

A Review on the Development and Application of the polygraph testing in China

Gu Hongmei

Beijing Police College, China
Correspondence: kjpcsh@126.com

Abstract: The application of the polygraph testing in China has a history of more than forty years. This technique has been improved mostly in the process of meeting practical needs and continuous application. However, there has always been dispute and discussion about it. It is generally believed that this technique includes basic theory, methods of the Polygraph testing, hardware and software of test instrument and working procedures. Although there are still some doubts on the accuracy and validity of the Polygraph test, it can still be used as an auxiliary and reference tool. In recent years, some new Polygraph testing procedures have been used, such as fMRI, PET, ERP, fNIRS and psychophysiological contactless detection systems etc. Compared to traditional polygraph instruments, these new attempts are trying to make use of some advantages or overcome some disadvantages.

Keywords: the Polygraph testing; development; application; review

1 Introduction

Historically, the Polygraph testing is deeply connected with lie detection. The practical needs of society promoted its development. In China, the Polygraph testing initially took shape in the 1990s. The technique includes basic theory, methods of the Polygraph testing, hardware and software of test instrument and working procedures. It is generally believed by Chinese academics and practitioners that the design of the relevant hardware equipment and the software are basically similar and the technique can be widely used as an auxiliary and reference tool at the service of judicial cases, trying to identify the facts of the cases. But there is much controversy regarding its theoretical basis, its scientific standing and its practical operation. A Polygraph testing could be used to try to identify if some people are lying, or by test cognition to try to detect guilty knowledge rather than lying.

2 Overview of research on fundamental theories

2.1 The meaning of the Polygraph testing

In the past, the Polygraph testing was used in criminal investigation, being described as a psychophysiological technique based on general psychology, experimental

psychology and criminal psychology, using knowledge of neuropsychological, bioelectronics, computer application, investigation and forensic science. By employing real-time recording, multiple psychological and biometric changes of the examinee in response to the questions of the examiner can be noted as psychological traces [1]. More recently, scholars and judicial staff have explained and defined the concept, definition, connotation and denotation of this technique. Generally speaking, they do not have fundamental disagreements on the basic elements and understanding of the technique. It is recognized as an applied technique which concerns psychology, electronic science plus investigation and material evidence. It is agreed that individuals' memory and cognition about specific things or facts of individuals is a necessary condition of the test. The polygraph examiner seeks to evaluate if the examinee is involved in the case or tries to obtain information about the case by triggering psychological and biometric responses to psychological stimuli and analyzing these signals. It is recognized that the function of the test has evolved from lie detection to probing psychological information in order to exclude innocent individuals, help determine case-related facts and who suspects might be, and the direction of investigation [2](for example, to collect other evidence).

2.2 The basic Principle of the Polygraph testing

Psychological researches have shown that psychological changes lead to biometric changes that can be detected, recorded, analyzed and evaluated by modern scientific instruments. Generally, researchers and judicial staff acknowledge that the Polygraph testing is designed to trigger psychological changes of the examinee using information about the case so that his/her physiological indicators will change. By detecting, recording, analyzing these changes, ascertainment of whether an examinee has information about the case could be achieved, and we can try infer whether and how the examinee is related to the case. Accordingly, as long as the chosen and detected physiological indicators are not controlled by the examinee and irrelevant variables are strictly controlled, the goal of test might be successfully achieved.

There are many theoretical descriptions regarding the Polygraph testing, but none of them perfectly explain all of the test phenomena and results, so further research and verifications are needed. The first theoretical description

is the hypothesis of fear, stress and anxiety, which holds that when the examinee is aware that him/herself is lying or deceiving during the test, emotional responses such as fear, stress and anxiety will be triggered and transferred into corresponding physiological response by the autonomic nervous system. This can then lead to changes in related physiological indicators, which may be detected [3]. The second is the hypothesis of conflict which holds that a physiological response is triggered when two conflicting intentions arise at the same time. The third is the hypothesis of conditioned reflex which holds that along with commitment of the crime comes strong emotional experience of the perpetrator and a conditioned reflex will be established, so when the criminal is asked about the case, strong emotion will be triggered, which will lead to the abnormal corresponding physiological indicators. However, this hypothesis comes with the risk of wrongly accusing innocent witnesses, especially those who already have been wrongly accused as perpetrators. The fourth is the hypothesis of cognition awakening which holds that physiological awakening is based on the cognition and evaluation of things, only the real perpetrators have the knowledge of the crime-committing scene (and innocent people do not), so when questions on the specific case are asked, the real perpetrators will have the self-awakening to the target question, leading to psychological abnormal changes. The fifth is the hypothesis of psychological trace and memorial trace, which holds that stimulating events from the outside world have effects on the receptors of humans and produce various psychological activity such as feelings, perceptions, thoughts and emotions. These activities are stored in the brain and the test can be considered a psychological process of recognition. The sixth is the hypothesis of information coupling, which holds that the examinee can be considered as a black box, the stimulating information given to the examinee is the information inputted, the psychological and physiological response of the examinee is the information outputted[4]. If the information inputted corresponds with the related information within the black box, it will process the inputted information and produce physiological changes, which can be used to try to determine if the examinee is involved in the case and the specific condition of involvement. The seventh is the hypothesis of oriented response, which holds that when an individual is exposed to two or more stimuli, the one with the bigger relevance to the examinee will be chosen and attention paid to other ones will be reduced. Thus, during the test, a perpetrator will be sensitive to relevant questions and will not give strong psychological and physiological responses to other questions.

