

The Conclusive Aspect of Brain Fingerprinting and the Doctrine of The Judge's Personal Belief in Criminal Cases.

Dr. Dellal Warda¹

¹Lecturer A, Faculty of Law and Political Science, University of Abu Bakr Belkaid Tlemcen, Mediterranean Legal Studies Laboratory, Algeria, Email: Warda.dellal@univ-tlemcen.dz

Soumission: 19/02/2026

Acceptation: 15/06/2026

Publication: 28/08/2026

Abstract

In the context of scientific advancements, various methodologies have emerged that significantly impact the domain of criminal evidence. Among these, the brain fingerprinting technique stands out, as it utilizes information retained in the human brain regarding a committed crime to assess an individual's connection to it. Although the outcomes derived from brain fingerprint testing are highly reliable, the criminal judge retains the discretionary power to consider this scientific evidence alongside other forms of evidence. The overarching principle governing evidence is the autonomy of the criminal judge to arrive at a personal conviction, guided by certain constraints that govern this freedom. Consequently, the judge must navigate the delicate balance between respecting the sanctity of an individual's private life and serving the public interest.

Keywords: The fingerprint of the brain, the principle of persuasion, the criminal judge, and the definitiveness of outcomes.

Introduction

The foundation of criminal justice lies in the necessity to prove that a crime has been committed and to assign responsibility to a particular individual. To achieve this, the criminal judge utilizes several evidentiary methods, especially traditional forms such as admissions and testimonies from witnesses.

Scientific advancements have led to the development of contemporary methods that criminal judges can utilize to ascertain the identity of offenders. The field of criminal investigation has experienced significant progress alongside advancements in neuroscientific research, which offers powerful tools for a more profound and precise comprehension of human behavior and intentions. This progress enhances the evidentiary possibilities in criminal cases. The techniques associated with neuroscientific evidence can be categorized into four main areas: scientific discoveries pertinent to criminal evidence, methods for diagnosing the accused, interventions aimed at altering an individual's perception of the act committed, and legal procedures designed to implement the aforementioned areas effectively.

Neuroscientific research has led to the development of neurotechnological evidence, which includes methods such as brain fingerprinting, narcotic analysis (often referred to as truth serum), hypnosis, and lie detection. These techniques play a significant role in the examination of neurological evidence within criminal investigations, as they are classified as diagnostic tools for the accused and involve technical interventions that influence an

individual's perception. This advancement is grounded in a growing comprehension of neural processes and their effects on human behavior.

This study aims to illuminate the role of brain fingerprint technology as a reflection of human intent. The brain has been utilized as a mechanism to provide evidence against defendants, leveraging this advanced technology that has emerged as a reliable scientific tool for identifying and investigating the perpetrator of criminal activities. The significant contributions of brain fingerprinting to criminal justice, identity verification, and various other domains have led to its endorsement by several foreign legal systems, following its scientific validation and recognition as a credible medical approach.

However, despite the scientific certainty of brain fingerprinting technology, it clashes with the general principle of criminal evidence, which is the freedom of the criminal judge to form his personal conviction. He may accept the evidence he deems appropriate from among the evidence presented before him.

This study raises the issue of reconciling the definitive nature of brain fingerprinting with the principle of judicial discretion in criminal cases to achieve justice?

We have tried to answer this problem by relying on the descriptive analytical approach, starting from explaining the brain fingerprint technology and how to apply it in the field of forensic evidence. Accordingly, this study was divided into two main axes as follows:

First: The concept of brain fingerprinting

Second: Restrictions on the use of brain fingerprint in criminal evidence

1.The concept of brain fingerprinting

A brain fingerprint refers to the distinctive amalgamation of cognitive processes, emotional responses, and behavioral patterns that the brain generates in its electrical activity. Each individual's brain fingerprint is unique, ensuring that no two people exhibit identical patterns, and it remains stable over the course of a person's lifetime. Consequently, this characteristic is regarded as a valuable tool in the pursuit of uncovering the truth in criminal investigations. In order to understand the nature of brain fingerprint technology, it is necessary to clarify the first appearance of this fingerprint, then its definition, and finally its relationship to criminal evidence:

1.1 Discovering the fingerprint of the brain:

The invention of brain fingerprints is attributed to American scientist Lawrence Farwell¹, who introduced the concept in 1984 under the term "Brain Fingerprinting."² To support his research on using electroencephalogram (EEG) technology for lie detection, the Central Intelligence Agency (CIA) provided him with a funding of one million dollars. This financial backing enabled Dr. Farwell to develop the technique, which he subsequently patented as "Brain Fingerprinting." Farwell and his team asserted that this method boasts an accuracy rate

¹ He is from Fairfield, Iowa and is the head and chief scientist of the Brain Fingerprinting Laboratory and a former member of Harvard Medical School.

