</tr>
<tr>
<td>Well-being</td>
<td>0.2310</td>
<td>0.063</td>
</tr>
<tr>
<td>Stress</td>
<td>-0.0426</td>
<td>0.390</td>
</tr>
<tr>
<td>Unfriendly World</td>
<td>-0.1747</td>
<td>0.125</td>
</tr>
<tr>
<td>Aggression</td>
<td>-0.1307</td>
<td>0.196</td>
</tr>
<tr>
<td>Social Closeness</td>
<td>0.0752</td>
<td>0.312</td>
</tr>
<tr>
<td>Social Potency</td>
<td>0.0212</td>
<td>0.445</td>
</tr>
<tr>
<td>Hard Work</td>
<td>-0.2473</td>
<td>0.051</td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>0.1291</td>
<td>0.199</td>
</tr>
<tr>
<td>Danger Seeking</td>
<td>-0.0533</td>
<td>0.364</td>
</tr>
<tr>
<td>Authoritarianism</td>
<td>0.1424</td>
<td>0.175</td>
</tr>
<tr>
<td>Absorption</td>
<td>0.1313</td>
<td>0.195</td>
</tr>
<tr>
<td>Associative Slips</td>
<td>-0.1715</td>
<td>0.130</td>
</tr>
<tr>
<td>Unlikely Virtues</td>
<td>0.1235</td>
<td>0.209</td>
</tr>
<tr>
<td>Content Balanced Desirability</td>
<td>0.0107</td>
<td>0.472</td>
</tr>
<tr>
<td>Content Balanced Acquiescence</td>
<td>0.1307</td>
<td>0.196</td>
</tr>
<tr>
<td>Content Balanced Endorsement</td>
<td>0.2315</td>
<td>0.063</td>
</tr>
<tr>
<td>Inconsistency</td>
<td>-0.1232</td>
<td>0.210</td>
</tr>
</tbody>
</table>
TABLE 10

Correlations between Personality Measures and Number of Scorable Questions

<table>
<thead>
<tr>
<th>Personality Scale</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Anxiety (beginning)</td>
<td>0.0216</td>
<td>0.435</td>
</tr>
<tr>
<td>State Anxiety (end)</td>
<td>-0.1172</td>
<td>0.186</td>
</tr>
<tr>
<td>Well-being</td>
<td>0.1604</td>
<td>0.110</td>
</tr>
<tr>
<td>Stress</td>
<td>-0.0829</td>
<td>0.264</td>
</tr>
<tr>
<td>Unfriendliness World</td>
<td>0.0279</td>
<td>0.416</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.1544</td>
<td>0.119</td>
</tr>
<tr>
<td>Social Closeness</td>
<td>0.1288</td>
<td>0.163</td>
</tr>
<tr>
<td>Social Potency</td>
<td>0.2395</td>
<td>0.033</td>
</tr>
<tr>
<td>Hard Work</td>
<td>0.1440</td>
<td>0.136</td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>0.1170</td>
<td>0.187</td>
</tr>
<tr>
<td>Danger Seeking</td>
<td>0.0887</td>
<td>0.250</td>
</tr>
<tr>
<td>Authoritarianism</td>
<td>-0.0052</td>
<td>0.484</td>
</tr>
<tr>
<td>Absorption</td>
<td>0.2158</td>
<td>0.049</td>
</tr>
<tr>
<td>Associative Slips</td>
<td>0.0725</td>
<td>0.291</td>
</tr>
<tr>
<td>Unlikely Virtues</td>
<td>-0.1927</td>
<td>0.070</td>
</tr>
<tr>
<td>Content Balanced Desirability</td>
<td>0.0007</td>
<td>0.498</td>
</tr>
<tr>
<td>Content Balanced Acquiescence</td>
<td>-0.0642</td>
<td>0.313</td>
</tr>
<tr>
<td>Content Balanced Endorsement</td>
<td>-0.2281</td>
<td>0.040</td>
</tr>
<tr>
<td>Inconsistency</td>
<td>0.0407</td>
<td>0.379</td>
</tr>
</tbody>
</table>
CHAPTER 4
DISCUSSION

CLASSIFICATION RESULTS:

The hit rate obtained in this study is comparable to those obtained in other mock crime studies (see Table 1). This provides further support for our innovations on the traditional experimental paradigms. The use of the crime videotape and the validation of the interrogation protocol do lead to efficient detection of deception.

Perhaps the greater success of some investigators relative to others is due to their having employed a stronger manipulation. If investigators start incorporating such procedures into their studies, one could soon determine if the weaker hit rates obtained by some investigators are actually due to weak experimental manipulations rather than to the actual process of detection of deception. This question might be clouding the whole issue of the efficiency of detection of deception.

