



"Neurolaw" and "Neurocriminology": A Prospective Study on the Use of Neuroscience in Algerian Courts

Ouabri Farid *

University of Algiers 1 Benyoucef Benkhedda

Faculty of Law

Laboratory of Criminal Sciences

f.ouabri@univ-alger.dz

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Abstract:

This study examines the emergence of neurolaw and neurocriminologie and their potential use in Algerian courts. It addresses the issue of how Algerian judges may receive neuroscientific evidence derived from brain imaging techniques. The study hypothesizes that such evidence is not yet integrated into Algerian judicial practice. Using a descriptive and analytical methodology based on scientific studies and foreign case law, the research aims to highlight the importance of neuroscience in judicial proceeding and the need for specific legislation in Algeria. The study concludes that Algerian law remains unprepared for neuroscientific evidence despite the significant legal, ethical, and technical challenges it raises.

Keywords: neurolaw, neurocriminology, responsibility, criminal behaviour, Algerian courts.

Introduction :

In the field of scientific research, it is well known that new practices first emerge across the Atlantic and then gradually make their way to other continents where they can flourish. This is particularly the case with “neurolaw” and “neurocriminology”, two new disciplines that use neuroscience for evidentiary or scientific research purposes, via the use of brain imaging techniques. Thus, whether it is a question of determining a person's criminal responsibility, assessing

* Corresponding author



the damage suffered, or preventing criminal behaviour, the introduction of neuroscience into the legal system raises many questions that embarrass judicial actors: judges, lawyers, and juries.

However, at the very moment when these neuroscientific techniques are being presented, debated, and accepted in courts abroad, particularly in Anglo-Saxon countries, what about their use in courts in Algeria? In other words, how will Algerian judges receive the neuroscientific evidence provided by brain imaging techniques ?

The hypothesis advanced in this study is that, in Algeria, the use of brain imaging as a mode of evidence in the courts is not yet on the judicial agenda, which makes it particularly relevant to undertake a prospective analysis of its potential future application .

The methodology adopted to support this hypothesis is essentially descriptive and analytical, relying primarily on scientific studies and foreign case law related to the subject under consideration.

The objective of this study is twofold: first, to highlight the importance of neuroscience in judicial proceedings, and second, from a prospective perspective, to demonstrate the necessity of establishing specific legislation in Algeria governing the use of neuroscience before the courts.

In order to properly conduct this study, the first part will examine the development of neuroscience, which has led to the emergence of “neurolaw” and “neurocriminology”, while the second part will attempt a prospective analysis of their possible use in Algeria courts .

THE FIRST TOPIC: THE RISE OF NEUROSCIENCE: THE DEVELOPMENT OF “NEUROLAW” AND “NEUROCRIMINOLOGY”

Neuroscience comprises all the sciences concerned with the study of the nervous system, particularly the human brain, from the point of view of its anatomy, functioning, structure, neural networks, glial cells, in short, all nervous phenomena. In recent years, two fields have been particularly affected by the rise of neuroscience: ‘neurolaw’ and ‘neurocriminology’. The former raises the



question of responsibility, while the latter raises the issue of the origin of criminal behaviour.

FIRST REQUIERMENT: NEUROLAW AND THE QUESTION OF RESPONSABILITY

The issue of criminal responsibility has, in recent years, undergone profound transformations as a result of the development of neurolaw. Neuroscientific evidence is now used both for the prosecution and for the defense before the courts, and even contribute to understanding the deliberative mechanism of the actors involved in judicial proceedings.

Firstly: Neuroscientific Evidence for the Prosecution and the Defense

Neurolaw is defined as a field of research that focuses on the legal and judicial applications of neuroscience¹. Several neuroscientific techniques have been used in recent years abroad (United States, Canada, Italy, France, India, Greece, Japan, etc.) in the context of forensic expertise. Whether it be brain scanning, electroencephalography, lie detectors, hypnosis, or MRI (Magnetic Resonance Imaging), all these techniques aim to provide 'neuroscientific' evidence that is supposed to be more objective and reliable than the results produced by traditional psychiatric expertise, which is considered too subjective and a source of contradictions.