2.3 Limitations of the application of the Polygraph testing caused by inadequate basic research
Abbreviations and Acronyms

There is no doubt that as an applied technique based on finding from experimental psychology, the Polygraph testing technique is reliable and efficient to some extent. But considering the complexity and variability of the human animal, psychological experiments and actual

cases, the reliability and validity of the test and the accuracy of its results can surely be affected. Psychology has been independent subject for more than 100 years, but our knowledge about the processes and manifestations of cognitive information in human brain is still limited [5]. Also, the choice of test indicators, the performance of the test instruments, the control of test conditions, the complexity of the physical and emotional state of the examinee, the conformity between the test responses and relating facts, the evaluation of test diagram, along with the knowledge structure, test experience, the comprehension of the case of the examiner and even the test environment are important elements limiting and affecting the reliability, validity of the test and thus the accuracy of the results. It should be admitted that there have been many misjudged cases in the application of the Polygraph testing. Therefore, there is still a long way to go for the scientific application of the Polygraph testing in China.

3 Overview of specific applied aspects related to the Polygraph testing

3.1 About the working steps and procedure of the Polygraph testing

There is no specific regulation or statement about the test technique or test procedures in Chinese law. In practical appliance, there is one followed by the majority of researchers and users: dynamic analysis of criminal psychological trace, compilation of test questions, pre-test talk, synchronous test of examiners and instruments, evaluation of the test diagram and post-test talk.

3.2 Specialized research in application of the Polygraph testing

- Examinee's decoding of language in the test. The response of the examinee towards the lingual aspect of the test questions is the process of decoding and comprehension of the words of the questions. During the test, lingual elements such as phonetic sounds and vocabulary and background knowledge, even non-lingual elements such as crime-related or non-related psychology, can affect the examinee's decoding of language. Accordingly, the research on the decoding principle can enhance the reliability and validity of the criminal psychological test [6].

- Analysis of temporal perception in the test. The temporal perception in criminal acts is one of the important contents of the test. The temporal perception about the case of the investigating personnel and the temporal perception of the perpetrator should be taken seriously and distinguished by examiners in the test [7].

- Research on emotional problems in the test. Research has shown that physiological indicators appear to reflect the emotional status of the examinee, but emotions are not strictly correspondent to specific physiological indicators. In the test, one must not draw conclusions on the examinee by only physiological indicators, especially single ones.

- Influencing factors of skin electro dermal response.

This is a relatively sensitive physiological indicator. Research has confirmed that skin electro dermal responses of an examinee can be distinctly different under various stimuli conditions. In the test, an individual's response towards a target question is usually stronger. In practice, however, any change of response of some individuals cannot be detected, excluding equipment factors. These individuals may be fool the test.

- Test validity of innocent "insider". Research has shown that in China, the CQT test method can trigger unusual physiological responses of not only guilty examinee but also innocent ones, leading to false positive results. Because some innocent examinees, to different extents, may obtain crime-related information by different ways, using crime scenario test method can also cause their psychological and physiological response towards target questions (related or key questions), which can lead to false positive results.

- Effects caused by test motivation of examinee. Research has found that test motivation of an examinee can directly affect his/her behaviors and therefore the outcome of the test.

- Research about female examinees in tests. Female examinees can show gender characteristic performances because of their age stages, different temperament types, different life background, different education background and different relation to the case, especially those on their period. Therefore, in psychological tests, besides following rules of psychology, physiology, bioelectronics when designing instruments and software, the objective difference between samples and cases should also be taken seriously. The knowledge and experience about a specific group cannot be simply generalized to others.

- Research about impact of language operation on test results. In the test, the examinee's understanding and output of language have mostly been discussed regarding the aspects of phonetic impact and vocabulary cognition impact. Considering that China is a polytechnic country with many dialects, on the basis of understanding the historical characteristic and the dialect habit of the ethnic group, when compiling test questions, the examiner should be fully aware of the linguistic characteristic of the examinee to make sure that the language of the test is concise and accurate, in order to ensure the validity of the test.

