PSYCHOPATHY AND DETECTION OF DECEPTION IN A PRISON POPULATION

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Introduction

Although a number of investigators have conducted lie detection studies with criminals and criminal suspects (e.g., Barland, 1975; Bersh, 1969; Kugelmass, Lieblich, Ben-Ishai, Opatowski, & Kaplan, 1968; Luria, 1932; Marston, 1921), only the Barland study dealt with the problem of the effectiveness of detection of deception with psychopaths. It is well established that individuals diagnosed as psychopathic (sociopathic) are relatively hyporeactive autonomically (Hare, 1970, in press). On the basis of such findings and the commonly-held belief that psychopaths can successfully deceive almost anyone, there are frequent claims that psychopaths can "beat" the polygraph test (Barland & Raskin, 1973; Ferguson & Miller, 1974, p. 215 ff.).

In the Barland (1975) study an attempt was made to determine if psychopaths were more difficult to detect in a situation where criminal suspects were examined using field polygraph techniques. Individuals were referred by prosecutorial, law enforcement, and defense sources for examination concerning the crime of which they were accused. From a sample of 77 such cases, psychopath and nonpsychopath groups were identified using scores obtained from the Minnesota Multiphasic Personality Inventory (MMPI), which was administered prior to the polygraph test. The 15 subjects who scored highest in psychopathy were designated as psychopaths, and the 15 lowest scorers were designated nonpsychopaths. There was no difference in rate of deceptive outcome or magnitude of polygraph scores for the two groups.

There are two important problems which arise in the interprtation of Barland's results. First, the MMPI may not be a very good instrument for diagnosing psycho-

pathy (Hare, 1972). Therefore, it is probably more accurate to identify psychopaths by employing clinical diagnoses similar to those reported by Hare (in press). Second, the Barland study was based on the results of field polygraph examinations in which there was some uncertainty about whether or not the subject was deceptive (ground truth). In order to obtain results in which greater confidence can be placed, it is necessary to have certain knowledge of ground truth as is provided in a laboratory experiment. The present research employed both of the above approaches. Furthermore, field polygraph techniques and a mock crime were utilized in an effort to simulate the field situation.

Method

Subjects

Subjects were obtained from the inmate population of the Lower Mainland Regional Correction Centre in Burnaby, British Columbia. A total of 54 male inmates volunteered for a "lie detection" experiment in which they could win a $20 bonus for successful performance. The subjects were divided into psychopath and nonpsychopath groups on the basis of a clinical diagnosis similar to that described by Hare and Quinn (1971).

Each potential subject's file was obtained from the records center at the prison. The information consisted of reports by correction officers, parole officers, physicians, psychiatrists, psychologists, and social workers as well as copies of letters written by the inmate, background information sheets, criminal records, court transcripts, law enforcement and inmate versions of the offenses, parole applications, and daily log sheets. Using that information, a trained and experienced researcher made a global assessment of the presence

or absence of psychopathy.That diagnosis of psychopathy was based upon the presence of many of the following indicators and the absence of counter-indications:

1. Manipulative behavior — threats of suicide, pseudo-attempts of suicide, pseudo-remorse, playing people against each other, lying, glibness, bogus physical complaints, blaming others, rationalizing own behavior, charming.
2. Impulsivity — sensation-seeking, quick temper (assaults, fights), low frustration tolerance, poor judgment, hedonism, ability to delay gratification.
3. Lack of empathy — crimes against people (fraud, armed robbery, extortion, rape, false pretenses), inability to form stable relationships with others, sexual promiscuity, contempt for others, treats others as objects, parasitical, uses people.
4. Childhood — parental protectiveness against punitive parent or society, early delinquency (especially pre-adolescent), flatness of affect, unable to learn from experience.
5. Counter-indications — genuine suicide attempts, crimes mainly impersonal, stability of family relationships or marriage, genuine remorse, subcultural delinquency, anxiety, stable employment history, concern for others, normal educational history.

Of the 54 volunteers, 4 were discarded because of initial problems with the instructions and question structure, 1 was actively psychotic, and 1 failed to conceal the $20 properly. The remaining subjects consisted of 24 psychopaths (mean age = 23.1 years) and 24 nonpsychopaths (mean age= 26.5 years). Half of each group was randomly assigned to the "guilty" condition, and half was assigned to the "innocent" condition.

Procedure.