Drug Effects:

As could be guessed from the review of drug studies (Chapter 1), no physiological effects were found for diazepam either at a tonic or reactive level. Although the overall F test was slightly significant (see Results), none of the multiple comparisons were significant. Subjects who had ingested diazepam showed similar heart and respiration rates, tonic skin conductance levels and skin conductance responses as the other subjects. Our review of the literature indicates that a suitable waiting
period was used for the dose employed. The one main drug effect found for the diazepam group was that they seemed to be aware of the fact that they had taken some diazepam (see Figure 12). This clearly argues for a diazepam effect which was probably mediated centrally, not at the autonomic level.

The results for the methylphenidate group are similar in that few, if any, physiological effects were found. Unlike subjects in other groups who maintained a fairly constant respiration time, subjects in the methylphenidate group increased the time required to complete 15 cycles of respiration as the interrogation progressed. These results must be interpreted with caution, however, since the conditions during which the measurement was taken at the beginning were not necessarily equivalent to those at the end; different amounts of activity (e.g., talking) were exhibited by subjects at these times. Once again, though, there is some proof of a drug effect which can be found in the measure of self-reported state-anxiety (see Figure 2) this time. One possible interpretation for this result is that methylphenidate subjects did not experience the decrease in arousal that subjects in the other group felt after sitting in a comfortable chair for approximately one-half hour and engaging in a repetitious task (the interrogation). Therefore, it seems that with the dose employed and the waiting period used, the only effect of methylphenidate was also centrally mediated. Due to the paucity of data on the metabolism of methylphenidate,
there is no way of knowing whether this is in part due to these two factors short of conducting a dose-response study with methylphenidate.

These results quite obviously conflict with those obtained by Waid et al. (1981). The methodological differences in between these two studies might be responsible for this apparent contradiction. First, the type of drug used might be responsible for the difference: perhaps meprobamate has a different effect than diazepam and does indeed influence autonomic activity. The experimental manipulation was also quite different. Perhaps the use of a validated interrogation protocol combined with more salient critical stimuli would have resulted in different findings for Waid et al. Obviously, a follow-up study should be done to resolve

Guilt Effects:

The results obtained in this analysis (see previous chapter) showed no arousal differences between guilty and innocent subjects. In fact, these subjects were found to be similar on both self-report (state anxiety) and physiological (tonic heart rate, tonic skin conductance, respiration rate, number of scorable questions) measures. Thus, one might suggest that innocent and guilty subjects differ only in their reactivity to critical information. ) The hit rate obtained confirms the fact that innocent and guilty subjects did indeed differ in their reactivity to the critical alternatives for each of the ten questions (also, see Appendix F1-10). In other words, it seems that
in the experimental situation at least, guilty subjects are not overridden with guilt and/or fear. If they are, this is not measurable through the psychophysiologic measures obtained in this study. What seems more plausible is that these subjects react to the critical alternatives with a greater orienting response than do innocent subjects. This is easily understood in the Guilty Knowledge paradigm since an orientation reaction to the signal stimulus (i.e., critical alternative), not a "lie response" is expected. This might also explain why, within the guilty groups, responses to critical alternatives tend to habituate over time (see Figure 11). That is not to say, though, that guilt and/or fear of detection have no part to play in this response; on the contrary, these factors might be responsible for an added amount of vigilance for the critical alternatives in the guilty groups.

Although these results seem quite plausible in the light of a laboratory investigation, this does not mean that such results would be found in a field situation. One must readily admit that in the analog situation, no matter how realistic one makes the crime stimulus, one cannot create the atmosphere of anxiety and apprehension that must exist in the field situation. Even if one could generate these in the analog situation, ethical concerns would prohibit the use of such methods.

Validation of Crime Film and Interrogation Protocol:

The results cited in the previous chapter clearly
indicate that the crime videotape is a valid alternative to the mock crime in an experimental setting. First, it presents the experimenter with an "uncertain" situation, that is, one in which s/he has to decide whether or not a given subject was actually involved in the critical event. It also has the advantage of being more realistic than a mock crime since actual crimes can be depicted. This has the added bonus of increasing the subjects' attention and involvement in the experiment. This was clearly demonstrated by the data given for the amount of information recalled by guilty subjects. The validating approach to the interrogation protocol questionnaire can be used to ensure that the questions asked can indeed be easily answered by persons viewing the film only once. At the same time, one can test the transparency of the protocol by administering a multiple-choice version to pilot subjects who have not seen the crime videotape.

The relationship between recall of critical knowledge and detection was demonstrated by a moderate but very significant correlation coefficient, similar to that obtained by Waid et al. (1978). It is quite surprising to find a coefficient of this magnitude when one realizes the small range of scores available for such a computation.