² Essam El-Din Abdel Aal El-Sayed, The Validity of Brain Fingerprinting in Criminal Evidence, Arab Journal of Security Studies, Volume 35, Issue 2, 2019, p. 276.

nearing 100% in assessing whether a suspect possesses knowledge of specific criminal details³.

This revelation gained significant attention across multiple media platforms, leading to a profound sense of astonishment and ongoing discourse within American society. It demonstrated the capability to transform words and images associated with criminal activity into signals and visual cues displayed on computer screens. This technological advancement aims to establish a connection between the offender and the relevant words and images, positing that the brain serves as the primary driver of all human behavior. It is the brain that orchestrates, carries out, and retains the memories of events that transpire during the commission of a crime, with the actual perpetrator's brain preserving these occurrences in its memory⁴.

This revelation gained significant attention across multiple media platforms, leading to a profound sense of astonishment and ongoing discourse within American society. It demonstrated the capability to transform words and images associated with criminal activity into signals and visual cues displayed on computer screens. This technological advancement aims to establish a connection between the offender and the relevant words and images, positing that the brain serves as the primary driver of all human behavior. It is the brain that orchestrates, carries out, and retains the details of events that transpire during the commission of a crime, with the actual perpetrator's brain preserving those memories.

With the emergence of this technology in the field of criminal evidence, it has become possible to know whether a person has information about the crime or not, by examining the signals emitted by his brain, and those signals are analyzed to produce a report with the result that reaches very high levels of accuracy⁵.

1-2 Definition of brain fingerprint:

1-2-1 Linguistic definition: A fingerprint originates from an impression, specifically an impression made by fabric for the purpose of drawing. In the language, the fingerprint is the mark and it is from the common people's speech. The fingerprint is what is between the tip of the little finger and the ring finger. It is said that a man has a thick fingerprint⁶, meaning he is thick. It is said that I have not separated from you by an inch, nor by a period, nor by a reproach, nor by a fingerprint. It is said: A man with a thick fingerprint, meaning he has a thick fingerprint, if he stamps with the tip of his finger, and the fingerprint is the trace of the

³ Abdel Moneim Rahma Salam/ Ahmed Shukran Bahr El-Din, Brain Fingerprinting and its Validity in Criminal Evidence: A Comparative Study between Islamic Law and Libyan Criminal Law, Perdana: International Journal of Academic Research (Social Sciences and Humanities), Volume 16, Issue 1, April 2023, p. 3.

⁴ Mahmoud Mohamed Soueif, The Role of Brain Fingerprinting in Criminal Evidence, Dar Al-Jamiah Al-Jadida, Alexandria, 2022, p. 109.

⁵ Federal agency views on the potential application of brain finger printing report to the honourable Charles E. Grassley n.s.senate. GAO-02-22.october 2001.p 4-5.

⁶ Al-Munjid in Language and Media, Catholic Press and Dar Al-Mashreq, Beirut, Thirty-eighth Edition, 7111, p. 41, Fingerprinting Article.

stamp on the finger. In Arabic, the fingerprint is the space between the tip of the little finger and the tip of the ring⁷ finger, and the space is the space between every two fingers in length⁸. The term fingerprint refers to fingerprints, and includes all types of prints with ridged lines, such as handprints and heel prints.

- In this linguistic context, the word "brain" is marked by specific phonetic features, including the dammah. The brain, with its plural forms including "amkhakh" and "mikhakh," serves as the central organ of the nervous system. The brain constitutes the majority of the nervous tissue located within the cranial cavity, encompassing all regions except for the cerebellum, pons, and medulla. It serves as the fundamental core of all cognitive and physiological functions. In the hadith: A noble hadith: "Supplication is the pith of worship."⁹

1-2-2 Terminologically:

Brain fingerprinting is a scientifically objective approach designed to reveal concealed information within the brain by non-invasively assessing the brain's reactions through electroencephalography (EEG), which captures brainwave activity using sensors positioned on the scalp. This method entails presenting words, phrases, or images that are pertinent to a criminal case or investigative context on a computer display, interspersed with other unrelated stimuli¹⁰.

