



Accuracy rate of lie-detection in China: Estimate the validity of CQT on field cases



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HIGHLIGHTS

- We provide the detailed accuracy rates from China, a non-English speaking country.
- We estimate the accuracy rate of CQT examinations sampling 148 field cases.
- 2 steps, with or without the non-indicative records, have statistical difference.
- The accuracy rates were 95% for detecting offenders, and 85% for innocents.
- We verify Ginton's non-standard method and improve the algorithm.

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ABSTRACT

Objective: To explore the accuracy rate of the comparison question test (CQT) by Binomial Distribution way on field cases in Chengdu area of China. In detail, the study revealed the accuracy rate of detecting guilty and innocent examinees, and the rate of False Positive and False Negative.

Method: The study was built on the field cases with only two examinees that held the opposite opinions to the same single case. The original evaluators and four experienced polygraph specialists independently chose and scored 148 field criminal cases into the final study, among which 111 paired-records were concluded as indicative records and the rest, 37 ones, were ruled as non-indicative.

Result: Judging from all records, the accuracy rate of detecting guilty examinees was 0.836 with a 0.164 False Negative rate. In addition, the rate to detect innocents was 0.822 with a 0.178 False Positive rate. Judging from indicative cases only excluding the non-indicative, the accuracy rate rose to 0.958 for perceiving guilty examinees with a 0.042 False Negative rate. To innocents, the accuracy rate was 0.859 with a 0.141 False Positive rate.

Conclusion: The study with non-standard methodology was not limited to mock cases and the final confessions. It was able to estimate validity of other lie-detection ways, GKT, POT, etc., with this method being applied. With high accuracy rate and validity, polygraph examinations were able to give better decisions to real-life investigations.

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1. Instruction & background

Polygraph test, which is a kind of psychophysiological technology, is well-known as “Lie-detection” or “Detection of deception” in China. Polygraph equipments are used to achieve the physiological information with the purpose of revealing psychological and behavioral situation on examinees [1]. The technology, which estimates the examinees whether they are telling the truth or they are liars, appears with the main formations of the comparison question test (CQT) and guilty knowledge test (GKT). The application of polygraph examinations for

forensic investigation is widely spread in legal enforcement of more than 46 countries in the Americas, Europe, Africa and Asia [2]. In addition, increasing development has taken place to extensive areas in China for recent decades.

In China, the polygraph technique has been researched and made in practice since 1980. During these years, the technology, which is made great progress by Chinese specialists following the worldwide footsteps, has been extended to real-life case investigation for various departments (e.g., public & national security, prosecution, and military), soon afterwards, with the extension of screening test to staff competence and qualification for social institutions. Due to the lack of enough details from the criminal scene sometimes, we tend to choose comparison or control question test rather than the guilty knowledge test and the

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criminal investigation is only focused on the suspect whether he or she is guilty or innocent.

Were the CQT decisions we made correct or not? For recent years, researches on the accuracy rate, academically called the criterion validity, of CQT have been widely issued throughout the world. Raskin & Honts claimed that the CQT accuracy could reach up to 0.9 or even higher [3]. Yet so far, other researchers suggested that it was impossible to gain a credible estimation rate due to the lack of a dependable research structure and therefore, they questioned about such a high figure, which was supposed to be lower [4,5].

Most of studies on the accuracy rate were operated with mock crimes due to the need of knowing the results and strict laboratory designing. Iacono, however, stressed that questions to examinees involved in the live criminal scenes were valid rather than experimental simulations due to the crucial differences between them [6]. The suspects, tested with real-case questions, were able to be thoroughly evoked because the offenders were afraid of the legitimate penalties and the innocents were anxious to error. On the other hand, the examinees, involved in the analogue crimes, lack psychological tension to motivate sufficient physiological responses and consequently confused the accuracy rate [7,8]. It was hard to distinguish whether the accuracy was affected from the non-aroused status or from the flaw of the polygraph technique itself. As polygraph is eventually applied to field crimes and actual events, the accuracy rate on real-life cases appears to be more important.

