

Brain FingerPrinting

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Abstract:

Every forensic science provides scientific data & scientific conclusions for the use of non-scientist panel of judges & juries, who evaluate these on a consistent & legal basis regarding facts. The reason of this document is to describe the boundaries of the science of Brain Fingerprinting & state what falls within & outer the boundaries.

Keywords: forensic science, multifaceted response analysis, memory and encoding related multifaceted electroencephalographic response, criminal investigation, brain waves.

1. INTRODUCTION

Every science involves skill, judgment, or "art" on the part of its practitioners and the science of Brain Fingerprinting testing is no exclusion. Investigators' need for exact, scientific means of involving perpetrators with crime scene evidence has inspired some scientists to invite, "What does the criminal constantly obtain with him?" from the crime sight that records his attachment in the misdeed. The answer to this query, of route, is the intelligence. Forensic science is always evolving, from the discovery of the individuality of the human fingerprint, to the capability to equivalent a criminal to his crime through DNA profiling; technology continues to provide investigators with new armaments. But fingerprint and DNA confirmation are bare in the only one percent of all personal belongings. When trusted techniques fail, investigators must turn to cutting-edge technology to bring invisible clues to light.

Every criminal leaves evidence in the rear. The input is to know how to find it. A innovative technique is testing a way of tapping the suspect's intelligence, to twirl the criminal's individual memory against him.

Dr. Lawrence Farwell is the Chairman and Chief Scientist at Brain Fingerprinting Laboratories in Seattle, Washington. He has urbanized a new programmed system known as **brain fingerprinting**. It reads the remembrance centers of the person brain. He believes that Brain Fingerprinting will one day be used to positively link perpetrators to their crimes.

Brain Fingerprinting may seem similar to Polygraph (usually called a Lie Detector), but it differ in significant way. A polygraph dealings physiologic response such as heart rate, sweating, inhalation and other processes that are only indirectly related to brain function. Brain Fingerprinting information come unswervingly from brain function. It and other associated tests do not compute frankness but seek to determine whether the subject has a particular memory.

Information of frequent details of the offense, such as the murder bludgeon, the accurate location of the body, the amount of currency stolen -- any in sequence not accessible to the public -- may disclose that a exacting person is connected with the offense.

1.1 EXISTING SYSTEM

The existing system measures the innocence, guilty and every actions of human being. This system needs more response from human beings. It is not that much efficient, it requires more time and attention from human beings. It is equal to the lie detector test. Most of the time it fails because it does not accurately measures the changes occurs in the human body.

1.2 PROPOSED SYSTEM

In a proposed system, measurements are recorded in fractions of a second after the stimulus is existing, prior to the matter is capable to prepare or control a response. Brain responses were recorded from the midline anterior, innermost, and parietal scalp location, referenced to associated mastoids (at the back the ear), and from a position on the brow to follow eye activities. At the closing stages of every investigation, subject matter were given a written list of all stimulus items and asked to mark each item as important, somewhat important, or immaterial – those marked were thrown out. Relevant words, pictures or sounds are presented to a subject by a computer in a series with stimuli. The brainwave responses measured with the help of a patented headband equipped with EEG sensors. It does not measures the guilty or innocence. Brain fingerprinting method is based on an electric signal known as MERMER (memory and encoding-related multifaceted electroencephalographic response). The technique is said to be more effective than a lie detector test.

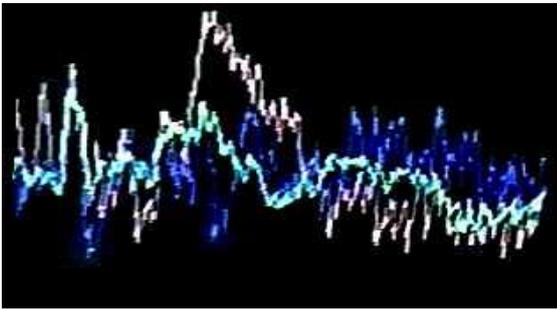
2. SCIENCE OF BRAIN FINGERPRINTING

When someone commits a crime, his brain records (i.e.) it has a memory.





Brain Fingerprinting seeks to expose that remembrance, by viewing the believe evidence taken from the offense picture. A head band with sensors is placed on the matter sequence of pictures or words is flashed on the computer screen. The computer report the brain impression formed in reaction to what the subject sees. The responses are recorded as a signal type.



By analyzing the blueprint of effect, Farwell can decide if the subject is recognizing what he is bearing in mind. So at what time you have a state of affairs where a crime has been dedicated, and there are confident information only the suppose with know, then we can test: does this brain have these information stored in it? If so, then the consider stanch the offense. If not, then not.

3. BRAIN FINGERPRINTING DETECTS IN SEQUENCE

Brain Fingerprinting detects information stored in the individual brain. Sensors on a headband, list the subject's EEG, or brain signal reaction to the processor images. The EEG is feed all the way through an amp and into a processor that uses proprietary software to display and interpret the brain effect. A specific, electrical brain sign reaction, known as a **P300**, is emitted by the intelligence within a division of a succeeding when an personality recognize and process an inward incentive that is important or notable. When an immaterial spur is seen, it is seen as being not important and not notable and a P300 is not emitted.