Brain fingerprinting is a forensic method that assesses the recognition of known stimuli by analyzing the brain's electrical wave responses to words, phrases, or images presented on a computer screen. The underlying principle is that a suspect's response to specific details of an event or activity can indicate whether they possess prior knowledge of that event or activity. Farwell subsequently identified the "multifaceted EEG response related to memory and encoding" (MERMER), which encompasses the P300 component along with other characteristics, and is believed to offer greater accuracy compared to the P300 on its own¹¹.

Brain fingerprinting can be defined as a technique that assesses the electrical activity of the brain, analyzing this activity in under a second when an individual is presented with familiar stimuli from their past. For instance, when a suspect is shown an item related to a crime they committed, their brain instinctively registers recognition, and this response is captured by electrodes placed on the scalp that track brain wave activity. Conversely, an individual who was not present at the crime scene exhibits no such brain response¹².

Through technology, it has become possible to prove the suspect's relationship to the crime, just as a blood test doctor can prove that the accused was drinking alcohol.

⁷ Al-Murshid Muhammad bin Saleh, *The Automated Fingerprint and Its Relation to the Security Dimension in the Kingdom of Saudi Arabia*, Master's Thesis, Naif Arab University, 2013, p. 18.

⁸ Ibn Manzur, *Lisan al-Arab*, Dar Ihya al-Turath al-Arabi, Beirut, Third Edition, 1999, p. 423.

⁹ Al-Maany Al-Jami', *Al-Maany for Every Drawing and Meaning, Definition and Meaning of Brain in the Al-Maany Al-Jami' Dictionary - Arabic-Arabic Dictionary*, published on the following link: <https://www.almaany.com/ar/dict/ar-ar/> Date of visit: October 20, 2024 at (12:15)

¹⁰ Lawrence A. Farwel. Brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials. *Cogn Neurodyn* (2012) 6:115–154. P 115.

¹¹ Dhiraj Ahija/ Bharat Singh. Brain fingerprinting. *Journal of Engineering and Technology Research* Vol. 4(6), pp. 98-103, November 2012. P 98.

¹² Abdul-Moneim Rahma Salam/Ahmed Shukran Bahr El-Din, the previous reference, pp. 3-4.

1-3 The correlation between brain fingerprints and evidence in criminal cases.

Farwell's Brain Fingerprinting has demonstrated a remarkable accuracy rate of 100% across more than 120 assessments. These evaluations encompass a range of scenarios, including tests conducted on FBI agents¹³, assessments by the CIA, and evaluations within Navy contexts, as well as practical applications in real-life criminal investigations¹⁴.

Dr. Lawrence Farwell says about the use of this technology in the field of forensic evidence: "The use of brain fingerprinting will bring in millions of dollars, save time, protect many lives, release innocent people from prison, and put the law into effect to pursue real criminals."

Prior to the advent of brain print technology, forensic evidence heavily depended on the recreation of the crime scene, establishing connections between the elements present at the scene and the traits of the suspected offender. This process often included the potential involvement of victims or witnesses to elucidate their relationships with the perpetrator. Additionally, forensic investigators utilized physical evidence such as fingerprints, blood, or other materials left behind by the offender at the crime scene. The primary method for accessing the information retained in the minds of perpetrators or witnesses was through interrogation and testimony, which served as a crucial component of forensic evidence.

Witness testimony, while a valuable form of evidence, is not without its shortcomings. Even when the accounts provided are honest, they often fail to deliver a comprehensive and precise portrayal of the criminal event, as human memory is inherently imperfect. This limitation also applies to offenders, who may be more inclined to fabricate their narratives compared to witnesses.

The lie detector was introduced as a tool for identifying falsehoods among suspects or witnesses, aiming to address the aforementioned shortcomings, by "Laykken" in 1960. In this method, the suspect is subjected to a series of inquiries regarding the crime, rather than a singular question about their involvement. For instance, an investigator might inquire about the accused's familiarity with the weapon utilized in the offense, and if the response is deceptive, the lie detector will indicate this. Nevertheless, it is important to note that the lie detector serves merely as an instrument for assessing the veracity of the accused's statements, without providing definitive insight into the actual events that transpired at the crime scene.