Most often, neuroscientific evidence is used by defence lawyers in criminal trials to prove that the accused is not criminally responsible, or to obtain a reduced sentence. Several cases bear witness to this. For example, in the United States, the defendant John Warnock Hinckley, who attempted to assassinate President Ronald Reagan on 30 March 1981, presented in his defence a brain scan performed by axial X-ray microtomography, which led the jury to find him not guilty by reason of insanity².

Also in the United States, Herbert Weinstein, convicted of murdering his wife in 1992, received a reduced sentence thanks to a brain imaging test that revealed the presence of metabolic disorders and a cyst causing brain damage, which were considered to have contributed to his criminal behaviour³. The same thing

¹ Sherrod Taylor, Harp Anderson, Elliott Tyron, « Neuropsychologist and Neurolawyers », *Neuropsychology*, vol. 5, 1991, p. 293.

² United States v. Hinckley, 672 F. 2d 115 (D.C. Cir. 1982).

³ Supreme Court, 1992, People v. Weinstein, 591 N.Y.S.2d 715.



happened in Italy in 2011, where a brain scan combined with genetic testing enabled a murderer to obtain a less severe sentence⁴.

Neuroscientific evidence can also be used as incriminating evidence by a criminal judge, who may order it as part of a forensic examination to reveal what is going on in the brain of an accused person, for example to expose a lie about a crime committed. This was the case in India in 2008, where a 25-year-old woman was found guilty of murdering her partner by poisoning and was sentenced to life imprisonment. During the trial, the judge relied on the results of a brain test (Brain Electrical Oscillation Signature Profiling BEOSP) which showed that the defendant's brain activity was associated with memories and details related to the crime (the brain recognised the word "arsenic"), details that only the murderer could have known. Nevertheless, the young woman was subsequently released on bail. The Indian Institute of Neuroscience and Mental Health, which carried out the brain scan, acknowledged the unreliability of this test, as did the Indian Supreme Court, which declared its use illegal⁵.

Neuroscientific evidence is also presented before civil judges to assess brain damage in order to seek compensation for damages suffered, or to argue incapacity to attend a trial to plead a case. In 2008, for example, in the case of *United States v. Kasim*, the defendant, a pediatrician accused of insurance fraud, successfully won his case in court on the basis of a SPECT scan that showed he suffered from poor judgement and was therefore unable to concentrate and understand the charges against him⁶.

All these examples clearly show how the use of neuroscientific techniques challenges the system of evidence and the very foundations of law, particularly the issues of discernment and free will, which are the cornerstones of criminal responsibility. Indeed, if the nervous system exercises control over the human body, control that translates into voluntary or involuntary actions, conscious or unconscious sensations, what happens if this system is defective? Can a brain injury influence our freedom to choose our actions? Can a person's discernment be altered or abolished because of a brain tumour, for example? If so, should the judge take this into account when determining the sentence or assessing the

⁴ Feresin Emiliano Feresin, « Italian court reduces murder sentence based on neuroimaging data », *Nature*, New blog, 2011: http://blogs.nature.com/news/2011/09/italian_court_reduces_murder_s.html (Accessed May 10, 2026).

⁵ Anand Giridharadas, « India's novel use of brain scans in court is debated », *New York Times*, éd. September 14, 2008.

⁶ *United States v. Kasim*, No 2:07 CR 56, 2008 U.S. Dist. LEXIS 89137 (N.D. Ind. 3 novembre 3, 2008; Granacher, « Commentary: Applications of functional neuroimaging to civil litigation of mild traumatic brain injury », *Journal of the American Academy of Psychiatry and the Law*, vol. 36. (3), 2008, pp. 323-328.



damage? In short, what is the probative value of the neuroscientific evidence provided by brain imaging?

We will see below that, in addition to these legal issues, other ethical and technical questions also arise from the judicial use of neuroscientific techniques, questions which, once again, are not on the agenda in Algerian courts.

Secondly: Understanding the Deliberative Mechanisms of Trial Participants

The use of neuroscientific techniques also makes it possible to understand the deliberative mechanisms of the participants involved in judicial proceedings. Indeed, presenting itself as the 'new queen of evidence'⁷, due to its a priori neutral and more objective nature than any other evidence, neuroscientific evidence exerts a certain influence, not to say fascination, on judges and juries. This new form of evidence would make it possible to 'move from plausibility to scientific truth, and from scientific truth to judicial truth', to quote Guy Canivet, then First President of the Court of Cassation in France⁸. Two examples illustrate the influence of neuroscientific evidence on those involved in the trial.

