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The Amount of Information Remembered by the Perpetrator in the Context of the Application of the Guilty Knowledge Technique in Criminal Investigation – a Pilot Study,***

Количество информации, сохраненной в памяти правонарушителя в контексте использования тестов GKT в ходе расследования уголовного дела: экспериментальное исследование

Key words: Guilty Knowledge Technique, GKT or CQT

Despite the fact that the Guilty Knowledge Technique [Lykken 1959, Lykken 1960], or GKT, originated more than five decades ago, its validity is still debatable, especially when compared to other polygraph techniques.

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Partisans of GKT superiority to other techniques, especially to Control Question Technique, support their opinion on the high percentage of correct results (up to 100% in some studies) coupled with a relatively low count of inconclusive indications, or even their lack [Lykken 1973, Elaad et al. 1992, Elaad 1998].

Members of this group believe that the GKT technique provides much more protection for innocent subjects, because, unlike the CQT, the polygrapher does not ask directly about perpetration of a crime during the procedure, but instead he verifies the subject's knowledge about all distinctive aspects of the case – in this way reducing the chances of a random reaction to critical question, which could be interpreted as a deliberate lie made by truly innocent subjects [Krapohl et al. 2009]. The Guilty Knowledge Technique is also believed to provide more solid methodological background than the CQT [Lykken, 1974; Ben-Shakkar & Elaad 2002].

On the other hand followers of the CQT technique claim that from diagnostic point of view it cannot match the latest forms of the Control Questions technique [APA Meta-Analytic Survey 2011, Gołaszewski 2012, Widacki 2014]. Superiority of the CQT may also lay in the broader spectrum of its potential application [Elaad 1990, Podlesny 1994, Podlesny 2003] – its effectiveness does not rely on the existence of multiple distinctive details of the case known only to the investigators. Some problems with the distinction between perpetrators and witnesses (who have some knowledge about the case as well) have also been indicated [Konieczny et al. 1984, Bradley & Warfield 1986].

Followers of the CQT also argue about the theoretical base of the Guilty Knowledge Technique, especially about the assumption that the perpetrator is in a state of high consciousness during the act, and because of that has the ability to remember fully the whole event with high amount of details. An argument has been made that every single perpetrator of a crime is more or less stressed during the critical moments of the event. The presence of stress during a crime may reduce the level of offender's perception [Christianson 2007] and result in a possibility that perpetrators do not remember many details of the crimes that – from the perspective of the theoretical background to the GKT – they are expected to remember [Widacki 2011]. This argument is particularly interesting because, if accurate, it can discredit the application of the Guilty Knowledge Technique in criminal investigation, and consequently also its very right of existence.

In the light of the above, before any comparison of validity between GK and CQ techniques can be made, it is necessary to determine in a staged event whether subjects are able to remember properly a sufficient amount of details for the Guilty Knowledge Technique to be used effectively.

Method

Forty (40) subjects (students of Andrzej Frycz Modrzewski Kraków University, aged from 21 to 27) were divided in two equal groups: A ("perpetrators") and B ("witnesses"). Members of both groups were arranged into 20 "perpetrator –witness" pairs, and all of them duly participated in an activity prepared for the needs of the experiment. After receiving their instructions, each pair have entered a darkened shooting range where the "perpetrator" had 7 seconds to assume his or her place in the shooting range and take the blank gun. After that time, a light beam was activated and illuminated the rotating shooting target with the picture below placed on it, 4m away from the shooting range. The photo (80 × 60 cm) featured the "victim": a young woman standing in quite a dark room and talking on a mobile phone.

Photo 1. The picture used in the experiment.