When a subject arrived for the experiment, he was met by an assistant who explained the nature of the experiment and administered a number of psychological tests. Then the assistant flipped a coin to determine whether the subject would be in the "guilty" or "innocent" condition. If the subject was in the "guilty" condition, he was told that there was a $20 bill in an envelope in a drawer in a nearby room. That room was normally off-limits to inmates, and a prison guard was stationed outside the door. The subject was instructed to obtain the $20 bill from the envelope when no one was observing him and to hide it in his pocket. He was informed that he would be taken to another room and be given a lie detector test concerning the $20. He was instructed to deny having taken the $20; and if he succeeded in being cleared by the polygraph test, he would win the $20. The "innocent" subjects were informed about the "crime" committed by the "guilty" subjects, and they were also instructed to deny having taken the money. If they successfully demonstrated their truthfulness, they also received a $20 bonus. Thus, all subjects were instructed to deny having taken the money, and all subjects who produced truthful polygraph charts received a $20 bonus. The $20 represented a considerable sum of money to the subjects, since they earned $.75/day for working at a prison job and had no other obvious sources of income.

The subject was then taken to the examination room, where a psychophysiologist trained in field polygraph techniques administered a control-question polygraph examination. The examiner did not know whether the subject was "guilty" or "innocent", or if he was psychopathic. The examination consisted of a pretest interview followed by physiological recordings obtained during the test phase. During the pretest interview the examiner obtained biographical information from the subject, reviewed the questions with the subject, and explained the physiological measures to be obtained and the theory underlying the use of the polygraph for detecting deception.

The polygraph test was a gederal government type of control-question test similar to that employed by Barland and Raskin (in press). It consisted of 10 questions including relevant questions at positions 5, 7, and 10 and control questions at positions 4, 6, and 9. All of the questions except the control questions were the same for each subject. The control questions were adjusted to fit each individual, and their wording was worked out with the subject prior to administering the test. A typical question sequence was as follows:

1. Were you born in Canada?
2. Regarding that $20, do you intend to answer truthfully each question about that?
3. Are you completely convinced I will not ask a question that hasn't been reviewed?
4. Other than what you told me, before you were 18 did you ever steal any money?
5. Did you take that $20?
6. Did you ever steal anything else from someone who trusted you?
7. Did you take that $20 from the drawer?

8. Is your last name _____?

9. Have you ever taken anything of value from an employer?

10. Do you have that $20 now?

Prior to administering the polygraph test the subject was attached to the polygraph, and a number test was conducted in order to adjust the instrument and to demonstrate the effectiveness of the technique to the subject. He was asked to choose a number between "3" and "6", and the number was written on a card and taped on the wall directly in front of where he was seated. He was then told that he would be asked about the number that he had chosen and that he was to anwer "no" to all of the questions. During the test the subject was seated facing away from the examiner and the polygraph, and both subject and experimenter observed the card with the number on it. The examiner then asked a series of questions about numbers from "1" to "7". Following the number test, the subject was informed that everything was working well, and that the results showed a large reaction to the number he had chosen and very little reaction to the other numbers. The subject was then told that the test indicated what his reactions looked like when he was lying and when he was telling the truth, and he was told that he had nothing to worry about as long as he truthfully answered every question on the polygraph test.

The polygraph test concerning the $20 was then administered. It consisted of a minimum of three charts obtained while the 10 questions were asked at a rate of one every 25-35 sec. If the results were not obvious after the third chart, additional charts were obtained up to a maximum of seven charts. If more than three charts were obtained, the fourth chart was a silent answer test in which the subject was instructed to answer silently to himself (Horvath &

Reid, 1972).

Following each chart, the examiner asked the subject if any questions bothered him and if he would like to change the wording of any questions. The attention of all subjects was directed toward the control questions, and it was often necessary to modify the specific wording of one or more control questions following admissions or expressions of concern by the subject. The wording of the relevant questions was never modified. Prior to each chart the subject was cautioned to tell the truth in answering every question. He was told that if he lied to any question, there would be reactions on the chart. That procedure was designed to focus the concern of "innocent" subjects on the control questions and to enhance the concern of "guilty" subjects with regard to the relevant questions. After the last chart had been obtained, a field-type numerical evaluation of the charts was performed by the examiner (Barland & Raskin, in press), and a decision was made on the basis of that score as described below.

Apparatus.

A Beckman Type R Dynograph was used to record the physiological activity at a chart speed of 2.5mm/sec. The amplitude of recordings was adjusted to provide pen excursions of approximately 1.5 - 3 cm in most cases. Thoracic and abdominal respiration recordings were obtained from pneumatic tubes positioned around the upper thorax and abdomen. Each pneumatic tube was attached to a Grass PT5A Volumetric Pressure Transducer, and the signal from that was fed into a Beckman 9853A Voltage/Pulse/Pressure coupler. Skin conductance (SC) was obtained from electrodes placed on the thenar and hypothenar eminences of