The first relates to the case of Jonathan Donahue in the United States, who in 2008 was prosecuted for assaulting a shop manager. After undergoing a psychiatric evaluation, the conclusions established that the accused was a psychopath. In support of this case, an experiment was conducted by researchers in Utah with 200 judges to verify the impact of brain data on their decision in Jonathan's case. The experiment revealed that judges who relied on brain data and scientific knowledge about psychopathy tended to hand down less severe sentences than judges who did not have access to this data and knowledge⁹.

The second example of the influence of neuroscientific evidence on judicial actors concerns the jury in a trial. In another experiment conducted in 2011, 300 jurors were given a test in which they had to decide on the guilt of a person who was said to have lied in their statements. The first group of jurors had access to data from a polygraph. The second group was informed of the results of thermal facial analysis. The third group had access to data from functional brain imaging (fMRI). Finally, the fourth and last group of jurors had no brain or scientific information about the defendant's case. The results of this experiment indicated

⁷ Pignatell Laura, Oullier Olivier, « Les neurosciences dans le droit », Cités, 2014/4, n° 60, p. 102.

⁸ Cavinet Guy, Discours d'ouverture du colloque Le droit des preuves au défi de la modernité, 24 mars 2000, Cour de cassation, Paris, La Documentation française, 2000.

⁹ Oullier Olivier, « Délibérations au tribunal : jugements, décisions, biais et influences », Archives de philosophie du droit, n° 56, 2012, p. 276.



that the group of jurors who had access to information from functional brain imaging returned the most guilty verdicts. However, when this same group was informed of the limitations of MRI, the proportion of jurors who found the defendant guilty returned to the level of the control group¹⁰.

In short, the questions raised by the use of neuroscience are not limited to the field of neurolaw, but also and above all concern neurocriminology, which also aims to demonstrate the cerebral origin of criminal behaviour.

SECOND REQUIERMENT: "NEUROCRIMINOLOGY" AND THE ORIGIN OF CRIMINAL BEHAVIOUR

Neurocriminology has emerged since the 1990 as a new field of criminological research. Its primary focus is the study of abnormalities in the human brain and their implications for criminal behavior, particularly "neurophysiological" deficiencies, as well as "neurofunctional" impairments.

Firstly: Neurocriminology and "Neurophysiological" Deficiencies

The study of the relationship between the brain and criminal behaviour is not new, but dates back to the very birth of criminology with the work of Cesare LOMBROSO in the 19th century, and even earlier with the work on phrenology carried out by Franz-Joseph GALL and Caspar LAVATER¹¹. The ambition at the time was to suggest that crime had a biological origin, i.e. stemming from brain abnormalities and physical traits that could be identified and therefore prevented. This theory, which has been disproved several times, resurfaced years later, in 1965, around the question of the 'crime chromosome', which also turned out to be more fantasy than reality¹². However, this has not prevented researchers in recent years from continuing to search for a new explanation for crime in the criminal's brain.

Indeed, several recent studies using brain imaging techniques on criminals have shown that their brains were affected by certain 'neurophysiological' or 'neurofunctional' abnormalities. In this regard, it is important to understand that neuroscience tells us that certain regions of the brain, such as the prefrontal cortex

¹⁰ *Op.cit.*, p. 277.

¹¹ Lanteri-Laura Georges, *Histoire de la phrénologie : l'homme et son cerveau selon F. J. Gall*, Paris, Presses Universitaires de France, 1970 ; Lombroso Cesare, *L'homme criminel : criminel-né, fou moral, épileptique : étude anthropologique et médico-légale*, traduit de l'italien par Albert Bournet et G Regnier, Paris, Félix Alcan, 1887.

¹² Clément Pierre, Blaes Nelly, Luciani Anne, « Le mythe tenace du chromosome du crime (encore appelé chromosome de l'agressivité) », *Raison présente*, 1980/54, pp. 109-127.



and the amygdala, control emotions and aggression and are responsible for moral judgement. When these regions are altered or atrophied, they prevent the subject from controlling themselves and can make them violent and aggressive.