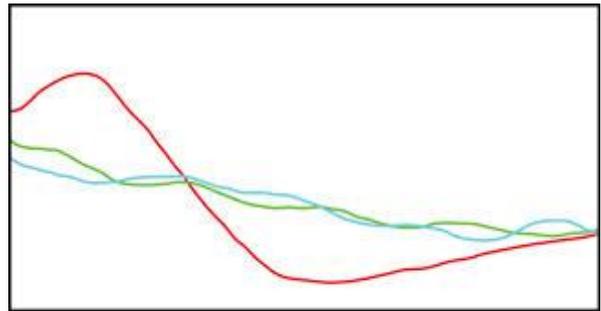
In his research on the P300 response, Dr. Farwell exposed that the P300 was one portion of a bigger theory reaction that he named a MERMER (memory and encoding related multifaceted electroencephalo-graphic response). MERMER comprises a P300 reaction, happening 300 to 800 ms after the spur, and supplementary patterns happening more than 800 ms

behind the spur, given that even supplementary exact domino effect

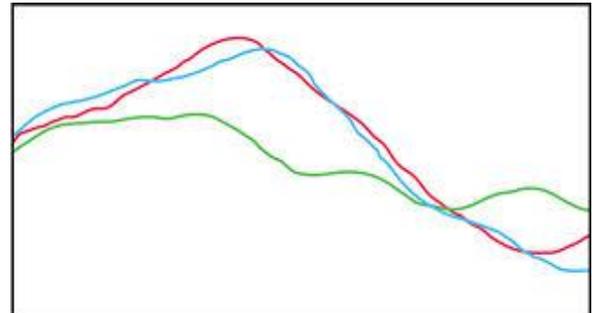
Using **Many-sided electroencephalographic reaction study (MERS)**, shows that a specific many-sided electroencephalographic response (MER), known as a memory and programming related many-sided electroencephalographic reaction (MERMER), is elicited when a person recognizes and processes a spur that is predominantly essential to him/her.

The MERMER includes: the P300, an electrically positive component maximal at the parietal scalp location, longer latency, electrically pessimistic subcomponent famous at the frontal scalp site, and Physic changes in the rate of recurrence and arrangement of the gesture.

COMPUTER CONTROLLED



Information not present



Information present

The entire Brain Fingerprinting system is under processor be in command of, together with arrangement of the stimuli, footage of electrical brain activity, a mathematical statistics study algorithm that compares the response to the three types of stimulus (goal, unrelated, explore), and produce a strength of mind of "information in attendance" or "information not present," and a geometric assurance altitude for this strength of mind.

4. SCIENTIFIC PROCEDURE

Three types of stimuli are presented: target, immaterial, and Probes. The Targets are made relevant and noteworthy to every single one subjects, i.e., the subject matter is agreed a listing of the goal stimuli and instruct to force down a exacting button in reaction to target and another button in reaction to every other stimuli. Since the comparatively rare Targets are singled out in the task being performed, the Targets are notable for the focus, and every goal spur elicits a MERMER. Nearly all of the non-Target stimuli are

immaterial, having no next of kin to the circumstances below examination. This immaterial do not bring out a MERMER.

Some of the non-Target stimuli are relevant to the situation under investigation. These applicable stimulus are referred to as Probes. For a subject matter who has participate in the circumstances in question, the Probes are notable due to the subject's understanding of that circumstances, and, consequently, Probes bring out a MERMER when the subject is familiar. Probes are impossible to differentiate from the immaterial for a subject matter who is not knowledgeable about the situation under investigation, and thus Probes do not extract a MERMER if the subject matter is not familiar.

Scalp recording was done with disposable EEG electrodes, comparable to folks used in typical EEG footage. The electrodes were surrounded in a special headband calculated and constructed by Dr. Farwell's Human Brain Research Laboratory.

4.1 The RSA Algorithm

The RSA (Rivest-Shamir-Adleman algorithm) is the most important public-key cryptosystem.

The RSA works because:

If $n = pq$, where p and q are large primes (several hundred digits), then

- i) Given p and q , we can easily multiply them to obtain n , but
- ii) Given n , there is no known way to factor n as pq in any reasonable amount of time.

This algorithm is used in the Brain FingerPrinting to record the each and every actions and activities of human brain effectively and efficiently.

