THE GSR IN THE DETECTION OF GUILT [1]

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Use of the lie detector depends on the assumption that there is a distinctive pattern of physiological response which accompanies lying and which can be distinguished from that which accompanies truth telling. Most modern lie detector operators expect lying to produce a greater amplitude of physiological response, although others have asserted that certain qualitative differences are characteristic (e.g., Marston, 1938, p. 52; Summers, 1939). Claims of high validities for these methods do not find support in properly conducted empirical study. The most extensive research thus far reported (Ellson, Davis, Saltzman, & Burke, 1952), which employed a total of 13 response variables and careful multivariate statistical analysis, achieved only 73% correct classification, against a chance expectancy of 25%.

Use of physiological measurements to detect not lying, but the presence of "guilty knowledge," requires only the more reasonable assumption that a guilty person will show some involuntary physiological response (e.g., GSR) to stimuli related to remembered details of his crime. If the crime is such that the investigator can discover a number of factual details with which only the guilty person should be familiar, then the guilty knowledge method can be used. The guilty knowledge items are interspersed with other similar but irrelevant items in a stimulus list. The S is told that E is going to mention a number of items and that, if he is guilty, he will recognize some of these as being related to the crime in question. The items may be stated in question form, in which case the S may or may not be required to answer.

A guilty S, knowing which items are relevant and which are not, would be expected to respond differently to the relevant than to the irrelevant items. Usually, he would be expected to give larger responses to the relevant items, although it should be pointed out that

any consistent difference in the responses to the two classes of stimuli is evidence of guilt. Thus, an S who manages by self-stimulation to produce large GSRs to the irrelevant items is betrayed by the fact that his responses to the relevant items are consistently smaller.

Method

Ss used in this experiment were 49 male college students who were assigned at random to four groups. Those in Group 1 (13 Ss) were required to enact two mock crimes in sequence, a "murder" and a "theft." For the Murder enactment, S was taken to the second floor of the building and required to knock on the door of one of the offices. The door was opened by an assistant who, after some preliminary conversation, invited S to play a hand of poker, which was thereupon dealt out, the assistant getting the better hand. Remarking that S now owed him a hundred dollars, the assistant then walked over to stand looking out the window. Taking a weapon from his pocket, S went through the motions of killing the assistant, hid the weapon in a drawer of the desk, and left the office.

In the Theft enactment, S had to idle near the doorway of a different office until the occupant, a woman, left it to go into the washroom. S then hurriedly entered and riffled through the desk calendar until he found a page on which his own name had been entered. He erased the name and then searched through the desk until he found the article (e.g., a watch) which he had been instructed to "steal." Leaving the office, he hid the stolen property in a locker in the hallway.

As already mentioned, Ss in Group 1 enacted both of these mock crimes, in random sequence. Those in Group 2 enacted only the Murder, those in Group 3 only the Theft, and those in Group 4 were exposed to neither of the crimes. The next step was for S to be turned over to another E for interrogation. E was not informed to which group S belonged. S was seated in the interrogation room, GSR electrodes attached to his dominant hand, shocking electrodes to his other hand, a blindfold put over his eyes and a pair of headphones adjusted to his ears. E was located with the apparatus in an adjoining room and spoke to S via a microphone.

Each S was told that he was to be questioned in relation to two crimes. He was instructed to listen to each question but not to reply to any of them. He was told that each question consisted of several parts and that if, at the end of any question, E felt that the physiological response (GSR) indicated guilt, then S would be given an electric shock. The shock

was then demonstrated, most *S*s finding it to be quite unpleasant (the shock was the discharge of a 2-mfd. capacitor, charged to 300 v., through ⅜ in. in diameter electrodes on the fingerprint area of the first and third fingers). In fact, irrespective of the particular *S*'s response, the shock was always given following the completion of the GSR to the last part of Questions 2, 3, and 5 of the Murder list and Questions 1, 3, and 4 of the Theft list. (The purpose of the shock was merely to increase *S*'s general anxiety level and increase to some extent his motivation not to give a guilty record and thus to create a situation resembling a little more that of real criminal interrogation.)

Both interrogation lists were standard and each consisted of six multiple-choice-type questions. *E* first read the question and then read each of the short alternative answers, allowing sufficient time after each for GSR activity to dissipate. One alternative for each question was relevant for a given *S*. Two of the six Murder questions were as follows:

(1) If you are the murderer, you will know that there was an unusual object present in the murder room. Was it (*a*) a record (*b*) an easel (*c*) a candy box (*d*) a chess set?; (2) The murderer hid the weapon in one of the drawers of a desk. Which drawer was it? Was it the (*a*) upper left (*b*) lower right (*c*) upper right (*d*) middle (*e*) lower left?