The situation persisted until a method was developed to ascertain the information retained in the brain regarding a committed crime, known as brain fingerprinting. This technique uncovers the specifics of the crime encoded in the accused's mind by assessing the brain's responses through electroencephalography (EEG), which measures brain waves non-invasively using sensors placed on the scalp. The data collected is then analyzed by a computer to ascertain whether the information stored in the brain pertains to the crime in

¹³ The FBI scientist "Drew Richardson" used this technique, where he applied it to many FBI agents from among a large group of people by measuring the brain's response to seeing things that only FBI agents know. See for more details: Lawrence A. Farwell. Drew C. Richardson. Graham M. Richardson. Brain fingerprinting field studies comparing P300-MERMER and P300 brainwave responses in the detection of concealed information. *Cogn Neurodyn* (2013) 7:263–299. P247

¹⁴ Dhiraj Ahija/ Bharat Singh. Brain fingerprinting. Op.cit. P 98.

question. A notable response, referred to as "P300-MERMER," is produced by individuals who possess knowledge of the crime, and the P300 response has been extensively studied in scientific literature for over three decades, achieving significant recognition within the scientific community¹⁵. Numerous scientific studies, field tests, and actual criminal cases—totaling more than 120 instances documented in various scientific publications and technical reports—have validated the exceptional accuracy and overall efficacy of brain fingerprinting, with the system achieving 100% accuracy in all research and field evaluations¹⁶.

Accordingly, brain fingerprinting can be used in the field of forensic evidence to uncover crimes committed and identify the perpetrator, especially crimes in which the perpetrator does not leave any fingerprints at the crime scene. This technology reduces the impunity of perpetrators and helps justice in acquitting every innocent person and convicting every guilty person¹⁷.

In the context of exonerating a convicted individual through the application of this method, the presiding judge of the Iowa Court in Pottawattamie County, United States, employed brain fingerprinting as a form of scientific evidence in a criminal case involving a man named Terry Harrington. The judge determined Harrington's innocence regarding the murder of John Schweer, a conviction that had led to his imprisonment for twenty-five years, beginning in 1978. This ruling was significantly influenced by the findings derived from the brain fingerprinting technique¹⁸.

As for the role of brain fingerprinting technology in convicting a guilty person, it played a fundamental role in bringing the serial killer "James B. Grinder" to justice, as Dr. "Farwell" conducted a brain fingerprint test on this person in 1999 and showed that the information stored in his brain matched the details of the murder of the victim "Julie Helton"¹⁹.

The application of brain fingerprint technology is not confined solely to homicide cases; it encompasses a wide range of violent offenses, financial crimes, and acts of terrorism. This innovative technology allows for the assessment of whether the statements made by a suspect during questioning align with the information encoded in their brain. It is important to note that this technology is not employed during the interrogation process itself; rather, it provides an objective analysis of the presence of specific information within the suspect's brain, independent of the veracity of their verbal claims. The brain serves as an infallible witness, revealing truths that may not be articulated accurately by the individual²⁰.

Therefore, we must ask about the possibility of using this modern technology with definitive results in criminal evidence under the rule of the principle of the judge's freedom of personal conviction, or does it conflict with it?

¹⁵ Lawrence A. Farwel/ op.cit. p 117-118.

¹⁶ J.R.Rajput, P.M. Deshpande, A.R.Wadhekar. Brain Fingerprinting Technology. Journal of Engineering Research and Applications. Vol. 5, Issue 1(Part 2), January 2015. p103

¹⁷ Abdul-Moneim Rahma Salam/ Ahmed Shukran Bahar al-Din, the previous reference, p. 5.

¹⁸ Khaled Mohammed Ajaj, The Role of Brain Fingerprints in Criminal Evidence, Anbar University Journal of Legal and Political Sciences, Volume One, Issue Twelve, 2017, p. 259.

¹⁹ Dhiraj Ahija/ Bharat Singh. Op.cit. p100.

²⁰ Mahmoud Muhammad Suwaif, the previous reference, pp. 38-39.

2-Constraints regarding the utilization of brain fingerprints in the context of criminal evidence.

It is essential to elucidate the overarching principle of evidence concerning the autonomy of the criminal judge in developing his individual conviction, as well as the influence of contemporary methodologies on this principle. Subsequently, we will outline the regulations governing the application of brain fingerprints in criminal evidence.

2-1 The principle of freedom of conviction for the criminal judge in light of modern means of proof:

Here we must shed light on the concept of this principle, then the impact of modern means on it:

2-1-1 Concept of the principle:

The rules of criminal evidence play an important role in proving the crime against the accused and convicting him, therefore they occupy an important position within the rules of criminal procedure and achieving its purpose. These rules do not apply only to the trial stage, but to all stages of criminal procedures, but they have an effective role during the trial stage, i.e. before the judge.