With regard to 'neurophysiological' deficiencies, for example, a study published in 2000 revealed an 11% reduction in grey matter volume in the prefrontal cortex in individuals with persistent antisocial behaviour¹³. Other studies have also shown that psychopaths have structurally altered amygdalae, especially the right amygdala, which showed an average reduction in volume of 18%¹⁴.

Brain deficiencies believed to be the cause of criminal behaviour can even be caused by accidents, foreign objects, or diseases such as tumours. The most famous example is that of Phineas GAGE, a railway foreman in the United States who, on 13 September 1848, was the victim of an accident at work when an iron bar pierced his skull, causing a change in his personality and behaviour, which became antisocial, rude and emotionally unstable¹⁵.

Another well-known example is that of Charles Whitman, a young man who was a student at the University of Texas in the United States and who killed and injured several people in 1966. Before he was shot by the police, Whitman left a suicide note in which he wrote: "I don't understand what's happening to me these days. I am supposed to be an average, reasonable, intelligent young man. But lately (I don't remember when it started), I have had a lot of unusual and irrational thoughts...." In the early hours of the morning before the murders, and after also killing his mother and wife, Whitman wrote in his letter: 'It was after careful consideration that I decided to kill my wife, Kathy, tonight... I love her dearly, and she has been a good wife to me, as any man could dream of. I cannot rationalise what could have driven me to do this.' WHITMAN also requested in his letter that

¹³ Raine Adrian, Lencz Todd, Bihle Suzan, Lacasse Lori, Colletti Patrick M., "Reduced prefrontal gray matter volume and reduced autonomic activity in antisocial personality disorder", *Archives of General Psychiatry*, 57 (2), 2000, pp. 119–27.

¹⁴ Pardini Dustin A, Rain Adrian, Kirk Erickson, Loeber Rolf, "Lower Amygdala Volume in Men is Associated with Childhood Aggression, Early Psychopathic Traits, and Future Violence", *Biological Psychiatry*, 75 (1), 2014, pp. 73–80; Yang Yaling, Raine Adrian, Narr Katherine L., Colletti Patrock, Toga Arthur W., "Localization of deformations within the amygdala in individuals with psychopathy", *Archives of General Psychiatry*, 66 (9), 2009, pp. 986–94.

¹⁵ Damasio Antonio, *Descarte's error : emotion, reason, and the human brain*, New York, Grosset/Putnam, 1994; Eslinger Paul J., Damasio Antonio, "Severe disturbance of higher cognition after bilateral frontal lobe ablation : patient EVR", *Neurology*, 35, 1985, pp. 1731-1741; Gearhart Shannon, « Phineas Gage », sur *britannica.com* :<https://www.britannica.com/biography/Phineas-Gage> (Accessed May 10, 2026). Sam Kean, « La véritable histoire de Phineas Gage », *Slate*, 2014 :<https://www.slate.fr/story/90151/phineas-gage-patient-neurosciences> (Accessed May 10, 2026).



an autopsy be performed on his brain to check for any abnormalities. The autopsy revealed that he did indeed suffer from a brain tumour in the hypothalamus region of his brain, which was compressing his amygdala¹⁶.

Secondly: Neurocriminology and “Neurofunctional” Deficiencies

With regard to ‘neurofunctional’ deficiencies, several studies have also shown that the brains of criminals function differently. For example, some research has revealed that the posterior cingulate cortex malfunctions in adult psychopathic criminals and aggressive patients¹⁷. Other studies have also shown a lack of activation in the prefrontal cortex in some violent criminals¹⁸, while others have also demonstrated a decrease in cerebral blood flow in the angular gyrus in murderers and impulsive and violent criminals¹⁹.

Other brain diseases can also cause criminal behaviour. This is the case, for example, with ‘sleepwalking murder’, a condition that causes some people to commit crimes without having any memory of their actions. This is what happened to Kenneth PARCS in Toronto, a 23-year-old man who, on 23 May 1987, got out of bed without waking up, got into his car and drove about 20 kilometres to break into his parents-in-law's home, stabbing his mother-in-law to death, then attacking his father-in-law, who managed to survive, before going to the police station and declaring, "I think I killed people... my hands," discovering for the first time that his hands were covered in blood. After undergoing a brain examination, the jury concluded that his actions were involuntary and found him not guilty²⁰.

