Deception and Non-deception in Guilty Knowledge and Guilty Actions Polygraph Tests

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Abstract

The Guilty Knowledge polygraph test (GKT) and a variation of the test, the Guilty Actions Test (GAT), were compared in a laboratory setting. 84 men who committed or witnessed a mock crime answered "No", repeated items, or remained silent in response to items on the GKT or GAT. A monetary reward was promised for appearing innocent on the test. An interaction with scores based on skin resistance showed that innocent witnesses tested on the GKT scored more in the guilt direction than subjects in any other groups. Subjects required to say "no" were more reactive to key items than subjects in the item repetition or silence groups. Thoracic respiration scores showed a difference between guilty and innocent subjects.

The main purposes of this laboratory study were to compare different types of Guilty Knowledge (Lykken, 1960) polygraph tests and different verbal responses to those tests. The study was conducted in the laboratory on subjects guilty or innocent of a mock crime.

Guilty Knowledge Tests (GKT) depend upon the assumption that suspects who have specific items of knowledge about a crime will be physiologically more reactive to questions about those items than to similar items not related to the crime (Lykken, 1960). Each crime relevant item is presented to suspects in sets comprised of similar plausible, but not crime related alternatives. For example, if a crime under investigation involved a murder in a particular location the GKT question set could be as follows: "The murder took place in a house... bank... store...hotel... service station?" Innocent suspects unaware of the location of the murder may respond to any location and only by chance alone would they have their largest physiological response to the key item. With several relevant items, each in an appropriate set, it becomes improbable that an innocent suspect would have relatively large autonomic responses in a systematic fashion to crime relevant items. Those suspects responding selectively to key items would be assumed to be knowledgeable about the crime and therefore, by inference, would probably be considered guilty.

Reviews of GKT laboratory results show high levels of detection of guilty subjects and almost perfect protection for innocent subjects unaware of crime relevant items (Furedy & Ben-Shakhar, 1991). Field work also finds that innocent subjects are protected but high levels of accurate guilt classification have not been found (Elaad & Ben-Shakhar, 1989), although subsequent work with a combination of physiological measures shows promise (Elaad, Ginton & Jungman, 1992).

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The GKT has not been widely used in the field (Ben-Shakhar & Furedy, 1990). Among the reasons for this is that obtaining crime-relevant items that only the investigator and criminal are aware of is perceived as difficult. Crime relevant items could be known to many people through a variety of means. For example, information could be printed in newspapers or be spread verbally by people connected to the criminal.

Wide dissemination of crime relevant information creates counterproductive situations for a GKT investigation. In one situation, guilty suspects could freely admit to information and avoid incrimination by claiming a news account as the source of the information. If guilty subjects did that, the test would have no purpose. In another instance, innocent informed people who have reasons not to admit having information could fail the GKT. As a consequence they could be considered guilty. These problems, although not insurmountable, have, in general, served as enough of an impediment such that the majority of field workers have reservations about the use of Guilty Knowledge tests.

Laboratory studies by Giesen and Rollison (1980) and Stern, Breen, Watanabe, and Perry (1981) have examined what happens when innocent suspects have information. Both studies found that the GKT could differentiate between those who had information because they were in a guilty role and those with the same information in an innocent role. Therefore, the GKT could still be of value when innocent suspects have information.

Bradley and Warfield (1984) and Bradley and Rettinger (1992) explored this possible value of the GKT with innocent informed subjects using a Guilty Actions modification known as the GAT. In the GAT the wording, using the example from above, was modified to: "You murdered the man in a house... bank... store... hotel... service station?". They asked suspects to respond "no" to all questions so that guilty suspects were not only reacting to the recognition of key information but they also were lying about the actions they did related to that information. Innocent suspects answering "no" recognized the information but were not lying about it because they did not do the actions. The differentiation found between guilty and innocent subjects aware of information by Gieson and Rollison (1980) and Stern et.al. (1981) was replicated but it must be stated that in both studies (Bradley & Warfield; Bradley & Rettinger) more false positive errors were found in the informed innocent groups than in uninformed groups.