This new approach to inducing experimental "guilt" in subjects also offers an easier way of providing an equivalent task for "innocent" or control subjects. A videotape similar in length and topic, but without the occurrence of the crime, can be made and shown to these
subjects, e.g., for an armed bank robbery, one could depict an ordinary excursion to the bank.

Finally, the videotaped crime has more flexibility. It is now possible to investigate the relative salience of different crimes in detection of deception. Studies can be designed to discover if any aspects of crimes lead to easier detection than others and also, more importantly, whether the repeated offenses of similar or different crimes by the same individual actually reduce the probability of that individual being detected in a polygraphic interrogation.

Post-hoc Findings:

The use of different lengths of interrogation protocol should be studied further. Although the data from Figure 11 suggests that a more optimal length of five questions for the protocol would yield better differentiation, post-hoc analyses did not support this. Hit rates were equivalent in both situations. If more studies come to the same conclusion, there would still be a case for shortening interrogation time, if only for the sake of time efficiency.

Future studies should look at the personality dimensions that were found to be significantly correlated with guilt scores and the number of scorable questions. These include measures of well-being, ambition and hard work for the number of scorable questions and measures of social potency, absorption (hypnotic susceptibility) and tendency to claim unlikely virtues for the guilt score.
Although these findings are at best tentative, they do indicate possible directions for future studies.

Conclusion:

This study was designed to incorporate a few changes into the laboratory study of detection of deception and also to attempt a replication of the Waid et al. (1981) study. The innovations to the methodology of the study, which comprised a crime videotape and a validated interrogation protocol, proved to be quite successful. No drug effects were found though with the medications and doses employed in this study. It is felt that further investigations would be necessary to determine if indeed these drugs can have an effect on the human autonomic nervous system.
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APPENDIX A
CRIME QUESTIONNAIRE

Male _______ Female _______

1. If you are guilty of this crime, then you know the number of the apartment that was burglarised. Was it
   a) 418?
   b) 206?
   c) 112?
   d) 307?
   e) 502?

2. A radio-alarm clock was stolen from the apartment. If you are the guilty person, then you know where in the apartment this radio was located. Was it on
   a) the floor?
   b) a night-table?
   c) the dresser?
   d) the stereo?
   e) the kitchen counter?

3. Some stereo equipment was taken from this apartment. If you are the guilty person, then you know what this stereo equipment was. Was it
   a) speakers?
   b) a cassette deck?
   c) a turntable?
   d) an amplifier?
   e) a receiver?

4. There was a poster on one of the walls of the apartment that depicted one or more people engaged in a sport. If you are the guilty person, then you know what sport was represented in the poster. Was it
   a) basketball?
   b) skiing?
   c) tennis?
   d) sky diving?
   e) windsurfing?

5. Something that was on the speaker close to the chair in the living room was stolen. If you are the guilty person, then you know what was stolen. Was it
   a) a lamp?
   b) a book?
   c) a brass urn?
   d) some binoculars?
   e) a jewelry box?

6. A musical instrument was taken from the apartment. If you are the guilty person, then you know what that instrument was. Was it
   a) a recorder?
   b) a guitar?
   c) an harmonica?
   d) a flute?
   e) a violin?
7. If you are the guilty person, then you would have noticed an unusual object on the bookcase. Was it
   a) a baby doll?
   b) a piggy bank?
   c) a rubber duck?
   d) a model airplane?
   e) a stethoscope?

8. There was a travel poster on one of the walls of the apartment. If you are the guilty person, then you know which country was depicted in the poster. Was it
   a) Italy?
   b) Japan?
   c) Mexico?
   d) Spain?
   e) Morocco?

9. Something valuable was taken from the dining room table. If you are the guilty person, then you know what this valuable item was. Was it
   a) a television?
   b) an antique clock?
   c) a stamp collection?
   d) a gold pen?
   e) silver candlesticks?

10. Some jewelry was stolen from the apartment. If you are the guilty person, then you know what was stolen. Was it
   a) a brooch?
   b) a pearl necklace?
   c) jade earrings?
   d) a cross and chain?
   e) a diamond ring?

11. Something was stolen from a wallet found in the apartment. If you are the guilty person, then you know what was stolen from the wallet. Was it
   a) a photograph?
   b) a key?
   c) money?
   d) credit cards?
   e) a blank cheque?

12. Another item was stolen from the apartment. If you are the guilty person, then you know what that is. Was it
   a) a toaster?
   b) stereo headphones?
   c) a coin bank?
   d) a portable typewriter?
   e) a marble statuette?
13. Something was deliberately broken during the commission of the crime. If you are the guilty person, then you know what was broken. Was it a

a) window?
b) clock?
c) bottle?
d) lamp?
e) picture frame?

14. If you are the guilty person, then you know the approximate time of the crime. Was it

a) 12:30?
b) 3:00?
c) 2:45?
d) 1:20?
e) 11:15?