Two of the six Theft questions were as follows:

(1) If you are the thief, you will know where the desk was located in the office in which the theft occurred. Was it (*a*) on the left (*b*) in front (*c*) on the right?; (2) The thief hid what he had stolen. Where did he hide it? Was it (*a*) in the men's room (*b*) on the coat rack (*c*) in the office (*d*) on the window sill (*e*) in the locker?

The number of alternatives averaged 4.67 in the Murder list and 5.0 in the Theft list. Questions 2, 3, and 6 in the Murder list and 2, 3, 4, and 6 in the Theft list were "double-blind," that is, the relevant or guilty alternative was varied at random from *S* to *S* so that *E* did not know which was which. Questions were always given in the same order within a list but whether the Murder or Theft list was given first was determined at random.

Scoring was simple, a priori, and objective. An *S*'s GSRs to the several alternatives in a given question were ranked in order of amplitude. If his largest response was to the relevant alternative, he was given a score of 2 on that question. If his second largest response was to the relevant alternative, he was given a score of 1. Thus, a perfect Innocent score was 0 and a perfect Guilty score was 12, for both lists.

Results

If all scores of 6 or less are classified "innocent" and all those over six "guilty," then four *S*s from Group 1 and one from Group 2 would be misclassified as to group, a total of 5 misses out of 49, or 89.8% hits. Considering the two crimes separately, there were 50 interrogations of Guilty *S*s (the 24 *S*s from Groups 2 and 3 plus the 13 *S*s from Group 1 who were Guilty of both crimes), and 48 interrogations of Innocent *S*s (the 24 *S*s from Groups 2 and 3 plus the 12 *S*s from Group 4 who were Innocent of both crimes). Forty-four of the 50 interrogations of Guilty *S*s resulted in scores of 7 or higher, all of the 48 interrogations of Innocent *S*s gave scores of 6 or lower, a total of 93.9% correct classification.

Discussion

It should be emphasized that these results by no means represent the upper limit of validity that could be achieved with the simple and objective guilty knowledge technique. On the other hand, one must consider whether results from such a laboratory study can safely be extrapolated to the real life criminal interrogation situation. Some of the points that might be raised in this connection are discussed below.

1. All *S*s in the real life situation would be more emotionally involved in the outcome. The use of electric shock in the experiment was intended to make the situations somewhat more comparable in this respect, but certainly an important difference still remained. However, because of the nature of the guilty knowledge method, an increase in general emotional reactivity in either an innocent or a guilty *S* does not in itself affect the validity of the test. As long as *S* is able to comprehend the situation and to respond more intensely to a question having some special significance for him than he does to most of the questions, the method is not compromised in its ability to differentiate innocence from guilt.

2. The *S*s in this experiment were not particularly sophisticated concerning the method being used and were not strongly motivated, if guilty, to try to defeat the test. There is no way in which an *S*, once he has perceived a stimulus, can inhibit what would be his normal GSR to that stimulus. However, it is possible to try to defeat the guilty knowl-

edge type of test by producing intentional or artificial responses to the nonsignificant stimuli so as to reduce the relative size of the involuntary guilty response and so confuse the record. Artificial GSRs can be produced in various ways by a sophisticated *S*. However, because the GSR is peculiar in that it does not produce any proprioceptive stimulation, it is not possible for a subject to know whether his attempt to produce a deliberate response has been successful and it is certainly impossible for him to deliberately produce responses of controlled sizes. Still, it remains to be experimentally determined to what extent a sophisticated, motivated *S* can confuse in this way a guilty knowledge record. A second experiment is in progress which is concerned with this problem.

3. The *S*s in this experiment were college students and hardly representative of the average run of criminal suspects; perhaps a proportion of the latter would not respond "normally" in such a test. Again, a final answer to the question suggested can only be provided by an appropriate experiment. The literature of lie detection does include references to the problem of the nonreacting *S*. However, in contrast to lie detection procedures, the guilty knowledge method, which uses each *S* as his own control, does not require that the responses of the guilty *S* be comparable in any way to those of the innocent, but merely that the guilty *S* respond differently to some of the items than he does to others—something which the innocent *S* cannot consistently do. It is interesting to note in this connection that one of the *S*s in Group 1 was a Hungarian expatriate who, while engaged in underground activities several years earlier, had been arrested and subjected to intensive interrogation by Russian secret police. Although he had been successful then in maintaining his forged identity and in convincing the MVD that he was ignorant of any underground activities, he was easily identified by the guilty knowledge test as being guilty of both murder and theft!

