

Analysis of lie detector tests in criminal law

Akashdeep Singh

Associate Professor in Law, Rayat College of Law, Railmajra, S.B.S. Nagar, Punjab Affiliated to Panjab University
Chandigarh, Punjab, India

Abstract

Society owes a commitment to its people and citizens that the strength of the states is not abused during the dispensation of justice and human rights are upheld at all times. To preserve rights, the most basic tool used by humans is the police set-up. More often than not, third degree methods are used to extract information to get further in the investigation. However, this completely defeats the purpose of human rights that we so greatly pride ourselves on. In order to overcome this problem, in the criminal justice system, there are lie detector tests that can be used. These tests are of three types- Polygraph, Narcoanalysis, Brain-Mapping (BEAP). Each of these tests uses a different mechanism to evaluate different aspects of the human body to tell dishonesty from honesty. Lie detector tests have been particularly helpful as they help in limiting or eradicating third degree methods in investigations and protecting the human rights of all citizens. Unfortunately, these tests have not managed to garner too much support due to certain technical issues and admissibility problems but researchers and scholars have ascertained a 95-98% success rate of these tests. This paper seeks to analyse the use of lie detectors in criminal law.

Keywords: polygraph, narcoanalysis, brain-mapping (BEAP), human rights, third degree methods, extract, lie detector

Introduction

Lie detector tests, as we know them today, have become an extremely popular cultural icon inasmuch that we see them everywhere- from crime dramas to advertisements. Psychologist Leonard Saxe, PhD (1991) has pointed out that the idea that we can detect a person's conformity to facts by assessing their psychophysiological changes is more of a myth than a reality. He believes that even calling the polygraph a "lie detector" is inaccurate^[1].

The lie detecting instrument is used to conduct tests which consist of physiological monitor that keeps tabs of three main indicators-

1. Heart rate and blood pressure which is measured using a blood pressure cuff.
2. Respiration is measured by an instrument called pneumographs wrapped around the subject's chest.
3. Skin conductivity is also called the galvanic skin or electro dermal response which measures through electrodes attached to the subject's fingers^[2].

Today, almost all examiners use computerised recording systems.

In an article published in the Deccan Chronicle in February 2016, the former additional solicitor general of India, Mr. KN Bhat, said, "In criminal cases when police resort to lie-detector tests it should be concluded that the investigation has reached a dead-end and other methods of discovering evidence or eliciting information, including procuring a confession, have failed." There has been a longstanding debate over the use of the lie detector test in India. Like Mr.

Bhat, several other legal experts, scientists and other professionals have argued over the accuracy and rates of error. Additionally, various NGOs, right-based activists and organisations have been severely opposed to the best mainly on humanitarian groups arguing that it violates the Fundamental rights of the subject. These deception detection techniques also known as DDT are mainly of three types- polygraph, narcoanalysis and brain mapping. All three of these techniques have various important clinical, scientific, ethical and legal implications. On one hand, they are extremely useful in revealing concealed information related to crime and can also play a crucial role in investigations even though results cannot be used as evidence during the trial. Supporters of this scientific method contest that it is far better than using "third degree" methods. On the other hand, many people have argued that they are violative of fundamental rights of individuals. In a recent landmark judgement, the Supreme Court of India stated that DDTs cannot be administered without consent^[3].

Meaning and Definition

The term Polygraph refers to a process in which selected physiological activities are recorded. According to the definition of Webster's legal dictionary "a Polygraph is a device for measuring certain involuntary bodily responses, such as blood pressure and perspiration, from which an opinion is drawn as to whether or not the person being tested is telling the truth. Also called, to some extent positively, a Lie Detector^[4]. Oxford Dictionary defines it as an "instrument for determining whether a person is telling

¹ Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

²Suresh Bada Math, "Supreme Court judgment on polygraph, narco-analysis & brain-mapping: A boon or a bane", Indian Journal of Medical Research, Volume 134, Issue 1, July 2011, p. 5.

³ Kedar Nagarajan, "Why are Lie Detector Tests Still being used in Criminal Investigations", The Caravan a journal of Politics and Culture, July, 2017. available at <https://caravanmagazine.in/vantage/lie-detector-test-criminal-investigation>

⁴ Definition of Polygraph, available at <https://www.merriam-webster.com/dictionary/polygraph>

the truth by testing for physiological changes considered to be associated with lying”^[5].