15. A camera was stolen from the apartment. If you are the guilty person, then you know what brand of camera it was. Was it

a) Yashica?
b) Nikon?
c) Canon?
d) Minolta?
e) Pentax?

16. Something was stolen from a bag in the closet. If you are the guilty person, then you know what that was. Was it

a) a travel kit?
b) a microphone?
c) a passport?
d) traveller's cheques?
e) plane tickets?

17. If you are the guilty person, then you know what was stolen from the closet. Was it

a) a yogurt-maker?
b) an electric drill?
c) a fur coat?
d) a slide projector?
e) a gun?

18. Some sporting equipment was taken from the apartment. If you are the guilty person, then you know what was taken. Was it

a) a motorcycle helmet?
b) a tennis racket?
c) ski boots?
d) a down vest?
e) a baseball glove?
19. An act of vandalism was committed during the course of the crime. If you are the guilty person, then you know what happened. Was it that

a) some crystal glasses were broken?
b) a message was written on the wall?
c) books were thrown on the floor?
d) some liquor was spilled on the carpet?
e) the contents of some drawers were thrown about?
**NUMBER OF ITEMS CORRECTLY GUESSED**

**FREQUENCY OF CORRECT GUESSING PER ITEM:**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>F(OUT OF 20)</th>
<th>ITEM</th>
<th>F(C/20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
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<td>2</td>
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<td>21</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>22</td>
<td>11</td>
</tr>
</tbody>
</table>

*N = 20*
CRIME QUESTIONNAIRE

MALE _______ FEMALE _______

Please print your answers legibly.

1. Apartment number: ______________________

2. Location of radio-alarm clock: ______________________

3. Stolen stereo equipment: ______________________

4. Sports Poster: ______________________

5. Stolen item: ______________________

6. Stolen musical instrument: ______________________

7. Unusual object on bookcase: ______________________

8. Travel Poster: ______________________

9. Stolen Item: ______________________

10. Stolen Jewelry: ______________________

11. Stolen Item from Wallet: ______________________

12. Stolen Item: ______________________

13. Broken Item: ______________________


15. Brand name of camera: ______________________

16. Stolen item from bag: ______________________

17. Stolen item from bottom closet: ______________________

18. Sporting equipment: ______________________

19. Act of vandalism: ______________________

20. Stolen credit cards: ______________________
<table>
<thead>
<tr>
<th>ITEM</th>
<th>F((/36))</th>
<th>ITEM</th>
<th>F((/36))</th>
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</thead>
<tbody>
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<td>36</td>
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<td>30</td>
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<td>5</td>
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<td>15</td>
<td>32</td>
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<td>6</td>
<td>35</td>
<td>16</td>
<td>29</td>
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<td>7</td>
<td>16</td>
<td>17</td>
<td>23</td>
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<td>8</td>
<td>30</td>
<td>18</td>
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<td>9</td>
<td>31</td>
<td>19</td>
<td>30</td>
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<tr>
<td>10</td>
<td>31</td>
<td>20</td>
<td>36</td>
</tr>
</tbody>
</table>

\(\bar{x} = 17.03\)

\(N = 36\)
INTERROGATION PROTOCOL

1. If you are guilty of this crime, then you know the number of the apartment that was burglarized. Was it...
   a) 418?
   b) 206?
   c) 112?
   d) 307?
   e) 502?

2. A radio-alarm clock was stolen from the apartment. If you are guilty of this crime, then you know where in the apartment this radio was located. Was it...
   a) on the floor?
   b) on the stereo?
   c) on the dresser?
   d) on a night-table?
   e) on the kitchen counter?

3. Something that was on the speaker close to the chair in the living room was stolen. If you are the guilty person, then you know what was stolen. Was it...
   a) a lamp?
   b) a book?
   c) a brass urn?
   d) some binoculars?
   e) a jewelry box?

4. A musical instrument was taken from the apartment. If you are the guilty person, then you know what that instrument was. Was it...
   a) a recorder?
   b) a guitar?
   c) a harmonica?
   d) a flute?
   e) a violin?

5. Something valuable was taken from the dining room table. If you are the guilty person, then you know what that valuable item was. Was it...
   a) a television?
   b) an antique clock?
   c) a stamp collection?
   d) a gold pen?
   e) silver candlesticks?

6. Some jewelry was stolen from the apartment. If you are the guilty person, then you know what was stolen. Was it...
   a) a brooch?
   b) a pearl necklace?
   c) jade earrings?
   d) a cross and chain?
   e) a diamond ring?
A 5 cont'd:

7. Something was stolen from a wallet found in the apartment. If you are the guilty person, then you know what was stolen from the wallet.
   Was it...
   a) a photograph?
   b) a key?
   c) money?
   d) a blank cheque?
   e) credit cards?