As an aggregate, the above studies show that simple recognition of crime relevant material does not necessarily result in detection and the GAT provides a way of testing this without confounding recognition and lying. Use of a GAT is not the only way that a confound between lying and recognition can be avoided. Lykken (1960) has pointed out that subjects may remain silent or repeat items in guilty knowledge questions. In such a situation neither guilty nor innocent suspects lie. Theoretically the significance of the recognized material for the guilty suspects could still make them reactive. Elaad and Ben-Shakhar (1989), however, found that an overt lie through requiring a "no" response resulted in higher levels of detection of guilty subjects than silence or key item repetition. Therefore to maximize detection, they recommended that a "no" response be used.

In practice, following the recommendation of requiring a "no" response could create the problem of making informed innocent suspects lie by denying information they know about. In such instances, innocent aware suspects may be falsely detected as guilty. The GAT solves this problem by focusing on actions done involving the crime-relevant information. For example, “If you are the murderer, you murdered the man in a house... bank... etc?". In saying "no" to these questions, innocent informed subjects, even though they are aware of the information, are truthful in their denials because they did not murder anyone anywhere.

To test if the distinction between the GKT and GAT makes a difference in detection accuracy, an attempt was made to replicate previous findings with differing response requirements on both forms of the GK test. Subjects obtained information either through being guilty of the mock crime or through witnessing the crime. Depending on their

condition they were asked to respond to questions with "no", the repetition of key words, or silence. It was expected that guilty subjects responding "no" on either the GKT or GAT would have detection scores more reflective of guilt than guilty subjects in the other response conditions. With innocent witnesses it was expected that a "no" response on the GKT would result in particularly high guilt scores. In this condition they have the information and they are forced to deny it. The GAT subjects in the "no" group were expected to score as innocent because even though they have information they are not lying.

Method

Subjects

Subjects were 84 men taking introductory Psychology who were given course credit for participation. They volunteered and were randomly assigned to the experimental conditions. A consent form signed by them indicated that participation was voluntary and that they could withdraw at any time. Men were used because men have a higher rate of criminality than women (Wilson & Herrnstein, 1985).

Apparatus

A Lafayette model 760-566 polygraph was used to record skin resistance responses, thoracic respiration, and abdominal respiration. Skin resistance was recorded using standard Lafayette zinc-zinc chloride electrodes. The electrodes were attached to the medial phalanges of the first and third fingers of the right hand. Respiration was recorded using standard Lafayette pneumatic chest assemblies. Baseline and sensitivity levels were adjusted individually.

Procedure

Eighty four folders were prepared prior to the experiment. A numerical code was written on each folder representing the type of test each subject was to be given and their mode of response, as well as a subject identification number. Since there were twelve conditions, twelve stacks were made with seven folders in each. Subject numbers of the forty two guilty and forty two innocent subjects were recorded. This record was kept from the polygraph examiner until after all subjects had been tested and their polygraph charts scored. The twelve stacks were then formed into two stacks, based on guilt or innocence. Each of these stacks were then shuffled thoroughly and then alternately placed, one at a time, onto a third stack. The result was that the top two folders on the stack would always have one guilty and one innocent subject with their tests and response modes randomly determined.

When pairs of subjects arrived at the laboratory, they were greeted and the procedures were explained to them by an assistant. The assistant then took the top two folders off the stack and randomly assigned them to the subjects with the flip of a coin. The subject's name, condition, and folder number were recorded, and the subject's name was written on the folder. Each subject was given an appropriate sheet of paper with either the guilty or innocent instructions on it. The instructions were similar to those used for the crime and witness conditions in Bradley & Warfield (1984). After reading these, they were taken to another room to perform or witness the mock crime. After the crime, subjects were taken either to a waiting room or to the testing room. Order of testing was determined with the flip of a coin. As each subject entered the testing room, the appropriate folder, without instructions, was given to the polygraph examiner so that the numerically encoded information could be used to indicate the test type and response mode to be used. Subjects were motivated to appear innocent on the test by the promise of receiving $20.00 if they were found innocent. These procedures allowed the examiner to administer the proper test and request the proper response mode while remaining blind to the guilt or innocence of the subjects.

Before the test, subjects were asked to speak only when answering the questions with the appropriate mode of response, and to remain still throughout the test. The response modes were "no", repetition of question key words, or silence. The examiner sat behind the subjects and read the items aloud, while marking item onset. Ten 5 item GKT sets about the mock crime were presented. At least 20s was allowed to elapse between items.

After the test, subjects were given recall and recognition tests by the assistant

about information that had been included in the polygraph test. They were promised $0.50 for each correct answer, so they could make a total of $10.00 if they answered all questions correctly.