In the United States Federal agencies, a Polygraph test is also a “Psychological Detection of Deception” or PDD examination. There is no Indian legislation which defines Polygraph, but United States Employees Protection Act of 1988 defines the term ‘Polygraph’ which means an instrument which-^[6]

- a. Can record continuously visually, permanently and simultaneously as minimum instrumentation tendered; and
- b. Can be used, or the result of which are used, for the purposes of rendering a diagnostic opinion regarding the honesty or dishonesty of an individual.

Brief history of Lie Detector

In ancient societies, a variety of elaborate methods were used to detect lies. These methods mainly involved torture as a means of extracting information. During the middle ages, boiling water was used as a lie detection tool. People during those times believed that truthful, innocent people would be able to withstand it better than liars. In 1895, Cesare Lombroso invented a machine to measure changes in blood pressure for police cases. Later on, in 1904, a device by Vittorio Benussi was used to measure breathing. Finally, there was a project by William Martson examining blood pressure of German prisoners of war, which indicated a strong relation between a person’s blood pressure and lying. A test of this nature is said to have been first done in the 19th Century by Italian criminologist Cesare Lombroso^[7].

Despite strong contributions from his predecessors, Marston has called himself the “father of the polygraph”. He was a strong advocate for the device and promoted its use in the courts. In 1938, he went on to publish a book titled “The Lie Detector Test” in which he spoke about the theory and use of the device.

In 1921, a device which could record blood pressure and galvanic skin response was invented by Dr. John Augustus Larson. His technology was first used in law enforcement at the Berkeley Police Department. More work was done on the same device by Leonarde Keeler. He updated the device, made it portable and added the galvanic skin response to it in 1939. This updated version was then purchased by the FBI and is said to serve as the prototype for the modern polygraph^[8].

Many different devices similar to Leonarde Keeler’s polygraph were introduced. These included the Berkeley Psychograph developed by CD Lee in 1936 which recorded blood pressure, pulse and respiration and the Darrow Behaviour Research Photo-polygraph which was developed solely for the purpose of behaviour research experiments^[9].

In 1945, a device was developed by John E. Reid which recorded muscular activity which accompanied changes in

blood pressure. He claimed that more accuracy can be obtained by making recordings of muscular activity along with recordings of standard blood pressure-pulse-respiration^[10].

Methods of Lie Detection

Over time, many people assume that lie detection refers to the polygraph test. However, this is incorrect. Lie detector tests used in criminal investigations are of three types- polygraph, narcoanalysis and brain mapping. All three of these tests involve different methods and techniques to get a person to tell the truth^[11].

Narcoanalysis

The narcoanalysis test involves the administration of a drug which causes the person to enter into different stages of anaesthesia. In its hypnotic stage, the person becomes slightly less aware and may give away information that he would not ordinarily reveal consciously. This technique has been known since the Second World War^[12]. The primary drawback of this technique is that many people are able to keep their ability to deceive even in hypnotic stage which means that even in a state of hypnosis, they can lie. On the other hand, many people can become extremely suggestive to questioning. The drugs used on the subject in no way guarantee that only the truth will be spoken because statements made in a state of hypnosis are not voluntary or clear. The narcoanalysis test without consent raises two main issues-^[13]

1. Physical assault inflicted on the subject by administering injections which may in turn have other side-effects. Added to that is the infliction of multiple painful stimuli like shaking the body, pushing, hitting, pinching etc.
2. Mental assault occurs because, through the test, the Investigators are tapping into the person’s mind and accessing his thoughts while he is in a hypnotic state which also leads to many privacy concerns.

Polygraph

The polygraph test which is often incorrectly assumed as the only method of lie detection, is a test which measures the physiological responses of a person. These include-^[14]

1. Heart rate
2. Blood pressure
3. Respiratory rate etc^[15]

The basis of this test is that a person who is guilty and intends to lie his way out of a test, while questioning, would go into a state of hyper-arousal which would in turn cause heightened or irregular physiological responses. These irregularities are picked up during the test by a person

⁵Meaning of Polygraph, available at <https://www.lexico.com/definition/polygraph>

⁶ Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

⁷ Paul V Trovillo, “History of Lie Detection”, Journal of Criminal Law and Criminology, Volume 29, Issue 6, 1939, p. 864-870.