8. Something was deliberately broken during the commission of the crime.
   If you are the guilty person, then you know what was broken. Was it...
   a) a window?
   b) an alarm clock?
   c) a bottle?
   d) a lamp?
   e) a picture frame?

9. A camera was stolen from the apartment. If you are the guilty person, then you know what brand of camera it was. Was it...
   a) a Yashica?
   b) a Nikon?
   c) a Pentax?
   d) a Minolta?
   e) a Canon?

10. Some sporting equipment was taken from the apartment. If you are the guilty person, then you know what was taken. Was it...
    a) a motorcycle helmet?
    b) a tennis racket?
    c) ski boots?
    d) a down vest?
    e) a baseball glove?
APPENDIX B
AVAILABILITY FORM

Participation in this study will require approximately 2 hours of your time. Please indicate below possible 2-hour time blocks during which you are available; e.g., Monday, 12:30 to 3:30 p.m.

If you are also available during the early evening or on the weekend (days only), please indicate this.

I am free at the following times:

<table>
<thead>
<tr>
<th></th>
<th>morning</th>
<th>afternoon</th>
<th>early evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
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<td></td>
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<tr>
<td>Tuesday</td>
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<td></td>
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<tr>
<td>Wednesday</td>
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<td>Thursday</td>
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<td>Friday</td>
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<td></td>
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<tr>
<td>Saturday</td>
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<td></td>
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<tr>
<td>Sunday</td>
<td></td>
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<td></td>
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</tbody>
</table>

Please indicate times.

I can be reached at the following number(s) at the following time(s):

phone number: ______________________, time: ______________________

phone number: ______________________, time: ______________________

NAME (please print legibly): ______________________
University of British Columbia
Medical Survey

In order that you may safely participate in this study, we need to have some information about your general health. Please answer the following questions by filling in the blank, or putting a tick in the appropriate box. Thank you for your cooperation. All information will be kept confidential.

1. In the past two years, have you been under the care of a physician for any medical condition(s)?
   If yes, and if known, what is (are) the condition(s)?
   [ ] Yes [ ] No

2. Have you ever been under a doctor's care for emotional or nervous problems (depression, anxiety, etc.)?
   If yes, are you currently in treatment?
   [ ] Yes [ ] No

3. Have you ever had any unusual drug reactions, drug allergies, or allergies of any kind?
   [ ] Yes [ ] No

4. Have you ever had any of the following conditions:
   Seizures or loss of consciousness?
   [ ] Yes [ ] No
   Persistent headaches?
   [ ] Yes [ ] No
   Head injury with loss of consciousness?
   [ ] Yes [ ] No
   Dizziness?
   [ ] Yes [ ] No
   Problems with vision or glaucoma?
   (excluding near- or far-sightedness)
   [ ] Yes [ ] No
   Persistent muscle weakness (myasthenia)?
   [ ] Yes [ ] No

5. How many drinks of alcohol do you have each week on average? (Give numbers for a, b, and c.)
   a) _________ bottles of beer/week
   b) _________ glasses of wine/week
   c) _________ 1.5 ounce glasses of liquor/week
6. Do you use the following drugs? About how often?

<table>
<thead>
<tr>
<th>Drug Type</th>
<th>NEVER</th>
<th>ONCE A YEAR</th>
<th>ONCE A MONTH</th>
<th>ONCE A WEEK</th>
<th>DAILY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Major tranquilizers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Mellaril, Thorazine, Largactil, Stelazine, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>b) Minor tranquilizers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Valium, Librium, Serax, Librax, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Barbiturates/sedatives</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Amytal, Nembutal, Phenobarbitol, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Amphetamines, stimulants</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Benzedrine, Biphetamine, Ritalin, Desoxyn, Dexedrine, Methedrine, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Others (Hashish, Cocaine, Hallucinogens) - Underline appropriate choices or specify:</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
INSTRUCTIONS: Please picture yourself doing each of the following tasks (e.g., throwing something, using scissors, striking a match) and then decide how strongly you prefer to use your right (or left) hand for the purpose. Score yourself 1 to 5 on each item, using the scale shown below.

<table>
<thead>
<tr>
<th>/1/</th>
<th>/2/</th>
<th>/3/</th>
<th>/4/</th>
<th>/5/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left hand only</td>
<td>Left hand preferred</td>
<td>Either hand (no preference)</td>
<td>Right hand preferred</td>
<td>Right hand only</td>
</tr>
</tbody>
</table>

EXAMPLE: In using a broom, I usually have my right hand on the handle above my left, but not always. Hence, I score myself '4' on this item.