Criminal evidence serves the purpose of evaluating the diverse types of evidence submitted in a case before a criminal judge, with the objective of determining the guilt or innocence of the accused regarding a particular offense. The judge possesses the discretion to analyze the criminal evidence, striving to uncover the truth in accordance with the principle of personal conviction, which allows the judge to accept and evaluate the evidence based on a system that prioritizes the freedom of evidence assessment.

Accordingly, what is meant by this principle is a subjective mental state that infers from the facts presented, on the basis of the investigation, possibilities with a high degree of certainty that are reached as a result of excluding the causes of doubt in a decisive and conclusive manner. Thus, the judge reaches a degree of certainty in a subjective and not objective manner, which is what is expressed by the judge's personal conviction²¹.

The principle of a judge's personal conviction is regarded as a fundamental tenet that underpins the system of free evidence. This principle allows judges the autonomy to select the evidence they deem appropriate, while also providing a rationale for the decisions they make in their rulings.

Article 212 of the Code of Criminal Procedure²² stipulates that crimes can be established through any means of evidence, unless the law specifies otherwise. This provision establishes the principle of the judge's discretion in forming a conviction, a principle further reinforced by Article 307 of the same code, which does not impose limitations on the methods by which a judge may arrive at their personal conviction.

The concept of a criminal judge's autonomy in forming convictions was further validated by a ruling from the Supreme Court, which stated, "In criminal matters, the foundation of

²¹ Zubaid Masoud, *Personal Conviction of the Criminal Judge*, National Book Foundation, Algeria, 1989, p. 36.

²² Order No. 66/155 dated 06/08/1966 including the amended and supplemented Code of Criminal Procedure.

evidence lies in the individual judge's belief, and this belief is not open to review by the Supreme Court."²³

The Algerian legislator did not grant the criminal judge complete autonomy in making convictions; instead, this freedom is limited by the stipulations of legal texts, as outlined in Article 212 of the Code of Criminal Procedure. Consequently, the legislator has embraced a system of restricted evidence.

It is important to highlight that the criminal judge's ability to establish proof is limited by specific conditions. The judge is required to base their findings solely on the evidence that has been submitted during the proceedings, which must originate from the case documents provided for consideration.

- The evidence on which the criminal judge bases his personal conviction must be legitimate, i.e., in accordance with the law and obtained legally.
- The judge must reach the stage of judicial certainty so that he can issue his judgment of conviction against the accused.
- The criminal judge's conviction must be based on evidence that is not rejected by the rules of reason and logic²⁴.

2-1-2 The impact of modern means of proof on the principle of the criminal judge's freedom of conviction:

The judge has the discretion to utilize any evidence he considers suitable for establishing a conviction, regardless of whether it is conventional, such as confessions or witness accounts, or derived from contemporary scientific techniques. The advancements in science observed in today's world have made it increasingly challenging to solve certain crimes using traditional evidentiary methods. Consequently, the adoption of modern evidentiary techniques²⁵, including genetic fingerprints, traditional fingerprints, and brain prints, has become essential, necessitating thorough examination and precise scientific analysis.

The reliance on scientific evidence necessitates that the criminal judge engage the services of a technical expert to derive meaningful conclusions. This expert is responsible for conducting examinations and generating reports based on contemporary evidentiary methods. Consequently, a pertinent issue emerges regarding the extent to which the criminal judge's personal conviction is influenced, given the judge's inability to fully grasp the extensive body of scientific knowledge. Additionally, the outcomes produced by these methods can be definitive, exemplified by techniques such as brain fingerprinting. This raises the question of whether the criminal judge is compelled to accept these findings or retains the autonomy to form an independent conviction.

Some individuals argue that the increasing reliance on scientific methods of evidence has resulted in a situation where judges are unduly influenced, with technical experts effectively holding the ultimate authority in legal cases, leaving judges with little choice but to accept

²³ Ahsen Bousguia, *Code of Criminal Procedure in Light of Judicial Practices*, Berti Publishing, Algeria, 2014, p. 102.

²⁴ For more details, see: Mahmoud Mohamed Soueif, the previous reference, pp. 50-59.

²⁵ Drissi Jamal, *Criminal Evidence with Scientific Evidence*, *Critical Journal of Law and Political Science*, Volume 17, Issue 2, 2022, p. 421.

their conclusions. Conversely, others contend that the use of scientific evidence provided by technical experts does not undermine the principle of judicial discretion, as judges retain the freedom to form their own convictions. This perspective emphasizes that judges can consider scientific evidence from contemporary methods, even if such evidence is scientifically sound, particularly when it conflicts with the specific circumstances and conditions surrounding the case at hand²⁶.