⁸Ganapati M Tarase, MS Ramadurg, “Scientific and Legal procedure of Polygraph Test”, Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

⁹Geoffery C Bunn, A Social History of Lie Detector (John Hopkins University Press, Baltimore, USA), 2012, p.73-76.

¹⁰ Paul V Trovillo, “History of Lie Detection”, Journal of Criminal Law and Criminology, Volume 29, Issue 6, 1939, p. 864-870.

¹¹ William Moulton Marston, The Lie Detector Test (RR Smith, California, USA, 1938) p. 1-5.

¹²Dhamendra Kumar Singh, “Constitutionality and Evidentiary Value of Narcoanalysis, Polygraph and BEAP Tests”, International Journal of Law, Volume 3, Issue 4, 2016, p.84-89.

¹³ All you need to know about Lie Detectors, available at <https://blog.ipleaders.in/lie-detector-test/>

¹⁴ All you need to know about Lie Detectors, available at <https://blog.ipleaders.in/lie-detector-test/>

¹⁵ How a Polygraph Works? Available at <https://science.howstuffworks.com/question123.htm>

trained in reading polygraphs. The measurement of hyper-arousal depends on many factors such as heart rate, blood pressure, respiratory rate, electromyography and skin conductance. It also depends greatly on the way the investigator asks the questions. The main drawback of this technique is that a state of hyper-arousal is caused not just by lying or deception. It could also be triggered by depression, psychosis, nervousness, anxiety, confusion, fear etc ^[16]. That being said, it is not difficult for a trained person to beat the polygraph test. A person who is calm and able to control or suppress his arousal symptoms could lie their way out of the test.

Brain mapping

The brain mapping test measures a person's neural activity by tapping into brainwaves via electrodes attached to the face and neck. The test relies on the idea that the brain would produce different, unique brainwaves when it comes across a familiar stimulus like an image or sound. The brain mapping method used in India is known as Brain Electrical Activation Profile Test (P300 Waves Test). In this test, the subject is exposed to different stimuli- visual or sound based which is relevant to the issue being investigated along with other irrelevant words and pictures. The underlying theory is that in case of a guilty suspect, exposure to certain "probes" relating to the investigation will cause an emission of the P300 wave which will be recorded by the lie detecting instrument. For instance, a by-stander who witnessed a murder could potentially be implicated as an accused if the test reveals that the said person was familiar with the information related to the same.

Testing Techniques and Questions

The subject for questioning is to be prepared without any premedication. The preparation is more a mental preparation than otherwise. Certain subjects are naturally unsuitable for this test, for instance, subjects with psychotic personality, over reactive personality, drug addicts; persons suffering from gross abnormality of any of these three conditions and persons who are by nature deceptive, restless and non-cooperative. These subjects require special preparation and need time to be fit for the test. They are not suitable for ready examination ^[17].

There are various techniques employed to be able to conduct a successful lie detection test. Before the test, the subject is to be prepared properly without administering any premedication. The said preparation is more mental than physical or otherwise. Solely for the purposes of this test, certain people are seen to be unfit. These include people with a psychotic personality, over-reactive people, drug addicts, restless and non-cooperative people etc. A person who is seen to be suitable for examination is thoroughly prepared before the test. The subject is first taken for a pre-examination interview during which the process, purpose and aim of the test is explained to him in detail. In order for the test results to be accurate, it is important for the person to be aware of the incident. The answers are supposed to be in "yes" and "no" form. Ideally, about 10 questions are asked and in the initial stage of questioning, the investigator

asks three categories of questions- ^[18]

1. Irrelevant questions

Irrelevant questions are those questions that are not related to the incident in any way. For example- Is your name "A"? Are you 45 years old? Do you live in "X" area? Have you been working for "C" firm? ^[19]

2. Relevant questions

Relevant questions during the test are those questions which are directly related to the incident that has occurred. Answering them will either implicate the subject completely or get him off the hook. For example- On 3-03-18 you robbed a bank? On 11-08-17 you saw "A" stabbing "B"?