1. Writing
2. Drawing
3. Throwing
4. Scissors
5. Toothbrush
6. Knife (without fork)
7. Spoon
8. Broom (upper hand)
9. Striking Match (hand holding match)
10. Opening Box (hand holding lid)

TOTAL

How do you write? (see picture)

LN LI RI RN
(Circle one)
RATING OF DRUG STATUS

A. BEFORE THE INTERROGATION:

I feel that the subject has taken:

a) Some drug: 1 2 3 4 5
   yes probably unsure probably not no
b) Diazepam: 1 2 3 4 5
   yes probably unsure probably not no
c) Methylphenidate: 1 2 3 4 5
   yes probably unsure probably not no

B. AFTER THE INTERROGATION:

I feel that the subject has taken:

a) Some drug: 1 2 3 4 5
   yes probably unsure probably not no
b) Diazepam: 1 2 3 4 5
   yes probably unsure probably not no
c) Methylphenidate: 1 2 3 4 5
   yes probably unsure probably not no
RECALL OF CRITICAL KNOWLEDGE - A

Subject I.D. #: ____________________________

Please answer the following questions to the best of your ability. If you are not sure about an answer, write it down anyways.

1. What was the number of the apartment that was broken into?
   ANSWER: ________________________________

2. A radio-alarm clock was stolen from the apartment. Where, in the apartment, was this radio-alarm clock located?
   ANSWER: ________________________________

3. There was a poster on one of the walls of the apartment that depicted one or more people engaged in a sport. What was that sport?
   ANSWER: ________________________________

4. Something that was on the speaker close to the chair in the living room was stolen. What was it?
   ANSWER: ________________________________

5. A musical instrument was taken from the apartment. What was it?
   ANSWER: ________________________________

6. There was an unusual object on the bookcase. What was it?
   ANSWER: ________________________________

7. There was a travel poster on one of the walls of the apartment. Which country was depicted?
   ANSWER: ________________________________

8. Something valuable was taken from the dining room table. What was it?
   ANSWER: ________________________________

9. Some jewelry was stolen from the apartment. What was it?
   ANSWER: ________________________________

10. Something was stolen from a wallet found in the apartment. What was it?
    ANSWER: ________________________________

11. Something was deliberately broken during the commission of the crime. What was it?
    ANSWER: ________________________________
12. At what time, approximately, did the crime take place?
   ANSWER: ____________________________

13. A camera was stolen from the apartment. What brand of camera was it?
   ANSWER: ____________________________

14. What was stolen from the bottom right-hand corner of the closet?
   ANSWER: ____________________________

15. Some sporting equipment was taken from the apartment. What was it?
   ANSWER: ____________________________
RECALL OF CRITICAL KNOWLEDGE - B

PART I - Please attempt to figure out the correct alternative to each of the following questions. Circle the appropriate choice. Do not leave any questions unanswered.

1. What was the number of the apartment that was broken into?
   a) 418
   b) 206
   c) 112
   d) 307
   e) 502

2. A radio-alarm clock was stolen from the apartment. Where, in the apartment, was this radio-alarm clock located? Was it on
   a) the floor?
   b) a night-table?
   c) the dresser?
   d) the stereo?
   e) the kitchen counter?

3. Something that was on the speaker close to the chair in the living room was stolen. What was it?
   a) a lamp?
   b) a book?
   c) a brass urn?
   d) some binoculars?
   e) a jewelry box?

4. A musical instrument was taken from the apartment. Was it
   a) a recorder?
   b) a guitar?
   c) an harmonica?
   d) a flute?
   e) a violin?

5. Something valuable was taken from the dining room table. Was it
   a) a television?
   b) an antique clock?
   c) a stamp collection?
   d) a gold pen?
   e) silver candlesticks?

6. Some jewelry was stolen from the apartment. Was it
   a) a brooch?
   b) a pearl necklace?
   c) jade earrings?
   d) a cross and chain?
   e) a diamond ring?
7. Something was stolen from a wallet found in the apartment. Was it
   a) a photograph?
   b) a key?
   c) money?
   d) a blank cheque?
   e) credit cards?

8. Something was deliberately broken during the commission of the crime. Was it
   a) a window?
   b) a clock?
   c) a bottle?
   d) a lamp?
   e) a picture frame?

9. A camera was stolen from the apartment. What brand of camera was it?
   a) Yashica?
   b) Nikon?
   c) Pentax?
   d) Minolta?
   e) Canon?

10. Some sporting equipment was taken from the apartment. Was it
    a) a motorcycle helmet?
    b) a tennis racket?
    c) ski boots?
    d) a down vest?
    e) a baseball glove?

**PART II** - The following questions pertain to the film segment which you did see. Please answer the following questions to the best of your ability.

