

Polygraph Tests - Benefits and Challenges

Panthayil Babu Rajan, PhD

Program Chair, General Studies, Higher Colleges of Technology
Madinat Zayed Colleges, Abu Dhabi, UAE

Abstract

This research describes the working, benefits and challengers of polygraph tests. Polygraph tests are lie-detecting devices that help ascertain individuals' honesty based on physiological indicators. The heart rate/blood pressure, respiration, and skin responses are the three indicators measured in the test to assess honest/deceitful behavior. The underlying assumption behind the working of polygraph tests is that the autonomic responses of dishonest individuals are distinctively different from those of honest people because the liars will be more nervous than truth tellers. Control Question Test (CQT), Guilty Knowledge Test (GKT) or Concealed Information Test (CIT) and Neuroscience-Based Advanced Polygraph Tests are the important types of polygraph tests used today. Polygraph tests are used to detect truthfulness of individuals in such important fields as crime investigation departments, national security agencies, and business and industry. However, accuracy of polygraph tests and ethical issues associated with the tests are highly debated.

Keywords: polygraph; autonomic responses; truthfulness; dishonesty; misclassification.

Introduction

Ascertaining individual honesty is of great significance especially in such important fields as national security, judiciary and criminal investigation, security screening, recruitment, and employee theft. For instance, in criminal investigations, if instigating teams failed to establish the truth, it may help several genuine criminals deceive legal system and escape from punishments, at the same time it may force many innocent crime suspects to receive punishments if evidence is not in their favour.

Polygraph test is a solution to this dilemma to a great extent. They are lie-detecting devices that help ascertain individuals' honesty based on physiological indicators. The testing apparatuses will have specific devices to record particular physiological indicators: "The instrument typically used to conduct polygraph tests consists of a physiological recorder that assesses three indicators of autonomic arousal: heart rate/blood pressure, respiration, and skin conductivity" ('the truth about lie detectors (aka Polygraph tests),' 2004, p.1). It reveals that the heart rate/blood pressure, respiration, and skin responses may provide indications as to whether or not a person is honest or deceitful. Since these responses are part of the autonomic system, one may not be able to manipulate them. Therefore, it appears that even if a dishonest subject tries

to hide truths, he or she may not be able to control or manipulate his or her internal systems. It is quite interesting and important to understand the mechanism behind polygraph tests, their applications, and the extent to which the lie-detection test results are reliable as well as the challenges associated with their applications. So, basically how do they work? And what are the benefits and challenges of polygraph tests?

Methods, Types, Applications and Challenges of Polygraph Tests

Polygraph tests are one way of assessing individual honesty. In this context, it is important to know the underlying principles and measurements employed in testing, types of polygraph tests, benefits and applications, and the challenges associated with it.

Polygraph Tests (current time)

As with any other instruments, polygraph tests are also designed based on certain underlying principles and assumptions. According to the American Psychological Association (APA), in polygraph testing physiological factors or responses such as heart rate/blood pressure, respiration, and skin responses of subjects are measured to assess their honesty responses. It is assumed that dishonesty or deceptive behaviors are reflected in psychological responses" ('the truth about lie detectors (aka Polygraph tests),' 2004). The act of telling lies or hiding truths might be manifested in physiological responses when candidates are subject to the test because "regardless of how well a person could control his voice and face, other signs such as blood pressure, heart rate, respiration and skin conductivity would betray him when he told a lie" (Metzinger, 2006, p.32). Indeed, it is quite logical and interesting to understand that our behavior is linked to the activities of our internal systems. This assumption has long been recognized in science that the autonomic responses of dishonest individuals are distinctively different from those of honest people because "the liars will be more nervous than truth tellers and so will betray themselves through unconscious actions" (Grubin & Madsen, 2005, p.358). The nervousness of liars is reported be quite natural because they are aware that they are doing something bad or unethical and the experience of nervousness may activate the autonomic system which is beyond control of individuals (Jensen, Meservy, Burgoon & Nunamaker, 2010).