3. Control questions

Control questions are more general in nature mostly relating to minor bad acts that a person may have committed in early life or childhood. These questions usually depend on the fact that even though they have occurred a really long time back, the subject would not have forgotten about them. For example- "Did you ever cheat on a test?" "Did you ever steal money from your mother's wallet?" "Did you ever think about robbing a bank?" ^[20]

For the lie detection test to be successful, the questions need to be arranged in a way wherein the responses can be easily compared. So, an irrelevant question is followed by a relevant question and then again irrelevant question followed by a relevant question. This arrangement is done so that the person can get time to come back to normal receptive stage so that is adequately prepared for the next relevant question ^[21].

There are different settings for the test which are as follows- ^[22]

1. first test
2. card test
3. 3rd test
4. mixed question test
5. yes test
6. guilt complex test
7. repeat test (re- examination test)
8. Peak of tension test.

The first test

Happens right after the subject settles down and the appliances are attached to his body. Before the test commences, he is explained the pattern of the test and the outcome, if he lies ^[23]

¹⁶Dhamendra Kumar Singh, "Constitutionality and Evidentiary Value of Narcoanalysis, Polygraph and BEAP Tests", International Journal of Law, Volume 3, Issue 4, 2016, p.84-89.

¹⁷Murray Kleiner Handbook of Polygraph Testing (Academic Press, San Diego, USA, 2015) p.10-15.

¹⁸Ganapati M Tarase, MS Ramadurg, "Scientific and Legal procedure of Polygraph Test", Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

¹⁹Ganapati M Tarase, MS Ramadurg, "Scientific and Legal procedure of Polygraph Test", Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

²⁰Ganapati M Tarase, MS Ramadurg, "Scientific and Legal procedure of Polygraph Test", Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

²¹ Kerry Segrave, Lie Detectors-A Social History (McFarland & Co., Inc Publishers, North Carolina, USA, 2014) p.1-13.

²²Ganapati M Tarase, MS Ramadurg, "Scientific and Legal procedure of Polygraph Test", Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

²³Murray Kleiner, Handbook of Polygraph Testing (Academic Press, San Diego, USA, 2015) p.10-15.

Card Test

This is done to ascertain whether the subject has lied during the first test. When findings and results from the first test remain uncertain and no conclusions can be drawn, the card test is conducted. For this, seven playing cards with different numbers are used. The subject is asked to pick a card from the seven and is later allowed to look at it. After that he picks up all seven cards one by one to identify the one that is his. He should answer no to all seven and that means that one of the answers is wrong. The graphic change during the wrong answer then becomes helpful to compare it to the questions in the first test.

“Third Test”

This becomes necessary when conclusions cannot be drawn from the card test which means that no changes were noticeable in the comparative study. During this test, the questions are repeated and the person is told that the responses from the polygraph were not all truthful.

Mixed Question Test

Sometimes during the relevant questions, certain changes are noticed and it becomes important to ascertain whether the responses were correct or not. In order to do that, the person is asked the same questions again only with some rearrangement.

“Yes” Test

In certain circumstances, another test becomes necessary. In the “Yes” test, among the irrelevant questions, the person is asked some falsely incriminating questions. Before the test commences, the person is asked all the questions are told to say “Yes” to all of them. The expectation is that there will be a change in the response when he says “Yes” to a falsely incriminating question.

“Guilt Complex Test” I

In this test, the offence for which a person is being questioned is not the subject matter directly. However, questions are asked which create a guilt complex in him. For example, if “A” hit “B”, he could be asked- “You carried a weapon with you when you met him” etc ^[24].

“Re-examination Test”

Re-examination is carried out in case the responses are erratic or if a particular subject is being unresponsive or inconsistent. The questions are asked in a very general, suggestive manner which aims at not unnecessarily exciting the subject.