the left hand and connected to a Beckman 9842 Galvanic Skin Response Coupler, which imposed .5V across the electrodes. The recordings were made using a 22-sec time constant. Skin potential (SP) was obtained from an active electrode placed on the thenar eminence of the right hand and an inactive electrode positioned approximately 4 cm below the elbow on the volar surface of the forearm. The skin beneath the inactive site was vigorously rubbed with an alcohol-dampened, coarse tissue until a local erythema was produced. A time constant of 17 sec was utilized. Heart rate (HR) was obtained from electrodes attached to the right wrist and left ankle (EKG Lead II) and connected to a Beckman 9857 cardiotachometer Coupler. Due to equipment malfunction, considerable HR data were lost, and the HR data are not reported here. All of the electrodes were Beckman Biopotential filled with .05M NaCl in a cornstarch paste and attached with Beckman adhesive collars. Prior to electrode application each site was cleaned with 95% ethanol. Vasomotor activity was recorded from the left thumb using a photoelectric plethysmography consisting of a Fairchild FPA 104 transducer which consists of a light-emitting diode and a phototransistor. The transducer was placed in an aluminum cyclinder and attached by means of an adhesive collar and masking tape. The signal was fed into a Beckman 9874 Photocell Coupler. Finger pulse amplitude (FPA) was obtained by recording the signal with a .1-sec time constant, and finger blood volume (FBV) was recorded with a 20-sec time constant.

Quantification of the Data.

There were two types of evaluations made on the charts. The first consisted of an on-the-spot, numerical evaluation similar to that employed by the U.S.

Army Military Police School (Barland & Raskin, in press). The criteria for responses were modified to include only those which have been demonstrated to discriminate between truth and deception in laboratory studies (Podlesny & Raskin, 1975). Specifically, the following criteria were used in scoring responses: Respiration— sustained decreases in amplitude, slowing of rate, increases in baseline, apnea; Skin Conductance — increase in SC, multiple responses, increased duration of response; Cardiovascular — decrease in FBV, decrease in FPA, slowing of HR.

Using the above criteria, the responses to control and relevant questions were compared for each type of measure (respiration, skin conductance, cardiovascular) on each chart. The responses to adjacent pairs of control and relevant questions (4-5, 6-7, 9-10) were compared, and a number ranging from +3 to -3 was assigned to each pair for each type of measure on each chart. The sign and size of each such score was determined according to the relative magnitudes of the responses to the control and relevant question in each pair. If the response to the control question was larger, then a positive score was assigned; if the response to the relevant question was larger, a negative score was assigned; and a zero was assigned if there was no difference between the two responses. Whether the response was assigned a value of 1, 2, or 3 was determined by criteria used by USAMPS (1970). The total score was obtained by summing the scores over all question pairs, charts, and measures. If the total score was +6 or higher, the subject was judged to be truthful; if it was -6 or lower, the subject was judged deceptive; and a score between ±6 was considered inconclusive.

The second type of analysis of the charts consisted of an objective quantification of responses by a technician who had no knowledge of the field evaluations or the treatments administered to the subjects. Measurements were made on the responses to each of the three control and three relevant questions on the first three charts obtained from each subject, since all subjects had at least three charts. The following scores were obtained for each of those 18 observations:

1. Thoracic Respiration Amplitude (TRA). The amplitude in mm of the first complete inspiration following the answer to the question was subtracted from the amplitude of the last full inspiration preceding the beginning of the question. This provided an index of change in RA, with positive scores indicating decreases in RA and negative scores indicating increases in RA.
2. Abdominal Respiration Amplitude (ARA). Scores for this measure were obtained from the abdominal tracing in the same manner as those described for TRA.
3. Respiration Cycle Time (RCT). The distance in mm between the points of maximum inspiration for the two respiration cycles following the question was subtracted from the distance between the points of maximum inspiration for the two cycles preceding the onset of the question. This provided an index associated with change in rate of respiration, with positive scores indicating speeding of respiration and negative scores indicating slowing.

4. Skin Conductance Response (SCR). The increase in mm was measured from the onset of the first increase within 1 sec after the beginning of the question to the highest point reached within 5 sec after the answer. The scores were also converted to micromhos. Since the scores expressed in mm yielded slightly more reliable results, they are the only ones reported here.
5. Skin Potential Response (SPR). The change in mv was measured for the first wave which began within the period beginning 1 sec after question onset and ending 5 sec after the answer. If the first wave was a negative wave which was followed by a positive wave, then the change in mv of the positive wave was measured from the highest point reached by the negative wave. Only waves which reached their peak within 3 sec following their onset were considered to be positive waves. That procedure was used to eliminate scoring as positive waves the simple recovery toward baseline following a negative wave.
6. Finger Blood Volume (FBV).The decrease in mm of the diastolic level of the tracing was measured from the highest point within the 4 sec following the onset of the question to the lowest point within 4-14 sec following question onset. Since there was a very large range of gain settings across subjects, all scores were corrected to a common gain.
7. Finger Pulse Amplitutde (FPA). The decrease in FPA was obtained by calculating the difference in mm of the sum of the amplitudes of the two largest adjacent pulses within 4 sec after the onset of the question and the sum of the amplitude of the two smallest adjacent pulses within 4-14 sec after the onset of the question. These values were also corrected to a common gain.