It is quite convincing that the autonomic responses such as the heartbeat and breathing rates are higher among the deceitful subjects than truthful persons. Similarly, the galvanic reactions or skin responses are different between honest and deceitful persons when subjected to questioning (Kumar, 2012). The lying subjects tend to sweat more than the honest individuals because the act of lying will cause poor resistance to negatively charged chloride produced on the surface of the skin (Metzinger, 2006).

Therefore, high quantities of negative chloride ions will be produced on the skin surfaces of guilty individuals (Grubin & Madsen, 2005). It gives a message that our body cannot lie even if our mind is attempting to deceive or cheat investigating teams or the test administrators. Experts are of the view that it may not be easy for the normal human beings to conceal the truth altogether as the physical responses to lying are manifested in different forms (Kumar, 2012; Metzinger, 2006; Grubin & Madsen, 2005). Therefore, it appears that the underlying assumptions or principles behind the working of polygraph tests are sound and logical.

Methods of Measurements

Polygraphs tests utilize indirect measures, the physiological responses of subjects, in order to assess honesty/dishonesty. The three important variables considered in polygraph tests are breathing rate, heart beat/blood pressure and skin responses" ('the truth about lie detectors (aka Polygraph tests),' 2004). Grubin and Madsen (2005) point out that the polygraph instrument will record these three physiological reactions simultaneously on a paper or computer which will be used to assess as to whether or not the subjects are honest and truthful. They say the basic reason behind including these variables is that the guilty individuals are likely to experience and display significantly different levels of physiological responses than innocent subjects when they are presented with different questions related to the crimes. Hence, according to the authors, the strength of physiological reactions is linked to deceitful behavior. There are specific devices to record the physiological factors under consideration. A pneumograph, fitted on the chest of the subjects, is used to record breathing rates of subjects (Gibson, 2001; 'the truth about lie detectors (aka Polygraph tests),' 2004). The cardiovascular activity is measured using a blood pressure cuff (Gibson, 2001). Electrodes attached to the fingertips are used to assess the skin responses (Gibson, 2001; 'the truth about lie detectors (aka Polygraph tests),' 2004).

The APA ('the truth about lie detectors (aka Polygraph tests),' 2004) provides a detailed description of polygraph testing. It says that there are two stages in the administration of polygraph tests: preliminary test and actual test. The APA reveals that pretest stage is designed to give orientation to the test subjects by explaining the purpose, procedures, and recording pattern. They are also given opportunity to clarify their doubts at this stage. According to the APA, whether or not the test subjects are lying or honest is assessed in the actual test stage. The subjects are asked a series of questions in the actual examination stage that may include "crime-related" and "non-crime related" questions. The APA notes that the nature of questions will depend up on the specific kind of polygraph device used in the examination. It explains that the physiological responses to the "crime-related" and "non-crime related" questions are compared to arrive a decision as to whether or not an examinee is truthful or lying. The lairs are likely to experience higher level of anxiety and show stronger physiological responses

when asked the “crime-related” questions than “non-crime related” questions (‘the truth about lie detectors (aka Polygraph tests), 2004).

Kaste (2015) reported that polygraph tests, especially the earlier types of tests, tend to produce two different kinds of unexpected results. They are “false negatives” and “false positives,” which are wrong classification of the test subjects. According to the author, while the “false negatives” declare the true guilt subjects as innocents, the ‘false positives’ misclassify innocents as guilty. He says that it is apparent that declaring innocent people as guilty would be far more dangerous than misclassifying guilty people as innocents. Therefore, Kaste suggests that it is inevitable that the test developers and researchers may pay more attention to innovate the methodology or develop measures to prevent the occurrence of “false negatives” and “false positives” so that polygraph tests could be effectively and widely employed in detecting lies.