From that moment, the "perpetrator" had 10 seconds to make one shot from the blank gun at the target, aiming to "kill" the "victim". After the time, the target began to rotate automatically to prevent further exposition. The "witness", unaware of the instructions given to the perpetrator, had to observe passively the whole event. After the target began its rotation, subjects were asked to leave the room and separately asked to fill in a questionnaire, where they first determined the level of stress generated during the experiment and then described shortly the whole event from their point of view. This was followed by answering 11 questions. The author of the

questionnaire believes that they indicated the most distinctive details of the picture. They related to:

- the gender and age of the "victim"
- situation, in which the "victim" was "caught"
- characteristic background details of the picture
- "victim's" hair color;
- "victim's" cloths and other details
- the objects in the "victim's" hands
- two particular, highlighted background elements in the pictured room (a wooden bookcase to the right from the "victim", and candlesticks with candles on the wall on the left).

The questions were to determine the amount of information that the subjects remembered while being exposed to the picture, and would be considered a starting point to develop polygraph tests using the GKT technique. The dramatic scenario of the experiment (unknown to the last moment, with little time to prepare and shoot blank gun, and also the loud noise accompanying the shooting) was developed to generate a relatively high level of stress, especially in the "perpetrators".

Results

In the questionnaires filled after the experiment all subjects described the course of the event without much detail but correctly. Descriptions of the picture placed on the shooting target were less accurate. Reasons for that are different, and they will be presented later in this article. The stress level generated by the event as declared by subjects (on a scale 1-10, where 1 is totally free of stress and 10 fully stressed) was distributed as shown in the table below:

Group	**Level of stress declared by a subject**		
	1–3 (low stress)	**4–6 (medium stress)**	**7–10 (high stress)**
A ("perpetrators")	9 subjects (45%)	5 subjects (25%)	6 subjects (30%)
B ("witnesses")	11 subjects (55%)	5 subjects (25%)	4 subjects (15%)

Table 1. Distribution of declared levels of stress in both groups.

At the first sight, the values seem to be very similar in both groups. The chi-square (χ^2) test value in this case is 0.6 and lies outside the acceptance region for a significance level of 0.05, in the context of the critical value of chi-square distribution with two degrees of freedom – 5.991. With respect to the above, the null hypothesis can-

not be rejected, which means that the amount of stress generated by the experiment cannot be considered distinctive for members of the two experimental groups.

Answers to the eleven questions about the distinctive elements of the picture used in the experiment allowed to determine the amount of information effectively remembered by subjects participating in the event.

Group	**Number of well-remembered details:**		
	0–3	**4–7**	**8–11**
A ("perpetrators")	8 individuals (40%)	11 individuals (55%)	1 individual (5%)
B ("witnesses")	2 individuals (10%)	12 individuals (60%)	6 individuals (30%)

Table 2. Distribution of the number of details (information) remembered in both groups.

The average number of remembered details of the picture exposed during the experiment is 3.8 in group A ("perpetrators") and 6.4 in group B ("witnesses"). The chi-square test value is 7.27 and lies in the acceptance region for the significance level of 0.05, because the critical value of chi-square distribution with two degrees of freedom is 5.991. With respect to the above, there are grounds to reject the null hypothesis in this case and the distinction between the two groups of subjects based on the number of details remembered is statistically relevant. The role in the experiment affected the ability of remembering details well, independently from the subject's declared level of stress.

Due to the large difference between the declared levels of stress (the lowest recorded value being 1 and the highest – 8) it seems reasonable to compare values of stress with the number of details remembered by the subjects regardless of their role in the experiment. The comparison of all 40 subjects participating in the experiment is presented below:

Declared level of stress	**Number of details remembered by individuals**		
	0–3	**4–7**	**8–11**
1–3 (low stress)	3 individuals (7.5%)	10 individuals (25%)	7 individuals (17.5%)
4–6 (medium stress)	2 individuals (5%)	8 individuals (20%)	-
7–10 (high stress)	5 subjects (12.5%)	5 subjects (12.5%)	-

Table 3. Distribution of the number of details remembered broken by the declared level of stress in members of Group A and B together.

The average amount of details remembered by the subjects who declared low stress level was 6.25, medium stress level allowed to obtain on average 4.3 details, and high level of stress – only 3.6 of details in the exposed picture. The chi-square test value for these results is 11.574 and the critical value of chi-square distribution with four degrees of freedom is 9.488. The resulting value therefore lies within the acceptance region for the level of 0.05, and the null hypothesis can be rejected. Therefore, with the 0.5 level of significance, it can be stated that there is a statistically relevant relationship between the subject's level of stress and the amount of remembered details of the event, regardless of affiliation to group A or B.