Brewer suggested that field studies are more ecologically valid in view of basing on the real-life cases [9]. Researches to those cases, however, suffered from the absence of trial control on the circumstances, e.g., the cause, the environment, the tool, and most importantly, the result. It was hard to judge the polygraph decisions without the suspects' confession or ground truth because of the inherent difficulty when we operated a high quality research [10]. Those studies were mainly based on the screened cases with confirming information, and thus the researching data was seriously reduced, which blocked the development of polygraph. Take our department as an example, there are only 13.71% (167 solving cases from all 1218 cases) of the examinations, chosen to be the fit-for-research samples.

The study was based on the unique non-standard method, which was firstly created and elaborated by Avital Ginton [11]. The methodology selected the field cases that were conducted with CQT examinations in the polygraph technical office. Each of the selected cases involved only two suspects who held contradicting opinions towards the same criminal matter. The contradicting opinions might be acted with the formation of:

- (1) Both declared himself as the accessory offender and accused the other people as the prime culprit, e.g., in a murder event, both people claimed that the opposite suspect had played the major role, including plan and kill. And minor effect was made by him. Or in a stealing case, each person claimed that the opposite had stolen the property, and he was just on the lookout;
- (2) Accused each other of handling one certain crime. e.g., both people were captured in the same car in the Hit-and-Run traffic accident and then declared that he was not the certain driver when the accident had taken place;
- (3) Accused the other people of committing a crime, but the accused one denied, e.g., 'I saw him set the fire.'

The background and details of the cases in the course of screening the field cases should be carefully checked to ensure the elimination of the cases that both suspects were liars or both of them just held their subjective perspectives without any necessary objective evidence. The various field cases, which were only composed of one truth-teller and one liar, could survive into the final research in the Chengdu Public Security Bureau (CDPSB) Polygraph Center. No matter what the real truth was, we knew that the results should be strictly consisted of one

positive and one negative before the paired CQT exam decisions were made in a same certain case. Therefore, it was possible to discover the false results if the analysis appeared to be two positive or two negative. According to this, it was unnecessary for CQT examinations to rely on the suspects' confession, especially sometimes maybe false confession. In addition, the algorithm improvement could be made in Ginton's non-standard method and represented later in details.

2. Method

Binomial Distribution, one of the most common mathematical models in statistics, is applicable to analyze that the probability of samples only resulted with two opposite outcomes: positive and negative. According to such classification method, idealization and efficiency are actualized into the statistical process. The study is based on the theory.

The cases that occurred in the live criminal scenes in the southwest area of China were selected into the discussion following the screening rules listed below. Suspects from these field cases were administered with the CQT tests from the original evaluators and four experienced polygraph examiners who were engaged more than 8 years in polygraph and more than 10 years in police investigation.

2.1. Case screening

Strict selecting criterion was made as follows:

- (1) Years: from 2009 to 2013;
- (2) Occurred in the real criminal scenes without any experimental controls;
- (3) Involved with only two suspects in one certain case, and both held absolutely opposite opinions;
- (4) Enough basic background material, objective evidence, testimony, etc. were provided to prove that both suspects were composed of one truth tell and one liar;
- (5) Both suspects undergone CQT examinations.

Each trial record, resulted with either truth or lying, was absolutely independent without any influence to each other. Following such pattern, it was helpful to recognize the regularity to some looked-randomized circumstances of lie-detection under the same trial conditions.

There were 578 cases where each case involved just two examinees. Most of them were criminal cases, e.g., murder, steal, rape, and arson and others were composed of the traffic accidents and some economic cases. Each case mentioned above gone through with the procedure of analyzing the fundamental scenarios by four polygraph specialists. They accepted cases with two people holding objective but opposite versions and eliminated cases of holding subjective impression or being both either truthful or deceptive. 578 cases were divided into two groups, that is, 289 records independently were analyzed to a group of two specialists. If one specialist in a group proposed a reasonable detail which suggested that both examinees possibly told the subjective impression or both deceptive in one case, the case was excluded from the final study. The certain record was screened into the further research only in the case of both specialists in one group independently reaching an agreement.

To illustrate the screening procedure with further details, one particular sample was given below. For a stealing event in the residence community as an example, two security guards witnessed two thieves, one sneaking into the house and the other being on the lookout. Guards were not able to distinguish each other because of the dark light deeply in the night when thieves ran away with cash and jewelries. The lost property with both thieves' fingerprints was found a few days later in their household and they both pleaded guilty to involvement in the case. According to their descriptions, however, neither of them

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