Data Quantification and Analysis

Skin resistance and respiration responses were taken for a period of 10 seconds following item onset. To allow subjects to habituate somewhat to the test items being given, responses to the first item of each set of five were not included in the analyses. For each measure, the degree of differential responding to key items in a set was transformed into a rank score.

To score skin resistance, the maximum height of the highest peak inside the l0s window was recorded in millimetres. If the largest of these reactions was in response to the key item in a set, then a score of 2 was assigned. If the second largest reaction was to the key item, then a score of 1 was assigned. No scores were given for third or fourth largest.

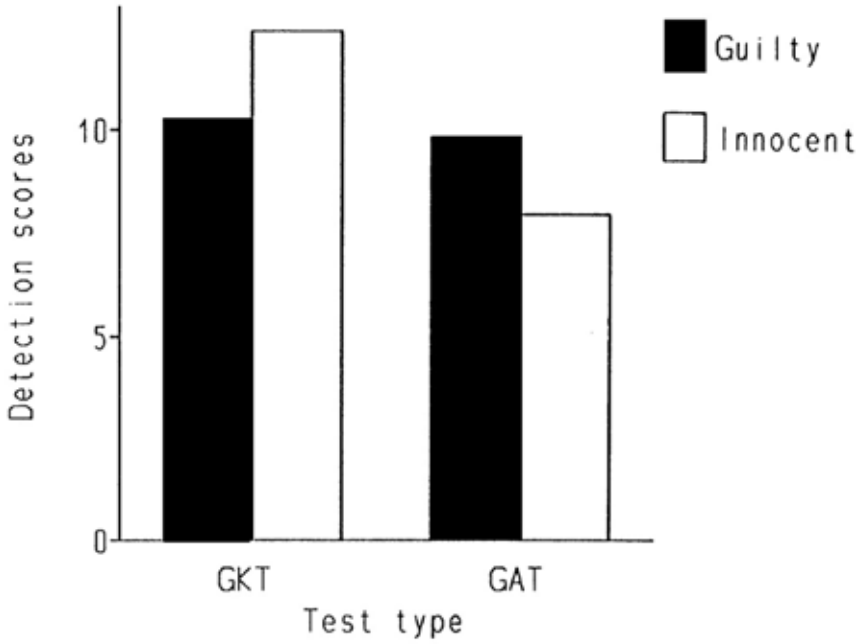
To score respiration, a template was used to mark off a period of l0s following item onset. A geographer's mapwheel was then used to measure the length of the trace within the window. Since suppression of breathing has been found effective for information detection (Timm, 1982) shorter traces were taken as indicating guilt. If the shortest trace was found after the key item, then a score of 2 was assigned. If the trace found after the key item was the second shortest, then a score of 1 was assigned. No scores were given for the two longest traces.

For each subject, rank scores for each measure were tallied. A total of 20 points was possible for each measure. Rank scores were analyzed in 2x2x3 ANOVAs. The independent variables were guilt/innocence, test type, and verbal response. Separate analyses were carried out on skin resistance, abdominal respiration, thoracic respiration, and a combination of the measures. Significance was accepted at $p<.05$.

Results

Skin resistance scores revealed a main effect of test type, $E(1,72) = 10.69$, $p<.05$. Subjects tested with the GKT ($M = 11.32$) produced larger scores than subjects examined with the GAT ($M = 8.87$).

Figure 1. Interaction of guilty/innocence with test type using skin resistance detection scores.



A main effect for the three response modes was found, $F(2,72) = 3.31$, $p<.05$. Tukey's HSD test found that differences were significant between "no" ($M = 11.43$) and "repeat item" ($M = 9.66$) response modes, and between "no" and "silent" ($M = 9.19$) modes, but not between "silent" and "repeat" modes.

An interaction was found between test type and guilt/innocence, $F(1,72) = 7.17$, $p<.05$. (See Figure 1.)

Simple main effects analyses revealed that innocent GKT subjects were more reactive than innocent or guilty GAT subjects and guilty GKT subjects.

With thoracic respiration scores, the only difference found was between guilt ($M = 10.31$) and innocence ($M = 7.74$), $F(1,72) = 8.58$, $p<.05$. No differences were found with abdominal respiration scores or with the combined measures. Memory for information about the mock crime was tested and no differences were found, as all subjects but one remembered all of the material.