The aforementioned perspective is the most commendable to adopt, as it acknowledges the discretion afforded to the criminal judge in determining the admissibility of evidence based on personal conviction. Subsequently, the judge evaluates the remaining evidence to form a judgment that leads to either a conviction or an acquittal. This process lies at the heart of the criminal judge's responsibilities, which are defined by an active engagement in the case at hand, ultimately culminating in a definitive ruling regarding the alleged crime.

According to Article 212 of the Code of Criminal Procedure, the Algerian legislator considered modern technologies, including brain fingerprints, like all other means of proof, to be subject to the discretionary power of the criminal judge. He may set aside scientific evidence despite its scientific conclusiveness - such as brain fingerprints - in the event that it conflicts with the circumstances and conditions of the case²⁷.

2-2 Controls for the use of brain fingerprinting in criminal proof:

To elucidate the regulations governing the utilization of this technology, it is essential to define the methods of its implementation and assessment. Subsequently, we will outline the legislative and judicial stance regarding the application of this technology.

2-2-1 How to perform and evaluate a brain fingerprint:

2-2-1-1 How to conduct a brain fingerprint:

The process of brain fingerprinting involves multiple phases before it is presented to the criminal judge. Initially, the crime scene is thoroughly investigated, and efforts are made to collect any instruments utilized in the commission of the crime. These tools are then presented to the suspect to assess how the act of displaying them influences their brain activity.

The crime scene serves as a silent witness to the offense, while the mind of the perpetrator acts as another stage that has recorded all occurrences. In this context, the information gathered from the crime scene is presented to the suspect in the form of images or phrases related to the incident, displayed on a computer screen positioned before them. The investigator seeks to uncover what resides in the suspect's internal memory regarding the event, utilizing sensors affixed to the suspect's head that are linked to the screen. These sensors measure the brain's neural activity when the suspect is exposed to any evidence or items associated with the crime, specifically monitoring the p300 waves, which signify the cognitive response to the event. Should the analysis indicate that relevant data is present, it suggests that the suspect is implicated in the crime²⁸.

²⁶ Mahmoud Muhammad Suwaif, previous reference, p. 103.

²⁷ Bin Taher Othman, The Sufficiency of Scientific Evidence and the Authority of the Criminal Judge in His Evaluation, *Journal of Legal Studies*, Volume Seven, Issue Three, 2020, p. 785.

²⁸ Essam El-Din Abdel Aal El-Sayed, the previous reference, p. 281.

In the next stage, the report prepared by the expert in the previous stage regarding the existence of information and data related to the crime is presented to the criminal judge at the trial stage, and here the judge has the discretionary authority to accept this evidence or not.

2-2-1-2 Evaluation of brain fingerprint technology:

Brain fingerprinting technology, akin to other contemporary scientific techniques, presents both benefits and drawbacks within the realm of forensic evidence. A significant advantage of this technology is its remarkable accuracy, achieving a 100% success rate²⁹, which led intelligence agencies to provide substantial financial support to its inventor for further development. Additionally, this method retains information from the suspect's memory over time, ensuring that critical data remains intact. Furthermore, the costs associated with brain fingerprinting are comparatively lower than those of genetic fingerprinting, and the time required to obtain results is notably brief.

However, despite the definitive results of this technique, it has drawbacks that may not be related to the technique itself. For example, if the suspect is not arrested, this technique cannot be used, or if tools or objects are found at the crime scene, they can be shown to the suspect. This technique is also subjective and is linked to the experience and skill of the criminal investigator, otherwise it will fail. In addition, the result of the brain fingerprint test provides the criminal investigator with information about the objects shown to the suspect in the brain's memory, but it does not prove the suspect's guilt or whether the crime has occurred³⁰.

The implementation of this technology in different countries faces several challenges, primarily due to the necessity for specialized laboratories and equipment designed to conduct the required tests. Additionally, there is a demand for highly skilled personnel who possess extensive experience in utilizing this type of technology.

2-2-2 The legislative and judicial position on the use of brain fingerprint technology in criminal evidence:

The legislative framework regarding brain fingerprinting reveals that most criminal laws do not explicitly endorse the application of this technology within the realm of criminal evidence. Instead, they operate under the broader provisions of the Code of Criminal Procedure, which empowers criminal judges to establish the occurrence of a crime through various means, including scientific evidence. This principle is reflected in Article 212 of the Algerian Code of Criminal Procedure, as well as in certain Arab legal systems, such as Article 147/2 of the Jordanian Code of Criminal Procedure and Article 175 of the Syrian Code of Trials. Furthermore, the French legal system acknowledges this approach in Article 427 of its Code of Criminal Procedure³¹, which, along with Article 156, addresses the regulation of contemporary scientific methods, including medical analyses and tests, and

²⁹ J.R.Rajput, P.M. Deshpande, A.R.Wadhekar . op.cit. p104.