Pilot polygraph examination

A decision was reached to run a pilot project using a group of four subjects to test the conditions (both rooms and equipment) required for running the examinations The group consisted of people participating in the experiment described above. The subjects included two from the group of the "witnesses", one person from the group of the "perpetrators", and one who was not connected to the event. The polygrapher was given the task to use polygraph examinations to determine who belonged to which group.

The examination made use of CQT tests, as proper use of GKT tests was impossible for a number of reasons. First, the experiment took place more than six months before the planned examination, and the knowledge of the event became destroyed in participants in the experiment, and the differences in the way the event was remembered between the witnesses and the perpetrator was possible. Consequently, which is another argument, the knowledge of the perpetrators and witnesses of the event became levelled, the only difference between the witness and the perpetrator being the fact that the perpetrator held the gun in his hand an shot. Let a good example of portraying the blurring of the differences be the fact that neither the perpetrator nor the witness remembered what weapon was used, yet both witness and the perpetrator remembered perfectly well what the target at the shooting range was. All this resulted in the lack of sufficient characteristic differences in the features of the event between the knowledge of the witness and the perpetrator, which made it impossible to use GKT tests.

For the reason above, a CQT technique was used, to be precise the latest development in the CQT family, namely the UTAH ZCT. The test was developed in the option that contains control questions about Directed Lie Control (DLC). The examination made use of two UTAH ZCT DLC tests. The first was to check whether the subject

is a witness, and the second was to test whether the examinee is the perpetrator. NDI results obtained in both tests meant that the person was not connected to the event. If the first test produced NDI and the second DI, the subject was believed to be the perpetrator. Analogously, with NDI being the result of the first and DI in the second test, the subject was believed to be a witness.

Witness Test	**Question Type**	**Perpetrator Test**
Are you sure I am going to ask only the questions we have discussed?	**SYMPTOMAT IC**	Are you sure I am going to ask only the questions we have discussed?
Are you going to answer the questions concerning the event at the shooting range truthfully?	**CRITICAL (Relevant)**	Are you going to answer the questions concerning the event at the shooting range truthfully?
Are you sitting on a chair?	**NEUTRAL**	Are you sitting on a chair?
Have you ever lied to a person who trusted you?	**CONTROL (Comparison)**	Have you ever lied to a person who trusted you?
Did you witness a shot being fired at the shooting range?	**CRITICAL (Relevant)**	Did you witness a shot being fired at the shooting range?
Are you wearing shoes?	**NEUTRAL**	Are you wearing shoes?
Have you ever cheated at the exam?	**CONTROL (Comparison)**	Have you ever cheated at the exam?
Were you at the shooting range when the shot was fired?	**CRITICAL (Relevant)**	Did you have a gun in your hands on that day?
Are we at a university?	**NEUTRAL**	Are we at a university?
Have you ever said something derogatory about another person when they couldn't hear?	**CONTROL (Comparison)**	Have you ever said something derogatory about another person when they couldn't hear?
Did you see the person who fired the shot at the shooting range?	**CRITICAL (Relevant)**	Did you fire a shot at the shooting range on that day?

Table 4. The questions used in the polygraph examination.

Results of the pilot study:

Polygraph results obtained were ESS (Empirical Score System) scored. For tests analysing single issue (ZCT), the system features the following decision thresholds: To classify the subject as deceptive (DI – Deception Indicated), the total test score must amount at least to -4, or any of the spots needs to reach at least -7. If the global some is +2 or greater, the person classifies as NDI (No Deception Indicated). In the remaining cases we speak of inconclusive (INC) results. The results of all the tests are presented in the table below. The table provides not only the aggregated results, but also those of spot analysis, and evaluation of individual reactions to specific questions.