Classification results

A cutoff point of 10, a value that had maximized the rate of correct detections by Bradley & Warfield (1984), was used to classify subjects as guilty or innocent.

Table 1 shows the results for the SRR measure and thoracic respiration, the measures that differentiated between subjects in different conditions. With the SRR measure the correct classification of 27 of 42 subjects

Table 1. Subjects indicated as guilty or innocent using skin resistance and thoracic respiration responses.

		Verdict			
		Skin Resistance		Thoracic Respiration	
Condition					
Guilty		**Guilty Knowledge Test**			
	No	4	3	5	2
	Repeat	3	4	4	3
	Silent	4	3	4	3
Innocent					
	No	0	7	5	2
	Repeat	1	6	4	2
	Silent	4	3	4	3
Guilty		**Guilty Actions Test**			
	No	5	2	4	3
	Repeat	4	3	5	3
	Silent	2	5	4	3
Innocent					
	No	4	3	4	3
	Repeat	7	0	4	3
	Silent	5	2	7	0

with the GAT was higher than the correct classification of 16 of 42 subjects with the GKT: chi square (1, N = 42) = 4.46, p<.05. This difference was due to the rate of classification of innocent subjects. That is, 16 of 21 were classified correctly with the GAT but only 5 of 21 were correct with the GKT: chi square (1, N = 42) = 9.52, p<.05.

Discussion

The main hypothesis that innocent aware subjects tested on the GKT would be highly reactive to key items was supported. Field workers who have reservations about using the GKT are correct in their concerns that innocent people with information could be classed as guilty. Results with SRR scores showed that innocent suspects examined with the GKT not only had higher scores than those of innocent suspects tested with the GAT but they also had scores higher than guilty suspects tested with either test. The difference was reflected in the classification of innocent subjects. Fully 76% of innocent GKT subjects were classed as knowledgeable and by inference could be classed as guilty.

The GAT form of the GKT clearly has an ameliorative effect on this problem. Only 24% of the innocent aware GAT subjects were misclassified. The GAT wording asking if one did an act involving specific information thereby provides some measure of protection for innocent aware subjects. Whether that level of misclassification could be acceptable or useful in practical situations remains an open question. It may represent enough of an improvement that more investigators could consider the GAT form of the GKT. Of course great caution is necessary since these results may not generalize to the field situation.

There was no evidence to support the idea that the GAT form of questioning could be a better test for the detection of guilty suspects. It could be argued that a question on an activity, such as "Did you do ...?", could evoke a more elaborate memory including that of motor movements and therefore stronger physiological responding than the more passive questions on "Do you know ...?". This did not happen and the tests did not differ in effectiveness with guilty subjects.

As mentioned in the introduction, Lykken (1960), emphasizing the information component of the GKT, suggested that lying by innocent knowledgeable subjects could be avoided by asking subjects to repeat the test items in each question or remain silent to each question. This study did not support Lykken's (1960) solution of using repetition or silence. Subjects who denied key items with a verbal "No" were more likely to be detected as having information than those who either repeated information or were silent. Our results are consistent with Elaad and Ben-Shakhar's (1989) recommendation that the "no" response be used for effective detection of guilty suspects.

The applied implications of this study are of interest to the degree that investigators would readily infer guilt after a GKT has indicated crime relevant knowledge. Of course, they do not have to; they could consider a suspect knowledgeable for a variety of reasons and focus an investigation on determining initially if a suspect has knowledge, and then focus on why.

The theoretical implications of the study are very important. Detectability is very much affected by the scenarios in which the subjects are involved. Simple information detection was weak. That is, with questions on the GAT when innocent aware subjects denied an action they did not do, only 23% were detected as informed. The situation was relatively mild and we would speculate conformed to normal expectations of denying actions that subjects participating in a lie detection experiment could have or readily develop. Subjects assigned to the guilt condition were detected as having information 52% of the time. All these subjects had the information, committed the mock crime and one third of them had to lie about knowing or doing actions with the key information. Nothing in this guilty role would confound normal expectations of subjects.

Innocent subjects in the unusual condition of having to deny information with the GKT were detected at the 76% level. Therefore, information plus a violation of normal expectations (i.e., having to lie when innocent) resulted in the highest information detection rates. The sensitivity of the GKT to

alteration of psychological "sets" and "expectations" promises that the test can be a particularly valuable tool in understanding detection effects.

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