Types of Polygraph Tests

Grubin and Madsen (2005) reveal that although Hugo Munsterberg of Harvard University was the pioneer of the modern lie detecting devices, it was John Larson, a well-known U.S forensic psychiatrist, who is credited to be the first creator of the modern polygraph test. Larson developed the first commercially usable modern polygraph test in 1921. The authors say that the instrument recorded three physiological activities (such as blood pressure, pulse rate, and respiration) simultaneously on a paper that were used to relate honesty and truthfulness of subjects. They note that the initial form of the test developed by Larson underwent several modifications over the years.

Currently, there are different kinds of advanced polygraph tests being used in lie detection. Control Question Test (CQT), Guilty Knowledge Test (GKT) or Concealed Information Test (CIT) and Neuroscience-Based Advanced Polygraph Tests are the important new versions of polygraph tests (Saxe, 1994; Happel, 2005).

Ben-Shakhar, Bar-Hillel and Liebllich (1986) say that CQT is the most commonly used type of polygraph test in the criminal investigations. They explain that there are three sets of questions included in the CQT. They are “relevant questions,” “irrelevant questions” and “control questions.” The “irrelevant questions” are not related to crime subject and they are asked in the preliminary testing. Ben-Shakhar et al. point out that these questions are asked for the purpose of making the subjects familiar with the testing situation and procedures. The “relevant questions” are specific to the crime under consideration and the “control questions” are related to the general truthfulness of the past of the test candidates. According to the authors, the physiological responses to “control questions” and “relevant questions” are compared to assess as to whether or not the subjects are lying or truthful. They point out that the truthful subjects tend to fear more the “control questions” than the “relevant questions” because they are

sure that they had not committed any crime. The authors say that the liars are more likely to experience stress at “relevant questions” that will be reflected in increased physiological responses. Therefore, according to Ben-Shakhar et al., more intense physiological responses to “relevant questions” (arising from anxiety and stress required to conceal the truth) is a sign of dishonesty.

According to Sax (1994), GKT or CIT is another type of modern polygraph test. Variation in the format of question is the major difference between CQT and GKT, the author says. He says, in GKT, a set of multiple choice questions associated with the crime context is presented to the test subjects. For instance, a theft suspect is asked “whether or not Dhs 100, Dhs.500 or Dhs 1000 stolen?” (Saxe, 1994). It was assumed that only the real culprits will be able to identify the correct answer. When a guilty person recognizes the correct choice he or she will be experiencing higher levels of physiological reactions. A stronger physiological reaction upon recognition of a correct answer indicates that the person is guilty or concealing the truth (Saxe, 1994). Meijer, Smulders, Johnston and Merckelbach (2007) note that the GKT has certain advantages over the CQT. In the GKT, more “relevant questions” are included and each question is provided with four alternative answers. This option would work in favor of innocent subjects as more number of questions and multiple answers help reduce the probability of “false positive” misclassification. Hence, according to the authors, the GKT helps minimizing the “false positive” (innocents as guilty) misclassification error significantly. However, the authors reveal that this multiple choice format tends to reduce the test subjects’ sensitivity to “relevant questions” that may lead to classify more number of guilt suspects as innocents.

According to Meijer, Smulders, Johnston and Merckelbach (2007), in order to minimize the problems associated with the GKT, the modern polygraph testers use another psychological test called Symptom Validity Testing (SVT) in combination with the GKT. The authors are of the view that the GKT in combination with the SVT tend to produce better results in detecting liars.

According to Metzinger (2006), Neuroscience-Based Advanced Polygraph Tests are the advanced version of polygraph tests. In Neuroscience-Based Advanced Polygraph Tests, the pattern of brain waves in response to the test questions are measured in order to relate the truthfulness or dishonesty of subjects. These methods assume that a special kind of brain wave is linked to the act lying. He says human brain tends to produce a unique type of wave called P300 wave when exposed to familiar information or images. Therefore, by comparing the verbal responses of a test subject and his/her brain waves, one can understand whether the person is lying or not. Metzinger further noted that the Brain Finger Printing is the specific technique employed in the neuroscience-based polygraph tests. The subjects are fitted with an electroencephalogram (EEG) to record their brain waves and are presented with images or information relevant to the crime.