³⁰ Lawrence A.Farwel. op. cit. P 142.

³¹ Imran Wafaa, Genetic and Brain Fingerprints in the Field of Criminal Evidence, Journal of Human Sciences, Volume 2, Issue 48, 2017, p. 309.

recognizes genetic fingerprinting as a valid form of criminal evidence in the Penal Code of 1992³².

As for American law, the Human Genome Act issued in 1993 permitted the use of genetic fingerprinting as a scientific means of criminal evidence, which may be considered in the same way as brain fingerprinting. For example, the Genetic Privacy Act of the American state of Illinois permitted the taking of a sample for genetic fingerprinting and brain fingerprinting during investigation or accusation without the person's consent, and that they may be considered as acceptable evidence before the court³³.

The judiciary's stance on the utilization of this technology as evidence indicates that brain fingerprint technology, due to its infringement on individual privacy, should not be admissible unless it is acquired through lawful means. It is the responsibility of the judge to ensure that such evidence is obtained legally before it can be considered valid for substantiating the case at hand.

The United States Supreme Court has established specific criteria for the admissibility of scientific evidence in criminal cases. Firstly, such evidence must gain acceptance from experts and scholars in the relevant field before it can be considered valid by a criminal judge. Additionally, multiple laboratory tests must be performed on the technology in question to ensure the reliability of its results, allowing for a thorough comparison and analysis of these outcomes.

-Monitoring the technology used by those with experience in this field.

- Experts should be honest, trustworthy and have a good reputation³⁴.

The criminal judge retains the discretion to either accept or reject the brain print as a form of evidence, similar to any other evidentiary material. The law does not mandate that the judge must give precedence to one type of evidence over another. This issue pertains to the importance of ensuring that the evidence is obtained legitimately, as it has implications for the privacy rights of individuals. It is essential to strike a balance between the protection of personal privacy and the public interest in the pursuit of criminal justice.

Conclusion:

This research highlights that the concept of brain fingerprinting is regarded as one of the most significant advancements in contemporary science. Its reliability renders it nearly foolproof in the conclusions it draws. Consequently, it plays a crucial role in elucidating crimes where the evidence has been concealed by the offenders. This technique relies on interpreting the data stored in the brain of the accused concerning the crime in question. Our investigation yielded several findings, with the most notable being:

-In light of scientific development, modern scientific methods have begun to play an important role in the field of criminal evidence, where the criminal judge can resort to them with the help of a technical expert.

-Brain fingerprinting is considered one of the modern techniques that helps the criminal judge to lift the ambiguity of the crimes committed, especially crimes in which the

³² I See Articles 25/226 to 226/30 of the French Penal Code.

³³ Mahmoud Mohamed Soueif, previous reference, p. 144.

³⁴ Essam El-Din Abdel Aal El-Sayed, the previous reference, pp. 282-283.

perpetrator does not leave any fingerprints at the crime scene, so his brain becomes the witness against him.

Brain fingerprint technology must be utilized in accordance with the same standards that govern all forms of evidence, whether conventional or contemporary. Among these standards, the most critical is the validity of the evidence obtained through this technology.

The findings derived from brain fingerprint technology, while definitive, do not impose a mandatory obligation on the criminal judge. This is due to the overarching principle in criminal law that grants judges the discretion to determine their conviction, allowing them to favor one piece of evidence over another based on the materials presented in the case. Furthermore, current legislation lacks explicit provisions that endorse the application of brain fingerprint technology within the realm of criminal evidence, thus rendering it subject to the general evidentiary rules outlined in the Code of Criminal Procedure.

- The criminal judge has several controls in the event that he uses the brain fingerprint technology, as he must ensure the legitimacy of obtaining the evidence derived from this technology, and he tries to balance between the sanctity of individuals' private lives and what the public interest requires in terms of maintaining security in society and protecting it from all types of crimes, because the brain fingerprint test is considered an infringement on a person's right to the privacy of his memories stored inside his brain. - Despite the recognition of the conclusiveness and accuracy of the brain fingerprint results, they are not suitable to be independent evidence from the rest of the evidence with which it is possible to decide the guilt or innocence of the suspect, and this technology may not be useful in proving crimes whose perpetrators are unknown in order to apply them to them, or in the event that there are no tools at the crime scene to show to the suspects when conducting the brain fingerprint test, or that the means recorded by the suspect's brain may have a legitimate relationship with him and does not confirm his commission of the crime.