Results[1]

Numerical Evaluations

Accuracy of decisions. Using the total score obtained for all of the charts on each subject and an inconclusive region of ±5 inclusive, 87.5% of the subjects were correctly categorized, 4.2% were incorrectly categorized, and 8.3% were inconclusive. Excluding inconclusives, 95.5% were correctly categorized. Table 1 shows the breakdown of results for "guilty" and "innocent" subjects and for psychopaths and nonpsychopaths.

TABLE I

EXAMINER DECISIONS BASED ON TOTAL NUMERICAL SCORES

	Deceptive	Truthful	Inconclusive
"Guilty"	21	0	3
"Innocent"	2	21	1
	Correct	**Wrong**	**Inconclusive**
Psychopaths	23	1	0
Nonpsychopaths	19	1	4
Combined	42	2	4

Although there were only 2 errors, both of them were false positives, i.e., "innocent" subjects whose polygraph charts indicated deception. With regard to psychopathy, one of the errors occurred on a psychopathic subject and one on a nonpsychopath. It should be noted that no "guilty" subject was

[1] The significance of all results of statistical analyses was evaluated using a .05 rejection region.

able to produce a truthful result. There were no significant differences in accuracy rates for psychopaths and nonpsychopaths.

A post facto manipulation of the cut-offs of the inconclusive region was made for boundaries ranging from zero to ±12, and the results are shown in Fig. 1 in terms of percent accuracy of decision and percent inconclusives for the "guilty" and "innocent" groups. When the inconclusive region was limited to scores of zero, 96% of the "guilty" subjects and 88% of the "innocent" subjects were correctly categorized, and there were no inconclusives. With boundaries of ±2 there was maximal accuracy of decisions combined with a relatively low rate of inconclusives. As the boundaries of the inconclusive region were widened, there was no improvement in accuracy of decisions and the percent of inconclusive cases eventually increased dramatically. It appears that the optimal boundaries are somewhere in the region of ±2 to ±4. At any point in that region there were no false negatives, 9% false positives, and 6% inconclusives.

Effectiveness of numerical scores. Since all subjects had at least three charts, the total numerical scores for the first three charts were compared for "guilty" and "innocent" for psychopaths and nonpsychopaths. The mean scores for those groups are shown in Table 2.