1. What was the number of the apartment that you visited?
   ANSWER: ________________________________

2. What unusual object did you see on the bed?
   ANSWER: ________________________________

3. What time did the alarm clock on the dresser indicate?
   ANSWER: ________________________________

4. One of the water faucets in the apartment was dripping. Which faucet was it?
   ANSWER: ________________________________
5. How many pots were on the stove in the kitchen?
     ANSWER: ________________________________

6. What was lying on top of the stereo, next to the plant?
     ANSWER: ________________________________

7. Was the television set turned on or off?
     ANSWER: ________________________________

8. What unusual object did you see between the dining room table and the stereo?
     ANSWER: ________________________________

9. How many people had eaten at the dining room table?
     ANSWER: ________________________________

10. What was written on the last sign that you saw after leaving the apartment?
     ANSWER: ________________________________
EXAMINER ATTRIBUTE RATING

Subject I.D. #: ____________________________

Please circle the number corresponding to your choice of an answer for each of the following two questions.

1. How confident are you that this lie detection technique can accurately detect guilt or innocence? (Circle one alternative.)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>not at all confident</td>
<td>not very confident</td>
<td>mildly confident</td>
<td>fairly confident</td>
<td>very confident</td>
<td></td>
</tr>
</tbody>
</table>

2. Given that this technique is accurate, how much confidence did you have in the skill of the polygrapher? (Circle one alternative.)

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<tr>
<th></th>
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<tbody>
<tr>
<td>not at all confident</td>
<td>not very confident</td>
<td>mildly confident</td>
<td>fairly confident</td>
<td>very confident</td>
<td></td>
</tr>
</tbody>
</table>

3. How confident are you that the polygrapher was truly blind: i.e., unaware of which film you had seen before he started interrogating you? (Circle one alternative.)

<table>
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<tbody>
<tr>
<td>not at all confident</td>
<td>not very confident</td>
<td>mildly confident</td>
<td>fairly confident</td>
<td>very confident</td>
<td></td>
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</tbody>
</table>

4. Drug Status: I feel that I have been given (circle one alternative for each category):

- **a. Some drug:** (Valium or Ritalin) yes probably unsure probably not no

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<th>3</th>
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<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Valium or Ritalin) yes</td>
<td>probably</td>
<td>unsure</td>
<td>probably not</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>

- **b. Valium:** (a mild tranquilizer) yes probably unsure probably not no

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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a mild tranquilizer) yes</td>
<td>probably</td>
<td>unsure</td>
<td>probably not</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>

- **c. Ritalin:** (a mild stimulant) yes probably unsure probably not no

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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a mild stimulant) yes</td>
<td>probably</td>
<td>unsure</td>
<td>probably not</td>
<td>no</td>
<td></td>
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</tbody>
</table>
APPENDIX D
Consent Form

I have been asked to participate in a study in which I will be asked to perform a certain task. I may also be asked to ingest a pill. The pill will either be a placebo which contains no drug or a completely safe, active medication that may exert a very mild sedating or stimulating effect. Afterwards, my body’s physiological responses will be recorded while I respond to some questions. Electrodes will be attached to my fingertips to measure skin conductance and on my arms or chest to measure heart rate. A belt around my chest will monitor respiration. I understand that there is nothing dangerous or harmful about these procedures and that all information obtained in this project will be kept confidential and used only for the purposes of this study. By signing this form, I agree to participate although I realize I am free to withdraw from the study at any time without prejudice.

At the conclusion of this experiment, you will still, to some extent, be under the influence of the medication we have given you. During this time, you should avoid hazards that require mental alertness such as operating machinery or driving a motor vehicle. Also, you should refrain from taking any other drugs or alcohol.

Signature ______________________________________

Date __________________________________________

Study I.D.# ___________________________________
APPENDIX E1

You are about to see a videotape showing the inside of an apartment. Your task is to watch this film segment as carefully as possible. You are to pay as much attention as possible to all details shown. Notice where things are located and the general layout of the apartment. Your memory for such details may be tested afterwards and you may also be eligible to get some money in return for good recall.
APPENDIX E2

Unfortunately, you match the description of someone who burglarized an apartment and stole some objects. The police have picked you up. They have no hard evidence that you committed this crime, so they have informed you that if you can pass a lie detector test, they will let you off the hook.

In one half-hour, a polygrapher will accuse you of the crime and take you to a room where he will attach you to a lie detector. It is very important that you don't mention anything of what has happened so far to the polygrapher when he comes to get you. Please do not ask him any questions.

If you succeed in appearing innocent on the lie detection test, not only will you regain your reputation, but you will also earn $5.00.

THE END
TAPE B - INSTRUCTIONS

Now that the film is finished and you've turned off the television and playback unit, please go get the polygrapher in the coffee room (486) which is 2 doors down to your right. He has a few personality tests he wants you to fill out before he interrogates you. Be sure not to mention anything of what you have seen. All your questions will be answered at the end of the experiment.