Based on our findings, we recommend the following:

- Countries should allocate a budget for scientific research focused on developing modern scientific evidence in criminal evidence, and developing existing evidence to reach the most accurate results in criminal evidence processes.

- The necessity of including modern scientific methods, including brain fingerprinting, within special texts that clarify the controls for their use.

- Countries must allocate laboratories equipped with all means to conduct brain fingerprinting, and train experts and criminal investigators to apply this technology so that they can submit a report that helps the criminal judge reach personal conviction.

It is advisable to employ brain fingerprinting during the research and investigative stages of enigmatic crimes, as this approach can conserve both time and resources in search operations. By doing so, the scope of potential suspects can be effectively reduced, allowing the findings to be considered as evidence that the criminal judge may exercise discretion in evaluating the results.

References:

1-Books:

- Mahmoud Mohamed Suwaif, The Role of Brain Fingerprints in Criminal Evidence, Dar Al-Jamiah Al-Jadida, Alexandria, 2022.
- Al-Munjid in Language and Media, Catholic Press and Dar Al-Mashreq, Beirut, Thirty-Eighth Edition, 7111, Fingerprint Article.
- Zubdat Masoud, The Personal Conviction of the Criminal Judge, National Book Foundation, Algeria, 1989.

2-University theses:

- Al-Murshid Muhammad bin Saleh, The Automated Fingerprint and Its Relationship to the Security Dimension in the Kingdom of Saudi Arabia, Master's Thesis, Naif Arab University, 2013.
- Ibn Manzur, Lisan Al-Arab, Dar Ihya Al-Turath Al-Arabi, Beirut, Third Edition, 1999.
- Ahsan Bousquia, The Code of Criminal Procedure in Light of Judicial Practices, Berti Publishing, Algeria, 2014.

3- Scientific Journals:

- Essam El-Din Abdel-Aal El-Sayed, The Validity of Brain Fingerprints in Criminal Evidence, Arab Journal of Security Studies, Volume 35, Issue 2, 2019.
- Abdel-Moneim Rahma Salam/ Ahmed Shukran Bahr El-Din, Brain Fingerprints and Their Validity in Criminal Evidence: A Comparative Study between Islamic Sharia and Libyan Criminal Law, Perdana: International Journal of Academic Research (Social Sciences and Humanities), Volume 16, Issue 1, April 2023.
- Fedral agency views on the potential application of brain finger printing report to the honourable Charles E.Grassley n.s.senate. GAO-02-22.october 2001.
- Lawrence A.Farwel. Brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials. Cogn Neurodyn (2012) 6:115–154.
- Dhiraj Ahija/ Bharat Singh. Brain fingerprinting. Journal of Engineering and Technology Research Vol. 4(6), pp. 98-103, November 2012.
- Lawrence A.Farwell. Drew C. Richardson. Graham M. Richardson. Brain fingerprinting field studies comparing P300-MERMER and P300 brainwave responses in the detection of concealed information. Cogn Neurodyn (2013) 7:263–299.
- J.R.Rajput, P.M. Deshpande, A.R.Wadhekar. Brain Fingerprinting Technology. Journal of Engineering Research and Applications.Vol. 5, Issue 1(Part 2), January 2015.
- Khaled Mohammed Ajaj, The Role of Brain Fingerprints in Criminal Evidence, Anbar University Journal of Legal and Political Sciences, Volume 1, Issue 12, 2017.
- Drissi Jamal, Criminal Evidence with Scientific Evidence, Critical Journal of Law and Political Sciences, Volume 17, Issue 2, 2022.
- Bin Taher Othman, Sufficiency of Scientific Evidence and the Authority of the Criminal Judge in His Assessment, Journal of Legal Studies, Volume 7, Issue 3, 2020.
- Imran Wafa, Genetic and Brain Fingerprints in the Field of Criminal Evidence, Journal of Human Sciences, Volume 2, Issue 48, 2017.

4-Laws:

Order No. 66/155 dated 06/08/1966 including the amended and supplemented Code of Criminal Procedure.

5-Websites:

Al-Maani Al-Jami, meanings for each drawing and meaning, definition and meaning of the brain in the comprehensive dictionary of meanings - Arabic-Arabic dictionary, published on the following link: <https://www.almaany.com/ar/dict/ar-ar/> Visited on October 20, 2024 at (12:15)