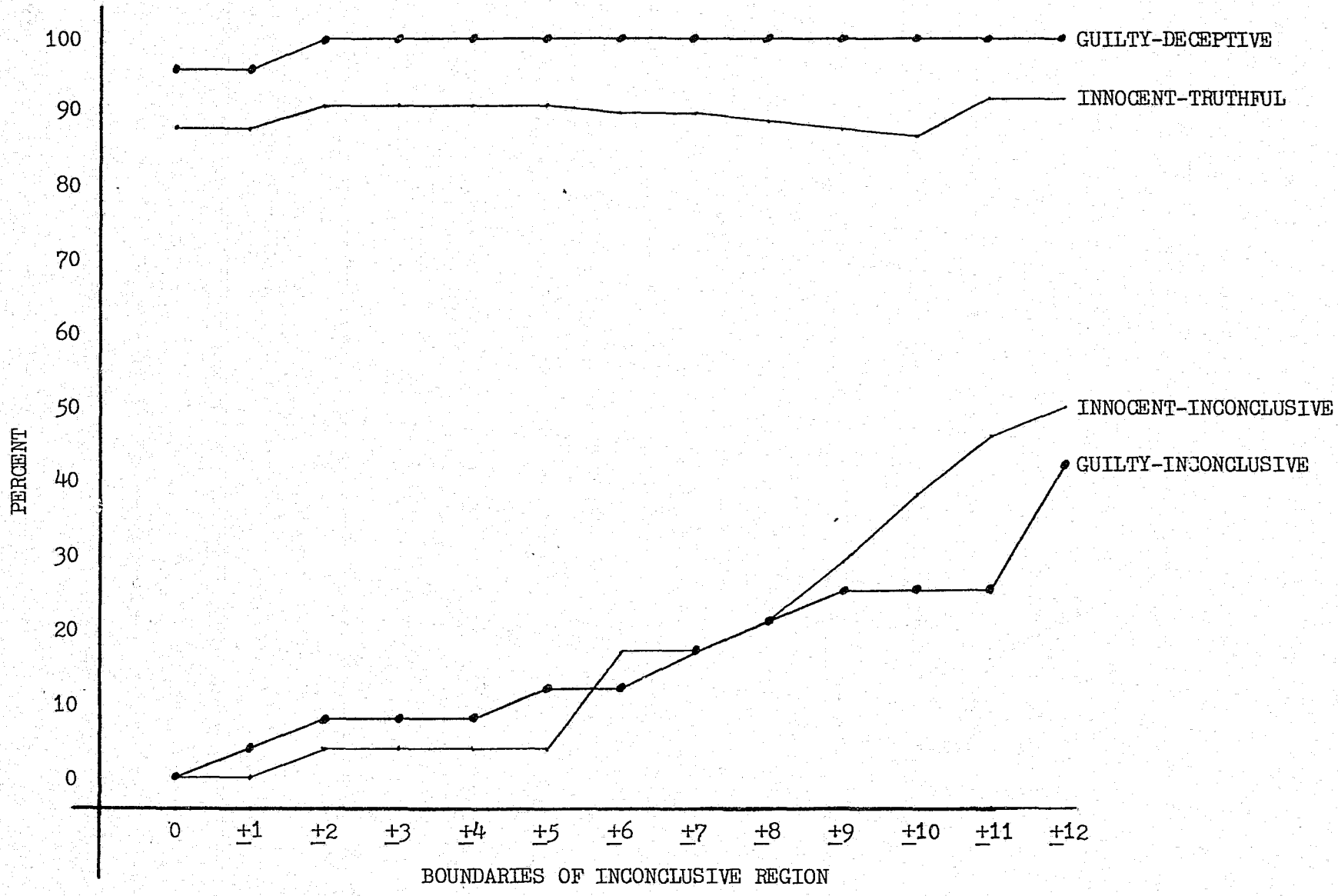

Fig. 1. ACCURACY OF DECISIONS AND PERCENT INCONCLUSIVES FOR DIFFERENT INCONCLUSIVE REGIONS IN A CRIMINAL POPULATION.

TABLE 2

MEAN TOTAL SCORES FOR THREE CHARTS

	Psychopaths	Nonpsychopaths	Combined
"Guilty"	-13.1	-9.2	-11.1
"Innocent"	+ 9.7	-9.2	+ 9.2

Analysis of variance indicated that the mean scores of -11.1 for all "guilty" subjects and +9.2 for all "innocent" subjects showed reliable discrimination between those conditions [F (1/44) = 77.17]. However, there was no reliable difference in the magnitude of scores for psychopaths and nonpsychopaths [F (1/44) = 0.89], nor was there any difference in the magnitude of scores for "guilty" and "innocent" subjects [F (1/44) = 0.53]. Thus, psychopaths and nonpsychopaths showed equally appropriate responses, and the numerical system identified "guilty" and "innocent" subjects with equal power.

Physiological measures. The scores for each of the three types of physiological measures was summed over the first three charts, and the mean total scores for "guilty" and "innocent" psychopaths and nonpsychopaths are shown for each measure in Table 3. The mean total scores for respiration showed significant discrimination between "guilty" and

TABLE 3

MEAN THREE-CHART TOTALS FOR EACH MEASURE

		Psychopaths	Nonpsychopaths	Combined
Respiration	"Guilty"	-2.5	-2.2	-2.3
	"Innocent"	+4.5	+4.2	+4.3
Skin Conductance	"Guilty"	-6.7	-4.9	-5.8
	"Innocent"	+4.7	+2.9	+3.8
Cardiovascular	"Guilty"	-3.9	-2.1	-3.0
	"Innocent"	+0.5	+2.1	+1.3

"innocent" subjects [F (1/44) = 59.06], as did the mean total scores for skin conductance [F (1/44) = 41.26] and cardiovascular [F (1/44)= 22.74]. There was a significant interaction between "Guilty-Innocent" and physiological measures [F (2/88) = 5.06], and a Newman-Keuls test showed that the skin conductance measure produced better discrimination between "guilty" and "innocent" subjects than did the respiration and cardiovascular measures. Additional analyses showed that the means for each measure were significantly different from zero[F (1/44 >4.10]. However, the respiration measure identified "innocent" subjects significantly better than "guilty" subjects [F (1/44)=5.32]. There were no significant differences between psychopaths and nonpsychopaths on any measures, and there were no reliable differences across charts for any

measures.

Quantitative Analyses.

The first three polygraph charts for each subject were analyzed using the procedures previously described. Each of the dependent variables generated in that manner was subjected to analysis of variance. Using the control-question technique, discrimination between "guilty" and "innocent" subjects would be indicated by a significant interaction between "Guilty-Innocent" and Question Type. That prediction is based on the principle that "guilty" subjects should slow larger responses to the relevant questions and "innocent" subjects should respond more strongly to control questions. The predicted interactions were obtained in every dependent variable as described below.