TYPE OF TEST:	WITNESS			
subject A		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	2	2
	CARDIO	0	0	0
SPOT	**I**	**2**	**2**	**2**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	2	2
	CARDIO	-2	0	0
SPOT	**II**	**0**	**2**	**2**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	-2	-2
	CARDIO	1	0	-1
SPOT	**III**	**3**	**-2**	**-3**
		R1	R2	R3
TOTAL	**8**	**5**	**2**	**1**
TEST RESULT:		NDI		

TYPE OF TEST:	PERPETRATOR			
subject A		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	0	2
	CARDIO	1	1	1
SPOT	**I**	**3**	**1**	**3**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	0	-2
	CARDIO	0	-1	1
SPOT	**II**	**0**	**-1**	**-1**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	0	0
	CARDIO	0	1	0
SPOT	**III**	**0**	**1**	**0**
		R1	R2	R3
TOTAL	**6**	**3**	**1**	**2**
TEST RESULT:		NDI		

TYPE OF TEST:	WITNESS			
subject B		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	-2	-2
	CARDIO	-1	-1	-1

TYPE OF TEST:	PERPETRATOR			
subject B		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	-2	2
	CARDIO	0	0	1

SPOT	**I**	-3	-3	-3
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	2	-2
	CARDIO	-1	0	0
SPOT	**II**	-3	2	-2
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	2	-2
	CARDIO	-1	-1	1
SPOT	**III**	-3	1	-1
		R1	R2	R3
TOTAL	**-15**	-9	0	-6
TEST RESULT:		DI		

SPOT	**I**	-2	-2	3
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	0	-2
	CARDIO	0	-1	1
SPOT	**II**	**0**	**-1**	**-1**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	-2	-2
	CARDIO	-1	-1	1
SPOT	**III**	-1	-3	-1
		R1	R2	R3
TOTAL	**-2**	-1	-2	1
TEST RESULT:		INC		

TYPE OF TEST:	WITNESS			
subject C		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	-2	-2
	CARDIO	0	0	0
SPOT	**I**	2	-2	-2
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	2	-2
	CARDIO	-1	-1	1
SPOT	**II**	**-3**	**1**	**1**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	-2	0
	CARDIO	0	0	0
SPOT	**III**	0	-2	0
		R1	R2	R3
TOTAL	**-5**	-1	-3	-1
TEST RESULT:		DI		

TYPE OF TEST:	PERPETRATOR			
subject C		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	0	-2
	CARDIO	0	1	0
SPOT	**I**	**0**	**1**	**-2**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	2	2
	CARDIO	-1	0	1
SPOT	**II**	**-3**	**2**	**3**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	2	-2
	CARDIO	1	0	-1
SPOT	**III**	**1**	**2**	**-3**
		R1	R2	R3
TOTAL	**-1**	**-2**	**3**	**-2**
TEST RESULT:		INC		

TYPE OF TEST:	WITNESS			
subject D		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	-2	2
	CARDIO	1	-1	0
SPOT	**I**	**1**	**-3**	**2**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	2	2
	CARDIO	0	1	0
SPOT	**II**	**-2**	**3**	**2**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	2	-2	-2
	CARDIO	0	-1	-1
SPOT	**III**	**2**	**-3**	**-3**
		R1	R2	R3
TOTAL	**-3**	**1**	**-3**	**-1**
TEST RESULT:		INC		

TYPE OF TEST:	PERPETRATOR			
subject D		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	0	0
	CARDIO	-1	1	-1
SPOT	**I**	**-3**	**1**	**-1**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	-2	-2	2
	CARDIO	-1	-1	-1
SPOT	**II**	**-3**	**-3**	**1**
		R1	R2	R3
	PNEUMO	0	0	0
	EDA	0	-2	-2
	CARDIO	0	0	-1
SPOT	**III**	**0**	**-2**	**-3**
		R1	R2	R3
TOTAL	**-11**	**-6**	**-4**	**-3**
TEST RESULT:		DI		

Table 5. Results of individual tests.