Peak of Tension Test

The Peak of Tension Test includes contains facts of the offence that has occurred without directly linking the person with it any way. For example, in case of a theft, the investigator might name various ornaments. The underlying objective is that when the stolen ornament is named, the subject’s level of excitement will be represented in graphic records. This is most suited for people who remain excited to some extent all through the interrogation.²⁵

²⁴Ganapati M Tarase, MS Ramadurg, “Scientific and Legal procedure of Polygraph Test”, Journal of Bio Innovations, Volume 5, Issue 2, 2013, p. 1-3.

Application and Utility of Lie Detector Tests

Ever since the development of the polygraph, it has been used in criminal investigations as method of assistance by the police mainly in countries like USA and Japan. However, in recent times, it has also been used for other purposes such as-

Recruitment of police and other personal ^[26].

Apart from the police department the federal bureau of investigation and the department of defence, banks and other organisations are also utilising the lie detector as an aid for investigation undertaken by them.

The big business and industrial concerns in USA use the lie detector for checking the honesty of their employees.

Specific quality of polygraph and allied deception tests can briefly be summarised as follows:

1. It can detect deception.
2. It can discriminate between the innocent and the guilty.
3. It can replace the third degree methods used in interrogations.
4. It can narrow down the field of inquiry for the police.
5. It can check the veracity of the statement of a witness.
6. It is an effective tool to ascertain and check the honesty of candidates or employees.

Recent Supreme Court Judgement ^[27]

In the famous case of Selvi v. State of Karnataka ^[28], there was a question before the Court relating with the relevancy of Polygraph test. In this case the court has to decide that whether conducting the Polygraph test on the subject without his/her consent is constitutionally valid or not. The Hon’ble Court observed that Article 20(3) protects an individual’s choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. The main object of Article 20(3) is to prevent the forcible ‘conveyance of personal knowledge that is relevant to the facts in issue’. The result obtained from each of the impugned test bear a ‘testimonial’ character and they cannot be categorized as ‘material evidence’ ^[29]. In this case, the Supreme Court has laid down some guidelines regarding Polygraph test also. The Court further held that Polygraph test should not be conducted on the accused person without taking his/her consent. If such test is conducted without taking the consent of the accused person, it would be a clear violation of Article 20(3) of Indian Constitution ^[30].

Constitutional Perspective ^[31]

In the case of Santokben Sharma Bhai Ladeja v. State of Gujarat ^[32], the Gujarat High Court held that —the Narco-

²⁶Suresh BadaNath, “Supreme Court Judgement on Polygraph, Narcoanalysis and Brain-mapping”, Indian Journal Medical Research, Volume 2, Issue 1, p.1-4.

²⁷Supreme Court Judgement on Polygraph, Narcoanalysis and Brain-mapping: Boon or Bane?, available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3171915>

²⁸AIR 2010 SC 1974.

²⁹ Suresh BadaNath, “Supreme Court Judgement on Polygraph, Narcoanalysis and Brain-mapping”, Indian Journal Medical Research, Volume 2, Issue 1, p.1-4.

³⁰Supreme Court Judgement on Polygraph, Narcoanalysis and Brain-mapping: Boon or Bane?, available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3171915>

³¹Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

³²2008 CriLLJ 68.

Analysis test is conducted under the supervision of doctors and proper care is taken and there is consent, observation of the State of the accused, and, as such, the element of risk is minimal. Risk is in fact part of life and pervades in most of human activities and on this ground, alone, therefore, the impugned test cannot be condemned^[33].

In the case of *Jitubhai Patel v. State of Gujarat*^[34], since the state had filed affidavit that it shall not conduct the test on the accused person without his consent, the issue of admissibility of scientific evidence becomes academic only. It may be decided at some different occasion. In this case it was held that the scientific tests such as Polygraph test, Narco-Analysis test can be conducted without taking the consent of the accused person.

The Bombay High Court upheld the legality of Polygraph test in the case of *Ramachandran Reddy v. State of Maharashtra*^[35]. In this case the court upheld special court's order of Pune, allowing the SIT to conduct scientific tests on the accused in the fake stamp paper scam including the main accused, Abdul Karim Telgi. The verdict also said that the evidence procured under the effect of Lie Detector test is also admissible. In the course of the judgment, a distinction was drawn between "statement" (made before a police officer) and "testimony" (made under oath in court). The judge, justice Palshikar and justice Kakade said that the Lie Detector and the Brain mapping test did not involve any "statement" being made and the statement made under Narco-Analysis test was not admissible in evidence during trial. The judgment also held that these tests involve "minimum bodily harm".