3.3 Specialized research in application of the Polygraph testing

This is the most controversial problem about the Polygraph testing.

- The problem of probative force. Some people think that the results of the test are a kind of expert conclusion as the evaluation and opinion of the examiner is drawn with specialized knowledge and technique. While other people think that the results of psychological test is a kind of hearsay evidence, its validity of proof is relatively weak being a kind of circumstantial evidence. It can only be used to test to what extent the examinee knows about the case and to what extent the examinee is related to the case, cannot directly and independently prove the facts of

the case, and therefore cannot be used as the proof of guilt of the examinee. Most people think that at the present time the results of the test should not be presented to a judge as a kind of forensic evidence to be inspected and accepted as proof, but it can be used as a helpful method of the investigation.

- The regulations of application of the finding of the Polygraph testing. If the examinee expresses dissent about the finding, he/she might ask the examiner to make an appearance in the court to be queried by prosecution and defense. In a recent case involving corruption, the defense lawyer proposed an examination of a test and asked the prosecution to show the recording video and the report of the test, but due to multiple reasons, the prosecution side did not, which led to questioning about regulations of appliance.

- The issue of standardization of Polygraph testings. Many researchers say that to ensure the justice of the lie detecting procedure, the test should be standardized in many aspects: to ensure the neutrality of test institutes and staff, and to standardize the subject of test the job requirements of examiners should be standardized; to ensure the willingness and the right to apply for a retake of a test, the test objects, the range of tests, the production and specific operation procedures in the use of this lie detector should be standardized.

4 Development of Hardware and Software Equipment of the Polygraph testing

At the present time there are many types of criminal psychological test instruments in the Chinese market and some new scientific technologies have been tried, such as the techniques of event-related potential (ERP), functional magnetic resonance imaging (fMRI), wearable device, hi-tech imaging technique, brain-brain connection technique, and a contactless intelligent emotion detection system. These techniques be sorted as contact ones or contactless ones. Contact test instruments can involve different numbers of indicators, the least is usually three (skin electro dermal response, breathing and pulse) and the most is 15 indicators, the vast majority of these have an intelligent rating system developed. Compared to the traditional test equipment, these new technologies are trying to make use of some advantages or to overcome some disadvantages.

5 The Applied Field of the Polygraph testing in China

The test's applied field in China has gradually been expanded from the initial crime investigation to investigation of civil disputes, pre-employment examination of institutes and enterprises and examination of military personnel.

5.1 The Polygraph testing in Criminal Investigation

- It can be used to help exclude innocent examinees. In the process of investigation, because of the need of extending the range of investigation, it is inevitable that some innocent people will be investigated. By applying the Polygraph testing, these people could be excluded from the suspected, ensuring that innocent people do not

receive criminal prosecution.

- It can be used to help identify perpetrator and involved insider and help find new clues or evidence of the case.

- It can be used to identify a direction of investigation by looking for evidence according to leads found in test or changing the method of interrogation and routing the psychological defense of the perpetrator, eventually to make the perpetrator to confess.

5.2 Applied in civil litigation

In recent years, many local courts in China have applied a Polygraph testing to civil cases, mainly those with two parties. This is different from criminal cases but can achieve good outcomes. Courts and judges are trying their best to pursue the unity of juristic fact and objective fact, so they are willing to verify the evidence they already have with test technique because this can provide strong scientific support to the acceptance of evidence and the affirmation of facts. At present, the use of polygraph in civil litigation has manifested itself as blind and chaotic.

Acknowledgment

This work was supported in part by a grant from project 'Intelligent Recognition Software for Non-contact Emotional Abnormality Personnel' (2018YYCXBSJ001).

References

- [1] WU Boxin. Overview of China's the Polygraph testing and appliance. *Journal of People's Public Security University of China* 1998, (02), 102-105.
- [2] WU Boxin. Practice and Theory of China's Psychological Test technique. Chinese People's Public Security University Press 2012.
- [3] V. Mark. Durand, David. H. Barlow, Translated by WANG Jian-ping etc. *Essentials of Abnormal Psychology*. China Renmin University Press 2009.
- [4] Michael S. Gazzaniga etc. *Cognitive Neuroscience*. China Light Industry Press 2013.
- [5] GU Hongmei. An Analysis of Subjects' Psychological States in Real Case test. *Journal of Liaoning Police Academy* 2013, (4)
- [6] ZHOU Hui, Examinee's Decoding of Language in Criminal Psychological Tests. *Policing studies* 2008, (9).
- [7] GU Hongmei. A Research on the Interview of the Polygraph testing from the perspective of Psychology. *Journal of Beijing Police College* 2014, (4).