Discussion

The experiment failed to achieve the situation, in which "perpetrators" of crime could reach a significantly higher level of stress than members of the "witnesses" group. Despite that the experiment indicated the existence of clear and statistically important difference between the number of details in the picture remembered by subjects who shot at it and by ones who only observed the whole event passively. The difference may result from factors other than stress itself. The conclusion that can be made from the descriptions made by participants in the study is that the "perpetrators" (most of whom had never fired a gun before) focused their concentration mostly on the correct completion of the task, which was to shoot the blank gun. Coupled with the very short time of exposure to the image, this circumstance did not let the "perpetrators" remember perfectly all the details of the picture, and for that reason they often only picked basic information (e.g. age or gender of the "victim", however some "perpetrators" also found these details a problem).

"Witnesses" on the other hand, had an opportunity to concentrate more on the picture during its 10-second exposition, because they had no other activity assigned for that time.

This aside, the research showed a connection between the level of stress reached during the experiment and the remembered level of detail concerning the actions. With the results of all subjects taking part in the experiment recapitulated, it can be estimated that with the increasing level of stress, the number of correctly remembered details diminishes. Regardless of the role played in the experiment, the experienced stress and its level clearly influence the quantity of details remembered from a certain event.

Results of the experiment cannot, however, substantiate a statement that perpetrators possess more specific knowledge of details of the crime. Outcomes are rather opposite: the need to focus concentration to accomplish specific tasks may result in the perpetrator retaining less information about details of a certain event than its witness.

There is another result worth indicating: both the "perpetrators" and "witnesses" of the simulated event remembered only little information, as the average result for the two groups was 3.8 and 6.4 respectively. That level of detail remembered about the event raises doubt about the potential distinction between the "perpetrators" and "witnesses" of an event by using the GKT polygraph technique. In addition, the "witnesses" who remembered the picture much better than "perpetrators" may be qualified falsely as perpetrators of presented crime because of their better knowledge of the event.

The experiment was designed to simulate the event in which the victim and the entire surrounding are completely unfamiliar to both the perpetrator and the witness. It can therefore be presumed that if participants of the event were familiar with the victim and crime scene, the level of detail remembered would be much higher.

A relatively small group of subjects (40 people) does not allow to issue any categorical statements about the cognitive value of this experiment. It seems necessary to conduct further research in this area on a much larger scale that would allow a more reliable analysis of the investigated phenomena, and provide more reliable conclusions as result.

Further studies in the area should attempt to generate more emotional involvement of participants of the experiment to generate more consistent stress reactions. In this regard, it seems appropriate to develop a pre-study narrative, which in this experi-

ment was limited to a brief explanation of each subject's role in the experiment. It is also possible that changing the form of exposure of the "victim" could improve the subjects' responses; therefore a dummy could be used for this purpose instead of a photo.

It is also necessary to reinforce the role of the perpetrators in further studies, e.g. by making them more familiar with the weapon and its elements, or asking to perform some other tasks that the "witnesses" would be unaware of. In this way, the "perpetrators" would be able to obtain certain information not available to the "witnesses", which could be useful in determining the role of a particular individual by subjecting him or her to a polygraph examination.

Analysing the results of the pilot experiment conducted, one clearly and immediately sees that it was not easy to tell the perpetrator apart from a witness using polygraph in this experiment. On the other hand, a decision which of the subjects was not connected to the case at all was incontrovertible. This may be an argument supporting the view expressed by the authors of the amendment to the code, who refer to the polygraph as a method used to the so-called "reduction of the number of suspects". What remains a problem is distinguishing witnesses from perpetrators in the test group. There are a number of reasons for that. The first is poor motivation of the subjects to the experiment: participants in the project did not receive any reward for "deceiving the polygraph". The other question was the fact that the instruction for the perpetrator and witness concerning the use of the blank gun was the same. The perpetrator was instructed about the weapon in the presence of the witnesses, who for that reason spent as much time same time watching the weapon, observing also the perpetrator and remaining at the site of the experiment (shooting range), which must have had an influence on blurring of the borders between the roles of different groups of subjects.

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