Thoracic respiration amplitude (TRA). The mean decrease in TRA is shown in Table 4. As predicted, the "guilty" subjects showed larger reduction in

TABLE 4

MEAN DECREASE IN THORACIC RESPIRATION AMPLITUDE (TRA) TO RELEVANT AND CONTROL QUESTIONS FOR "GUILTY" AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	.5	1.3
"Innocent"	.3	- .6

TRA to the relevant than to the control questions, whereas, "innocent" subjects showed larger responses to the control as compared to the relevant questions [F (1/44) = 9.77]. The difference in mean responses to the control

and relevant questions was significant for both the "guilty" [$t(44) = 2.18$] and the "innocent" subjects [$t(44) = 2.18$]. Perhaps, even more important was the finding that the "innocent" subjects responded in opposite directions to the control and relevant questions. "Innocent" subjects not only showed a decrease in TRA in response to control questions, but they also showed an increase in TRA following relevant questions. Thus, the TRA response in "innocent" subjects was one of suppression when they were deceptive and increased amplitude of respiration when they were truthful. There was also an overall difference in amount of suppression of TRA in the two groups [$F(1/44) = 6.49$]. The "guilty" subjects produced a mean decrease of .9 in TRA averaged over both types of questions, and the "innocent" subjects showed a mean increase of -.1 in TRA. Thus, the pattern of TRA responses in the two groups was characterized by suppression to both types of questions for the "guilty" subjects and a differential response in "innocent" subjects consisting of suppression to control questions and increased amplitude following relevant questions. There were no meaningful effects associated with psychopathy or charts.

Abdominal respiration amplitude (ARA). The mean decrease in ARA is shown in Table 5. As predicted, the "guilty" subjects showed relatively greater

TABLE 5

MEAN DECREASE IN ABDOMINAL RESPIRATION AMPLITUDE (ARA) TO RELEVANT AND CONTROL QUESTIONS FOR "GUILTY" AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	1.3	1.9
"Innocent"	1.2	.1

decreases in ARA following relevant questions, and the "innocent" subjects showed the reverse [F (1/44) = 8.47]. The difference in mean responses to the control and relevant questions was significant for "innocent" subjects [t (44) = 2.53] but not for the "guilty" subjects [t (44) = 1.51]. Again, there was a significant difference in the overall level of responses by the two groups, with the "guilty" subjects showing an overall mean ARA of 1.6 and the "innocent" subjects producing a mean of only .6 in ARA. There were no reliable affects associated with psychopathy or charts.

Respiration Cycle Time (RCT). Mean changes in RCT are shown in Table 6. As predicted, there was a significant interaction between "Guilty-Innocent"

TABLE 6

MEAN CHANGE IN RESPIRATION CYCLE TIME (RCT) TO CONTROL AND RELEVANT QUESTIONS FOR "GUILTY" AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	.0	-.1
"Innocent"	-.3	.4

and Question type [F (1/44) = 4.60]. However, that effect was mainly due to the differential responses of the "innocent" subjects to the control and relevant questions [t (44) = 2.78]. They showed a slowing of respiration following control questions and a speeding of respiration following relevant questions. There was not a differential response by the "guilty" subjects [t (44) = .25]. As with

the TRA measure, the "innocent" subjects responded in the opposite directions of slowing of respiration following deception and speeding of respiration following truthfulness. There were no reliable affects associated with psychopathy and no meaningful changes across charts.

Skin Conductance Response (SCR). The mean SCRs to control and relevant questions are presented in Table 7. As predicted, there was a significant

TABLE 7

MEAN SCR TO CONTROL AND RELEVANT QUESTIONS

FOR "GUILTY" AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	10.7	17.0
"Innocent"	12.2	10.2

interaction between "Guilty-Innocent" and Question type [F (1/44) = 34.52]. The "guilty" subjects showed significantly larger SCRs to the relevant questions [t (44) = 6.34], and the "innocent" subjects showed significantly larger SCRs to control questions [t (44) = 1.99]. There was a significant overall effect of Question type [F (1/44) = 9.40] which was accounted for by the disproportionately large SCRs to the relevant questions in the "guilty" subjects. There were no reliable affects produced by psychopathy or charts.