In the case of *Rojo George v. Deputy Superintendent of Police*^[36], the Court while allowing a Narco Analysis test observed that in present days the techniques used by the criminals for commission of crime are very sophisticated and modern. The conventional method of questioning may not yield any result at all. That is why the scientific tests like polygraph, brain mapping, narco analysis, etc. are now used in the investigation of a case. When such tests are conducted under strict supervision of the expert, it cannot be said that there is any violation of the fundamental rights guaranteed to a citizen of India^[37].

In *Dinesh Dalmia v State*^[38], the Court observed that where the accused had not allegedly come forward with the truth, the scientific tests are resorted to by the investigation agency. Such a course does not amount to testimonial compulsion. From the above discussion, it is very evident that conducting a Narco Analysis test does not violate Article 20 (3) per se. Only after conducting the test, if the accused divulges information which is incriminatory, then it will be hit by Article 20(3). Other information divulged during the test can help the investigation. Thus, there is no reason why we should prohibit such a test on grounds of

unconstitutionality^[39].

Evidentiary Value When Polygraph, Narcoanalysis and BEAP test Conducted Voluntarily (With Consent)

In *Selvi v. State of Karnataka* Apex Court¹² held that no individual should be forcibly subjected to any of the techniques in question, whether in the context of investigation in criminal cases or otherwise. Doing so would amount to an unwarranted intrusion into personal liberty. However, The Court allowed voluntary administration of the impugned techniques in the context of criminal justice, provided that certain safeguards are in place^[40].

Even when the subject has given consent to undergo any of these tests, the test results by themselves cannot be admitted as evidence because the subject does not exercise conscious control over the responses during the administration of the test. However, any information or material that is subsequently discovered with the help of voluntary administered test results can be admitted, in accordance with Section 27 of the Evidence Act, 1872^[41].

The Supreme Court of India in *Ram Singh vs. Sonia*^[42] while dealing with the question of admissibility and reliability of the result of the narcoanalysis test has not given any conclusive opinion regarding the admissibility and the reliability of the report of the narcoanalysis test^[43].

Conclusion

In the present day scenario, techniques used by the criminals for commission of crime are extremely complicated and modern. For this very reason, scientific tests like Polygraph, Brain Mapping, Narco-Analysis, etc. are frequently used for the purpose of investigation. These tests are conducted under situations of extreme necessity and under expert supervision and by competent investigators so that there is no violation of Fundamental Rights of any individual. In India this technique has proved to be a quite helpful in many situations. With the help of this test, various criminal cases have been successfully solved investigating authorities and courts. By and large, the lie-detector evidence has limited judicial recognition. In some courts of America, Polygraph test results have been recognized as a way to aid to investigation. The experts in the areas like fingerprints, firearms, identification questioned documents etc. have been widely acclaimed. But the Polygraph experts have not received acceptance and recognition from courts of many countries across the globe. This is an unfortunate circumstance because Polygraphists have established 95 to 98% accuracy of the Lie Detector in detecting deception or the truthfulness of the subjects in criminal investigations.

³³H. Pricilla, AryaR, "Polygraph and Narco test in Indian Evidence Law- Through Case Laws", International Journal of Pure and Applied Mathematics, Volume 12, Issue 5, 2018, p. 135.

³⁴2005(10) SCC 545.

³⁵ 2004 ALL MR (Cri) 1704.

³⁶2006(2) KLT 197.

³⁷Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

³⁸2006 CriLJ 2401.

³⁹Supreme Court Judgement on Polygraph, Narcoanalysis and Brain-mapping: Boon or Bane?, available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3171915>

⁴⁰Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

⁴¹Polygraph Test and its Legal Implication in the Indian Criminal Justice System, available at <https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/10/chapter6>.

⁴²AIR 2007 SC 1218.

⁴³ H. Pricilla, AryaR, "Polygraph and Narco test in Indian Evidence Law- Through Case Laws", International Journal of Pure and Applied Mathematics, Volume 12, Issue 5, 2018, p. 135.

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