4. The *S*s in this experiment spent only a few minutes in the mock crime situations and therefore had little opportunity to note the details of the situation which was used for the guilty knowledge test. It was no surprise

to find that many *S*s who were guilty of the murder, for example, reported after the interrogation that they had not noticed the map on the wall of the Murder room, or the chess set on the bookcase, or etc. Real life crime situations would obviously vary enormously among themselves in this respect. A suspect who is accused of having robbed a series of liquor stores can safely be assumed to know, if he is guilty, a number of things which an innocent person would not, such as the locations and appearances of the stores, the amounts taken, the appearance of the various victims, certain striking facts about what was said or done during the robberies, and so on. On the other hand, the question at issue might be which one of a group of armed thieves fired a fatal shot. In such a case, the guilty individual would not be expected to possess any guilty knowledge not shared by his confederates and/or the other suspects, and the present method would not be of any use. (Obviously, each suspect might be expected to give a larger response to the name of the guilty one than to the other names, his own excluded. Such consistency would, if found, rather clearly identify the guilty individual. However, such a method cannot have the certainty of the guilty knowledge technique.)

It seems reasonable to suppose that many real life crimes would lend themselves to the use of the guilty knowledge method, keeping in mind that trivial and seemingly irrelevant details are as useful as interrogation stimuli as are the more obvious facts, such as the weapon used, the article stolen, etc., which might be passed on to innocent suspects by the newspapers or the arresting officers and thereby made useless for this purpose. It also seems reasonable that, in such cases, the guilty person might be expected to have a wider range of guilty knowledge than was induced in the subjects of the present experiment.

5. Since only about 15 min. of interrogation time and only six questions were used in the interrogation for each of the mock crimes, it can be assumed that a higher validity could easily be achieved by a longer interrogation, using questions more than once and using a greater variety of questions. With only six questions and the simple scoring system used

here, about one S in 50 might be classified guilty though actually innocent, due to chance fluctuations. The probability of such false-positive misclassification decreases rapidly as the number of questions is increased. Thus, with only 10 questions, having five alternatives each, less than 3.28% of innocent Ss will show guilty responses on more than four questions and less than 0.64% on more than five. (These figures assume that the questions are well enough constructed so that the probability of an innocent S reacting most strongly to the relevant alternative is about equal to that for the mean of the other alternatives.)

6. The scoring system used in this experiment was simple and did not involve any attempt to defend against the possibility of S making deliberate responses in order to defeat the test. The guilty knowledge method does not require one to assume that the guilty S will tend to give *larger* reactions to the relevant items, although the present scoring system did require this result. All that need be assumed is that the guilty S will react *differently* to the relevant items, as a group, than he does to the irrelevant alternatives. The only way in which an S can behave consistently differently with respect to the set of relevant alternatives than he does to the others is by having some way of distinguishing these alternatives from the rest, i.e., by having the guilty knowledge which declares him to be guilty in fact. In a situation where active attempts by a sophisticated S to defeat the test are to be expected, then a more subtle scoring system than the one used above should yield a higher validity.

Summary

Forty-nine male college students, after random assortment into four groups, were required to enact one, both, or neither of two mock crimes. All were then given a guilty knowledge test, employing the GSR, which used six standard questions relating to each of the two crimes. A simple, objective, and a priori scoring system was used to determine guilt. Forty-four or 89.8% of the Ss were assigned to their correct group, against a chance expectancy of 25%. Considering the crimes separately, all Ss innocent of a crime were correctly classified, while 44 of 50 interrogations of Guilty Ss gave guilty classifications, a total of 93.9% correct classification against a chance expectancy of 50%.

Lie detection, requiring unreasonable assumptions about the consistency of physiological response patterns, has not been shown by acceptable research to have the high validity claimed for it and which is necessary for its useful application. Detection of guilty knowledge, while less widely applicable, is a more reasonable, objective, and generally defensible technique and is demonstrably capable of very high validity in those situations where it can be used.

REFERENCES

ELLSON, D. G., DAVIS, R. C., SALTZMAN, I. J., BURKE, C. J. A report of research on detection of deception. Contract N6onr-18011 with Office of Naval Research, 1952.

MARSTON, W. M. *The lie detector test*. New York: Smith, 1938.

SUMMERS, W. G. Science can get the confession. *Fordham Law Rev.*, 5, 335–354.