According to the author, if a crime suspect falsely reports that he/she is not aware or does not recognize the image, a P300 wave will appear on the machine revealing that the person is lying.

Benefits of Polygraph Tests

Polygraph tests have great significance as they have several useful practical applications. They are valuable instruments used to detect truthfulness and deceitful behavior in several fields. The crime investigation departments, national security agencies, and business and industry are some of the important organized sectors where the polygraph test are utilized.

Crime and Investigation

Criminal investigation is one of the major fields in which polygraph tests are employed to detect lying. They offer governmental agencies and legal systems with a useful and simple way to extract the truth from crime suspects. Grubin and Madsen (2005) have reported that polygraph tests are employed by criminal investigation teams and law enforcement agencies in the US and in other 69 countries around the world. White (2001) points out that while on the one hand criminals are unlikely to admit their criminality, there is no effective ways to extract the truth from them on the other hand. Moreover, generally, crime investigation teams tend to adopt complex and lengthy processes of interrogation to find out the truth, the author says. Often they apply punitive measures in the process of interrogation. In this context, according to the author, polygraph tests are valuable tools for the crime investigation teams to ascertain the truth (White, 2001).

Security agencies are other important context where polygraph tests are employed. Polygraph tests will help the security agencies in identifying suspected terrorists and other antisocial individuals who might disguise their identities (Happel, 2005). Polygraph tests are useful not only to identify the criminals who might try to deceive the legal-systems, but it will also be helpful for providing justice to several innocent victims who are convicted due to the wrong verdict by the court. If polygraph tests are administered among the convicted and imprisoned people, it may help identify the wrongly convicted people and rescue them from imprisonment (Metzinger, 2006).

It appears that polygraphs tests are quite effective in crime investigation (Grubin & Madsen, 2005). In the absence of effective and simple ways to distinguish between truthfulness and falsification, polygraph tests are indeed useful. Perhaps, the painless and simple way of their administration adds more value to the instruments. It inflicts no physical pain on the crime suspects (Metzinger, 2006).

Industry/Business

Industrial or business application is the other important use of polygraph tests. They can contribute significantly in enhancing organizational effectiveness. Selecting candidates with the right skills and experience as well as promoting employee honesty in the workplace are important aspects of effective and successful organizations. However, in recruitment, the job applicants may not be truthful on their job applications. They might dishonestly claim possessing the relevant skills and experience in order to qualify for employment (Walczyk, Schwartz, Clifton, Adams & et.al. 2005).

Walczyk, et.al. (2005) noted that if firms failed to identify such falsified or dishonest applicants, it might cost them significantly. They reported that dishonest job applications are extremely expensive to organizations as it might lead to considerable waste of investment such as time and money for recruitment. The authors report that in 2002 in the US about 24 % of job applications had misrepresented or falsified qualifications or experience on their job applications. The authors reveal that the dishonest job applications cost the American firms between \$ 6 billion to \$ 200 billion dollars each year. Therefore, they recommend using polygraph tests as important measures to screen the dishonest job applicants. Grubin and Madsen (2005) have also noted that polygraph tests are useful instruments in assessing honesty of job candidates.

Another important industrial application of polygraph tests according to Walczyk et.al. (2005) is to discover employee thefts. They say employee theft is a growing concern for organizations as it tends to cause the firms huge burden. The authors reveal that the stolen materials may include tangible goods or materials, organizational strategies, designs, formula and other intellectual properties of organizations of critical importance. Stealing of material and organizational strategies may even challenge the survival of firms. The authors report that the economic burden resulting from employee thefts in the US is more than \$15 billion each year.

