

RECENT ADVANCES IN LIE DETECTION

Dr. Yogender S. Bansal, Assistant Professor,
Dr. Dalbir Singh, Additional Professor & Head,
Dr. Sreenivas M, Senior Resident,
Mr. Avadh Naresh Pandey, Research Fellow,
Department of Forensic Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh.

ABSTRACT

Lie detection techniques are utilized by investigating agencies in a wide variety of fields, such as Defence, Secret Services, Terrorism, as the veracity of statements cannot be taken at face value.

KEY WORDS : Lie detection, Polygraph test, f-MRI

INTRODUCTION

Human beings are the only creation of the nature, bestowed with the ability to think, analyze and act accordingly, but few unscrupulous creatures have utilized these capabilities for the wrong purposes. Therefore the society is always on the lookout to develop measures to curb these criminal activities.

There are always new frontiers and novel techniques to combat crime. Recent advances in DNA research [1, 2], Dactylography [3], Cheiloscopy [4] help the investigators to the great extent to crack the case, but their availability is the major limitation.

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In the recent times, "polygraph" test has earned a lot of popularity. Typically, under stressful conditions, subconscious psychological events begin to occur which cause the body to respond in a physical sense, like increased sweating, respiration and heart rate, but again these can easily be circumvented.

Recently there has been a technological breakthrough, providing a few new techniques by which it can be proved whether a person is telling the truth or not: f-MRI and Brain Fingerprinting are the much talked about techniques which have revolutionized Forensic investigations.

WHAT IS f-MRI

MRI uses radio waves and a strong magnetic field to provide detailed pictures of internal

organs and tissues. Functional Magnetic Resonance Imaging (f-MRI) is a relatively new use of existing MRI technology; where MRI detects regions where blood vessels are expanding, chemical /metabolic changes are taking place, or extra oxygen is being delivered in an active part of the brain.

In f-MRI, the patient lies on a sliding table, with his head in a brace and is asked to perform a particular task while the imaging is taking place. The metabolism in that particular region of the brain responsible for that task will increase, resulting in changed signal in the MR image. By mapping the signals onto digital images of the brain, f-MRI is able to monitor the movement of blood, determining which areas of the brain are activated by a particular task. [5]

Blood oxygen level dependent (BOLD) f-MRI, measures brain activity associated with deception. Activated areas of the human brain show localized increase in blood flow. Thus, the oxygen content of venous blood increases during brain activation, resulting in increased MR signal intensity. [6, 7]

A classical feature of the human brain is the anatomical specialization of cortical regions for the processing of different types of information. Exploiting this fact Daniel Langleben used f-MRI on 18 volunteers who were subjected to the 'Guilty Knowledge Test'. He found sections of the brain that exercise a significant role in attention, and which monitor and control errors (the anterior cingulate gyrus and parts of the prefrontal and premotor cortex), were more active in the volunteers when they were lying than when they were telling the truth. Langleben said, "If truth was

the brain's normal 'default' response, then lying would require increased brain activity in the regions involved in inhibition and control." [8]

WHAT IS BRAIN FINGERPRINTING

"Brain Fingerprinting", the brain child of Dr Lawrence A. Farwell is a new computer based technology to identify perpetrator of a crime by measuring brain wave responses to crime related words or pictures.[9]

Brain Fingerprinting is based on the principle that the brain is central to all human acts. In a criminal act, there may not be many physical evidences at the crime scene, but the 'brain' is always there recording the sequences of the crime. The Basic difference between a criminal and innocent person is that the criminal has the details of the crime stored in his brain, whereas the innocent does not.

In recent years, EEG has undergone technological advances that have increased its ability to read brain activity from the entire head simultaneously.

In Brain fingerprinting testing, the subject is made to sit in a quiet room with sensors on his headband that measure electrical brain responses. Three types of stimuli: "targets," "irrelevant," and "probes", in the form of words, pictures, or sounds are presented for a fraction of a second each, under computer control. Incoming stimulus that is significant and noteworthy results in a specific , electrical brain response, known as P-300, which is one aspect of a larger brain wave response , known as MERMER (memory and encoding related multifaceted electroencephalographic response).[10]

Until recently, ERPs (event related potentials) method was adopted for the study of information processing brain activity which is a specific, positive and negative voltage changes during the information processing. The only disadvantage of ERPs is their "signal averaging" technique, which eliminates all the complex patterns resulting in the loss of meaningful signals as well [11]

This limitation led to the development of MERA (multifaceted electroencephalographic response analysis). Incorporating this technique Farwell and colleagues found that, MERMER is

elicited, when an individual recognizes an incoming stimulus. [12]

DISCUSSION

F-MRI is still in a phase of infancy and further research should be expanded to incorporate individuals from different demographic profiles in order to establish a broad base for comparisons and to corroborate the pattern predictive of truth telling and deception. Apart from that, f-MRI machines are bulky, expensive and highly sensitive to motion, decreasing the likelihood of its real-world application. Nevertheless, in the near future, with advances in Neuro-technology occurring at such a rapid pace, the admissibility of f-MRI results into courtroom may not be far away.

Looking from the practical point of view, determination of innocence or guilt, however, is a legal entity, rather a scientific determination. The investigating agencies can take the results of 'Brain Fingerprinting' as an evidence, along with all other available evidence, to reach a verdict of guilty or not guilty.

Brain Fingerprinting lie detection technique won a legal victory in the high profile case of Terry Harington, who was convicted of a night watchman's murder in Iowa (USA). He got acquitted as his "Brain Fingerprinting" patterns did not match with the crime scene evidences. Similarly in another case identity of the accused that had raped and killed the victim 15 years back was established through Brain Fingerprinting. [13]

With the Brain Fingerprinting and f-MRI , a new era in security and investigations has began, numerous cases like Miss Jammu Anara's case, Kanchi Mutt Shankracharya's case, DPS MMS case, would be ideal for these 'Lie Detection' techniques. Only time will tell whether suspects in such cases would be able to elude the investigating agencies armed with these technological advances.

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