Skin Potential Response (SPR). The mean negative and positive SPRs are shown in Table 8. As predicted, there were significant interactions between "Guilty-Innocent" and Question Type for both negative SPR [F (1/44) = 12.01]

TABLE 8

MEAN POSITIVE AND NEGATIVE SPR TO CONTROL AND RELEVANT QUESTIONS IN "GUILTY" AND "INNOCENT" SUBJECTS

	Negative		Positive	
	Control	Relevant	Control	Relevant
"Guilty"	4.2	6.2	4.8	8.0
"Innocent"	5.7	5.5	6.3	7.1

and positive SPR [F (1/44) = 7.56]. In both measures, the effects were mainly due to the relatively larger responses to the relevant questions by the "guilty" subjects. The significant overall effects of Question Type for negative SPR [F (1/44) = 8.04] and positive SPR [F (1/44) = 22.44] further demonstrated the stronger eliciting value of the relevant questions. In addition, there was a significant interaction between Psychopathy and Question Type in the positive SPR [F (1/44) = 5.98], which produced the disproportionately larger reactions of the psychopaths to the relevant questions. The mean responses of psychopaths and nonpsychopaths are shown in Table 9. It can be seen that the psychopaths

TABLE 9

MEAN POSITIVE SPR OF PSYCHOPATHS AND NONPSYCHOPATHS TO CONTROL AND RELEVANT QUESTIONS

	Control	Relevant
Psychopath	6.2	9.2
Nonpsychopath	4.9	5.8

showed significantly larger positive SPRs to the relevant questions [t (44) = 5.08], whereas there was no reliable difference in response to the two types of questions for the nonpsychopaths [t (44) = 1.62]. There were also significant decreases in positive SPR across charts [F (2/88) =24.49], which were accounted for by larger positive SPRs to the relevant as compared to the control questions on the first chart [F (2/88) = 10.05].

Finger Blood Volume (FBV). Decreases in FBV produced the predicted interaction between "Guilty-Innocent" and Question Type [F (1/44) = 4.15]. The mean decrease in FBV is shown in Table 10. The "guilty" subjects showed relatively

TABLE 10

MEAN DECREASE IN FBV TO CONTROL AND RELEVANT QUESTIONS FOR "GUILTY" AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	5.6	6.7
"Innocent"	6.4	5.8

larger decreases in FBV to relevant questions, and the "innocent" subjects showed relatively larger responses to control questions. There was also a significant decrease in FBV responses across charts [F (2/88) = 8.87]. There were no effects associated with psychopathy.

Finger Pulse Amplitude (FPA). The decrease in FPA also produced the predicted interaction between "Guilty -Innocent" and Question Type [F (1/44) = 7.53] and an overall effect of Question Type [F (1/44) = 9.64]. The mean responses are shown in Table 11.

TABLE 11

MEAN DECREASES IN FPA TO CONTROL AND RELEVANT QUESTIONS FOR "GUILTY AND "INNOCENT" SUBJECTS

	Control	Relevant
"Guilty"	4.9	6.2
"Innocent"	3.8	3.9

The results were due to the differentially greater decrease in FPA to the relevant as compared to control questions for the "guilty" subjects [t (44) = 4.14]. There was no differential response to the two types of questions by the "innocent" subjects [t (44) = .26], and there were no reliable effects associated with psychopathy or charts.

Discussion

The results of this study clearly demonstrate the effectiveness of the control-question technique in detecting deception in a population of prison inmates. Not only was there a 95.5% accuracy rate in decisions rendered, but only 8.3% of the tests yielded inconclusive results. Furthermore, the results strongly support the usefulness of the numerical scoring system developed and used in field situations.

The major predictions generated from the theory underlying control-question tests were all confirmed. Using the numerical scoring system, the "guilty" subjects showed reliably larger reactions to relevant questions, and the "innocent" subjects showed reliably larger reactions to control questions. That was true for each of the three physiological systems, e.g. respiration, skin conductance, and cardiovascular. Those results are in direct contradiction to the erroneous theoretical analysis presented by Lykken (1974).

In his recent paper Lykken (1974) stated that control-question techniques are designed to include control questions to which the subject answers truthfully; if his responses to the control questions are equal to or greater than the relevant questions, then the subject is judged to be truthful on the test. He went on to argue that such a technique could not possibly work very well. Unfortunately, his description of the control questions is wrong with regard to requiring a truthful answer by the subject, and he was also in error when he stated that a truthful result is obtained when responses to control and relevant questions are of equal magnitude. In fact, the results of this study clearly demonstrate the effectiveness of the control-question technique.

The major findings with regard to detectability of psychopaths clearly refute the arguments that psychopaths can defeat the test. Not a single "guilty" subject, either psychopath or nonpsychopath, was able to produce a truthful result. Furthermore, in contrast to the extensive literature reviewed by Hare (in press), psychopaths were at least as responsive as nonpsychopaths and showed some indications of being more responsive in measures of skin potential.