Please go get the polygrapher right away.

GOOD LUCK.

P.S. Tear this sheet up and throw it in the wastebasket.
APPENDIX E

We are presently living under difficult economic times. Money is hard to come by; jobs are scarce and difficult to obtain. You have decided that you are waisting your time as a student and would do better to apply your talents to another type of occupation. It is for this reason that you have decided to do an apprenticeship with a master thief. You are not the only student who has decided to do this; there is a lot of competition. In order to test your worth as a thief, the master thief has asked you to burglarize an apartment which he has previously cased. To succeed as an apprentice and be guaranteed a profitable career as a thief, you should steal only valuable items that will be difficult to trace. Besides carrying out the theft, you must also pay careful attention to where things are located and the general layout of the apartment. When you report back to the master thief, he will ask you questions about the apartment and about the stolen items.

E videotape you are about to watch depicts your burglary of this apartment. By watching this tape carefully and letting yourself go, it will be as though you are seeing the crime as if you are actually committing it. Let yourself go and imagine that you are about to break into an apartment and rob it. If you perform your task well, you will not only succeed as an apprentice, but you will also earn a bonus of $5.00.

GOOD LUCK
APPENDIX E

Unfortunately, a resident of the apartment building you just burglarized told the police he noticed someone meeting your description in the building at the time of the crime. The police have picked you up. They have no evidence that you committed the crime, so they have informed you that if you can pass a lie detector test, they will let you off the hook.

So, you have been accused of the crime. In a short while, a polygrapher will attach you to a lie detector machine and ask you questions relating to the crime you have committed. Of course, you must appear innocent during the interrogation. It has been shown that some people can control their physiological responses well enough to fool the lie detector. In order to help you achieve this goal, the master thief has sent you a drug that may help you to escape detection. This capsule is in the white envelope that you were given earlier.

When you see the polygrapher, it is important that you not mention anything about the fact that you have just taken a pill. You must be very careful not to give yourself away. You can best do this by not asking any questions.

The master thief has decided that he will give one of the stolen objects to the person who, while remembering the most details later on, appears the most innocent during the interrogation. So, on top of the $5.00 you can earn by remembering details of the crime, you might also win something valuable. You have a half-hour resting period
before the polygrapher appears.

THE END
Now that the film is finished and you've turned off the television and playback unit, please take the capsule included in this envelope. It will help you fool the lie detector test and give you a better chance at winning that special prize. You will find a water container and some paper cups on the desk.

As soon as you have taken the capsule, go get the polygrapher in the coffee room (436) which is 2 doors down to your right. He has a few personality tests he wants you to fill out before he interrogates you. Be sure not to mention anything about what you have seen, and don't mention taking the capsule. All your questions will be answered at the end of the experiment.

GOOD LUCK.

P.S. Tear this sheet up and throw it in the wastebasket.
APPENDIX F
If your percentile score is low (i.e., <50), then the description on the left applies more to you.

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Scale A - Low</th>
<th>Scale A - High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Does not seem particularly optimistic or happy. Does not seem to enjoy himself a great deal.</td>
<td>Is happy, content, and optimistic. Enjoys life and the things he is doing. Is interested in a lot of things.</td>
</tr>
<tr>
<td></td>
<td>Scale B - Low</td>
<td>Scale B - High</td>
</tr>
<tr>
<td></td>
<td>Scale C - Low</td>
<td>Scale C - High</td>
</tr>
<tr>
<td></td>
<td>Often prefers to be alone. Seems to keep people at a distance. Keeps thoughts and feelings to himself.</td>
<td>Enjoys being with people. Seeks close relationship with others. Shares feelings and experiences with others.</td>
</tr>
<tr>
<td></td>
<td>Scale D - Low</td>
<td>Scale D - High</td>
</tr>
<tr>
<td></td>
<td>Is not assertive. Does not seek leadership roles. Does not like to be the center of attention.</td>
<td>Is assertive. Takes the initiative in social situations. Is good at persuading people. Enjoys being the center of attention.</td>
</tr>
<tr>
<td></td>
<td>Scale E - Low</td>
<td>Scale E - High</td>
</tr>
<tr>
<td></td>
<td>Scale F - Low</td>
<td>Scale F - High</td>
</tr>
<tr>
<td></td>
<td>Scale G - Low</td>
<td>Scale G - High</td>
</tr>
<tr>
<td></td>
<td>Scale H - Low</td>
<td>Scale H - High</td>
</tr>
<tr>
<td></td>
<td>Is not turned on by art, music, nature. Is not particularly interested in fantasy, dreams, and imaginative experience.</td>
<td>Is responsive to music, art, the beauty of nature. Can get involved in imaginative experience and fantasy.</td>
</tr>
</tbody>
</table>