5. SCIENTIFIC EXPERIMENTS:

5.1. Harrington's Case

In April 2000, Dr. Lawrence Farwell conducted a Brain Fingerprinting test on Harrington. Brain responses showed finally that the record stored in Harrington's brain did not equal the offensesight and did equal his alibi, according to Dr. Farwell. The Brain Fingerprinting examination outcome were the first original indication at the bottom of Harrington's assert of blamelessness in over 2

5.2. Dr. Richardson's Comment

Drew Richardson, PhD a senior agent of the FBI and a scientist in the FBI Laboratories for 26 years says "I was assigned to collaborate with Dr. Farwell in the research, design and laboratory testing of a research study on Brain Fingerprinting skill. In our cram, certainly in all the studies to date, Brain Fingerprinting taxing has proved to be 100% exact, wherever a purpose can be made. I estimate that up to 70% of major crimes would someday be appropriate for applying Brain Fingerprinting technology.

6. APPLICATIONS:

6.1. HELPS TO CATCH A SERIAL KILLER

Macon County, Missouri Sheriff Robert Dawson engaged Dr. Farwell to method a Brain fingerprinting analysis on J. B. Grinder, who had been a assume in an unanswered murder case for 15 years. The test outcomes show that the certification stored in his brain matched dangerous information of the crime scene that only the perpetrator would know. Faced with an approximately confident assurance and a probable bereavement verdict, Grinder pled accountable in exchange for life in prison without the option parole. He then also confessed to the in the past unsolved murders of three other women.

6.2 .NATIONAL SECURITY APPLICATIONS

In a terrorist act, verification such as fingerprints or DNA may not be available, but the brain of the executor is always there — development, execute, and footage the crime. There are recollections of the offense stored in the brain of the performer and in the brains of those who helped plan the crime. Brain Fingerprinting Laboratories technology can detect these records stored in the brain and help identify skilled terrorists earlier than they smack, including those that are in long-standing "sleeper" cells. The technology will also be used to look up security in areas like VISA applications and the shelter of classify in sequence

6.3. ALZHEIMER'S DISEASE:

Brain fingerprinting can be used to recognize personnel distress from Alzheimers disease where a being suffers from beating of memory.

7. LIMITATIONS OF BRAIN FINGERPRINTING:

1. Brain fingerprinting detects information-processing brain responses that disclose what in sequence is stored in the subject's brain. It does not notice how that in sequence got there.
2. If, however, the suspect knows the whole lot that the investigators know about the crime for some genuine reason, then the test cannot be functional.
3. Another situation where brain fingerprinting is not applicable is one where the establishment have no information about what crime may have taken place. For example, an entity may withdraw below conditions where a specific suspect had a strong intention to assassinate the being.

8. RESULT

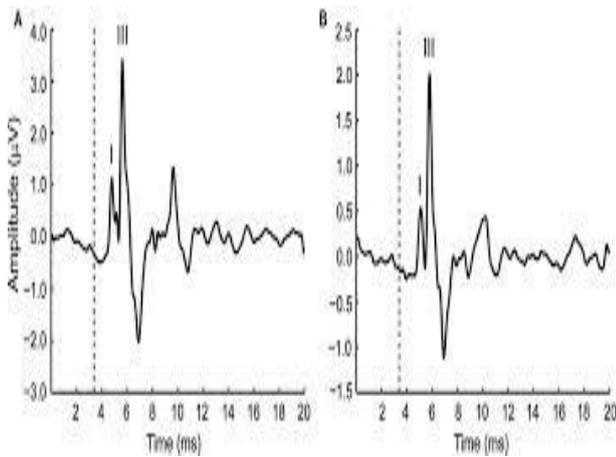
There are many diverse ways to current MERMER brain reaction data visually. Different methods exemplify different features of the data. No one method can passably imprison all of the in sequence included in the data in a visually familiar form. One method that is often successful in provided that a visual depiction of the differences in brain responses involves plotting average responses to Probe, goal, and immaterial stimuli as voltage over time at a exact scalp spot.

Figures A and B present the average brain responses to Probe, goal, and immaterial stimuli for two of the subjects. Figure A presents data for a subject who is well-informed regarding the investigated result. Figure B presents records for a subject matter who is not well-informed regarding the investigated event.

These figure near plots of voltage over time at the parietal (Pz) scalp position. In these figure, the MERMER appears as a positive voltage peak at in the region of 500 msec followed by a negative voltage deflection maximal at approximately 1200 - 1500 msec. (The latency of these deflections vary according to the velocity of the person subjects' brain dispensation.)

The brain responses of two subjects whose data are accessible here are typical of their personality groups, knowledgeable and not knowledgeable. As can be clearly seen in the figures, for the well-informed subjects (Figure A) the MERMER is elicit in response to both Targets and Probes. For the subjects who were not knowledgeable (Figure B), the MERMER is bring out only in reaction to target.

(Figure A and B) Information Present and Absent Brain Response



Figure(A)

Figure(B)

9. CONCLUSION

The 100-percent accurateness and tallassurance level of the results, however, supply further support for results from previous research using brain MERMER testing.

Today's complicatedoffensepicture analysis techniques can sometimes place the performer at the picture of the offense; however, corporealevidence is not always present.

In addition, if research determine that brain MERMER testing is dependablesufficient that it could be introduce as verification in court; it may be the criminal analytical tool of the prospect.

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