Thus, the commonly-held belief that detection of deception techniques are ineffective with psychopaths (Floch, 1950; Levitt, 1955) appears to be unsupported by the evidence. If psychopaths have succeeded in "beating the lie detector", they have probably succeeded in deceiving the examiner rather than producing truthful results on the polygraph charts (Ferguson & Miller, 1974, p. 217).

There is also a commonly-held belief among polygraph examiners that the infrequent errors which do occur tend to favor guilty persons (Horvath & Reid, 1971). However, the only errors in this study were false positives, i.e. errors of judging "innocent" subjects as deceptive. A similar pattern of errors was found in a previous research (Barland, 1975; Barland & Raskin, in press). On the basis of the available scientific data, it appears that the risk of error is greater with innocent rather than guilty persons. Thus, somewhat greater caution should be exercised in interpreting deceptive results, and somewhat greater confidence can be placed in the accuracy of results which indicate truthfulness. An inspection of the size of scores required to make a decision revealed that errors were minimized beyond scores of ±2 for the inconclusive zone. Since false negatives (errors of calling an "innocent" person deceptive) were reduced to zero and inconclusives were relatively low up to scores of -5, optimal results might be obtained with boundaries of the inconclusive region set at +2 and -4.

The detailed analyses of the various physiological measures confirmed the predictions from control-question theory, and they also provided some interesting information about the usefulness of specific measures. Every measure analyzed using either numerical scoring or quantitative measures showed

the predicted responses of "guilty" and "innocent" subjects. However, the power of different measures to discriminate "innocent" and "guilty" subjects was variable.

Although all three physiological measures showed significant identification of "guilt" and "innocent" subjects when numerical evaluation was used, skin conductance responses provided better discrimination between the conditions than did respiration and cardiovascular responses. However, the respiration scores identified "innocent" subjects significantly better than "guilty" subjects, whereas the other two measures showed no reliable differences in identification of "guilty" and "innocent" subjects.

Further, detailed analyses of respiration amplitude and respiration cycle time added additional information about the special usefulness of respiration measures in identifying "innocent" subjects. Decreases in both thoracic and abdominal respiration amplitude were greater to control questions in "innocent" subjects, but only thoracic measures showed reliably greater decreases to relevant questions among "guilty" subjects. Even more striking was the finding that "innocent" subjects responded with thoracic respiration amplitude changes in opposite directions for control and relevant questions. When they were deceptive with regard to control questions, their thoracic respiration showed suppressed amplitude; but when they were truthful with regard to relevant questions, they showed increased amplitude of thoracic respiration. A similar effect was not found with "guilty" subjects nor with abdominal respiration amplitude. Thus, it appears that thoracic respiration may be a more useful measure, especially in identifying truthfulness.

Results obtained using respiration cycle time, were similar to those obtained with respiration amplitude. Respiration cycle time successfully differentiated truth and deception only for "innocent" subjects. Furthermore, "innocent" subjects showed a differential response similar to that obtained with thoracic respiration amplitude. They showed a slowing of respiration following control questions and a speeding of respiration following respiration. Thus, deception by "innocent" subjects was accompanied by slowed respiration, and truthfulness was accompanied by increased respiration rate. The results obtained with thoracic respiration amplitude and respiration cycle time indicate a particular effectiveness of those measures with "innocent" subjects and a response which goes in one direction (suppression and slowing) following deception and the opposite direction (increased amplitude and speeding) following truthfulness. Those are the only measures which have demonstrated specific characteristics which are specifically associated with truthfulness and deception (Podlesny & Raskin, 1975).

All of the other measures showed reliable effects in the predicted directions. However, the electrodermal measures (skin conductance and skin potential) and decreases in finger pulse amplitude showed reliably larger responses overall to relevant questions. That finding raises some cautions for interpreting those measures, since they were more effective with "guilty" than with "innocent" subjects. In fact, the two "innocent" subjects who were erroneously judged to be deceptive showed almost all of their inappropriate responses in the electrodermal and cardiovascular measures, and one of them showed truthfulness in respiration measures. Thus, it appears that the small risk of error in

control-question tests seems to be associated with inappropriate electrodermal and cardiovascular responses to relevant questions in "innocent" subjects, and the presence of respiration responses in the truthful direction should create the suspicion of a possible false positive.

Finally, it should be mentioned that there was little evidence of systematic changes in the usefulness of various measures across successive charts. Such a concept has been put forward by Backster (1969), who calls it the "total-chart-minutes" concept. Backster asserts that the three major components are optimally useful at different times within a polygraph test, with respiration being most useful in the earlier portion of the test, cardiovascular during the middle portion, and skin resistance during the later portions. The data from this study are in direct contradiction to Backster's principal assertions, and there appears to be no evidence to support his position.

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