Although every organization may have their own ways of questioning suspected employees, such efforts may not yield positive results and the deceitful employees are unlikely to admit their act of stealing (Walczyk et al. 2005). Here is the relevance of polygraph testing. Polygraph testing may help organizations identify the dishonest employees and employee misconduct and take effective measures to counter it (Walczyk et.al. 2005). Hence, polygraph tests could play a significant role in enhancing organizational effectiveness.

Challenges to Polygraph Tests

Although polygraph tests have certain useful practical applications, there are several challenges. Accuracy and ethics issues are more frequently raised challenges to polygraph tests.

Accuracy

How accurate or scientific are the instruments is a major constraint of polygraph tests? Validity is one of the important accuracy measures that makes instruments qualify for wider practical applications. But polygraph tests do not satisfy this requirement. According to Saxe and Ben-Shakhar (1999), polygraph tests are invalid as there is no established relationship between the test items and dishonest behavior. The physiological indicators are measured in polygraph instruments as indicators of dishonesty. But, the linkage between physiological responses and deceitful behavior has not yet been empirically proved. Hence, polygraphs tests are invalid for the purpose (Saxe & Ben-Shakhar, 1999).

Moreover, polygraphs tests may not be able accurately in classifying honest and dishonest test subjects ('the truth about lie detectors (aka Polygraph tests),' 2004). The lack accuracy of these instruments is reflected in misclassification of test subjects. The important classifications errors such as "false positive" (declaring the innocent crime suspects as dishonest) and "false negative" (declaring the dishonest crime suspects as innocent) illustrates that these instruments are not valid ('the truth about lie detectors (aka Polygraph tests),' 2004). It is apparent that the classification errors are the major challenges to polygraphs tests that defeat the very goal of the instruments.

Ethical Issues

Polygraph test tends to produce considerable ethical problems. One of the major ethical problems associated with the use of polygraph tests is the challenge to personal autonomy of the test subjects. Polygraph tests are clear invasion into the personal privacy and civil liberties of individuals as several crime suspects or examinees are forced to become the subjects of the tests (Metzinger, 2006). The issue of privacy violation is true in the case of industrial application of the tests as well. In the case industrial thefts, several employees might be subjected to polygraph tests, regardless of their wish is an important challenge to their personal autonomy (Mitchell, 2003).

Interpretation of the test results is the other source of ethical violation in polygraph testing (Mitchell, 2003). Since there is no theoretically or empirically established relationship between physiological responses and deceitful behavior, the test administrators tend to interpret the results in a subjective or biased manner that is unfair and unethical (Metzinger, 2006; Brown & Murphy, 2010).

Conclusion

Polygraph tests are kind of magical instruments that help detect whether or not a person is lying. The underlying assumptions behind polygraph testing is that the act of telling lies is reflected in the physiological or neurological responses as the human body tends to react differently when deliberately trying to hide the truth or facts. Polygraph tests have several useful practical applications. Application of polygraph test is extremely significant in such fields as criminal investigation, national security, and employee recruitment and employee theft. There are different forms of polygraph tests available today. However, the success of polygraph testing will depend heavily on its ability to minimize misclassification of subjects. The biggest danger is “false positives” that declare innocent suspects as guilty. Nonetheless, a combination of different types of polygraph techniques such as CIT and GKT or CIT and neuroscience-based advanced polygraph tests would be able to achieve better results.

The polygraph tests appears to be better lie detection methods compared to the conventional methods of interrogation. Generally, in conventional methods of interrogation, the crime suspects are subjected to long periods of repeated interrogations and the officers often use punitive measures in their attempts of ascertaining honesty and truthfulness. The outcomes of such investigations may not be accurate as well. In this context, the simple and painless way of assessing honesty and truthfulness using polygraph tests might be more appropriate.

It is apparent that the scope of polygraph tests would be quite broad especially in the modern world where people everywhere are subject to different kinds of security threats and terrorist attacks. If the national security departments use polygraph tests, they may be able to identify terrorists who may disguise their identities to deceive government agencies to some extent. Hence, the role of polygraphs tests in maintaining peace, national security and social stability is quite impressive.

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