¹⁶ Eagleman David, "The Brain on Trial", The Atlantic, 7 juin 2011; Rafter Nicole, *The Criminal Brain: Understanding Biological Theories of Crime*, New York University Press, 2008, p. 204.

¹⁷ Kiehl Kent A, Smith Andre Marie, Hare Robert, Mendrek Adriana, A., Forster Bruce., Brink Johann, Liddle Peter F., "Limbic abnormalities in affective processing by criminal psychopaths as revealed by functional magnetic resonance imaging", *Biological Psychiatry*, 50 (9), 2001, pp. 677–84 ; New, A. S., Hazlett, E. A., Buchsbaum, M. S., Goodman, M., Reynolds, D., et al., "Blunted prefrontal cortical fluorodeoxyglucose positron emission tomography response to meta-chlorophenylpiperazine in impulsive aggression", *Archives of General Psychiatry*, 59 (7), 2002, pp. 621–29.

¹⁸ Yang Yaling, Raine Adrian, "Prefrontal structural and functional brain imaging findings in antisocial, violent, and psychopathic individuals: A meta-analysis", *Psychiatry Research: Neuroimaging*, 174 (2), 2009, pp. 81–88 ; Raine Adrian, Buchsbaum Monte, Lacasse Lori Lacasse, "Brain abnormalities in murderers indicated by positron emission tomography", *Biological Psychiatry*, 42 (6), 1997, pp. 495–508.

¹⁹ Soderstrom Henrik, Hultin Leif, Tullberg Mats, Wikkelso Carsten, Ekholm Sven, Frosman Anders, "Reduced frontotemporal perfusion in psychopathic personality", *Psychiatry Research: Neuroimaging*, 114 (2), 2002, pp. 81–94 ; Hoptman Matthew., "Neuroimaging studies of violence and antisocial behavior", *Journal of Psychiatric Practice*, 9 (4), 2003, pp. 265–78 ; Miczek Klauss A., De Almeida Rosa M. M., Kravitz Edward A., Rissman Emilie F., de Sietse F. Boer, Adrian Raine, "Neurobiology of escalated aggression and violence", *Journal of Neuroscience*, 27 (44), 2007, pp. 11, 803–6.

²⁰ Eagleman David, « Pourquoi les sciences du cerveau peuvent éclairer le droit », in Olivier Oullier, *Le cerveau et la loi : analyse de l'émergence du neurodroit*, Centre d'analyse stratégique, Paris, 2012, p. 40.



This is also the case for people with 'frontotemporal dementia' who experience sudden changes in behaviour, breaking social norms, stealing items from shops, undressing in public, eating rubbish, etc. It is estimated that 57% of patients with 'frontotemporal dementia' break the law²¹.

Another example is people with Tourette's syndrome, who are unable to control their behaviour or speech, losing control of their movements, hands and legs, and uttering insults, etc .

Finally, there is 'foreign hand syndrome': when one hand buttons a shirt, the other hand starts to unbutton it, or when one hand picks up a pencil to write, the other hand hits it to make it fall.

Once again, the results of all these neuroscientific studies bring back to the fore the fundamental question of free will, which is the very basis of criminal responsibility. These results have given rise to a rhetoric that has been circulating for several years, allowing anyone accused of a crime whose brain is impaired to say: 'my brain made me do it defence' ('it wasn't me, it was my brain'), a way of escaping punishment or obtaining a reduced sentence!

According to some neuroscientists, even genes play an important role in explaining our behaviour, as it is believed that in the United States, the overwhelming majority of criminals in prisons, as well as 98% of those sentenced to death, carry a 'particular set of'²². These genes increase the likelihood of committing a violent crime by 882% in individuals who carry them. They increase the likelihood of attacking others by up to 8 times, committing murder by 10 times, committing armed robbery by 13 times, and committing sexual assault by 44 times²³.

All these examples suggest, according to some researchers such as Professor David M. EAGLEMAN, that 'people's brains are very different'²⁴, and that if we want to understand criminal behaviour, we must not separate a person's behaviour from their biological functioning. This observation ultimately leads to the conclusion that we are not all equal in terms of our neurons, and therefore in terms of our freedom to choose and control our behaviour.

²¹ *Op. cit.*, p. 36.

²² *Op. cit.*, p. 38.

²³ *Ibid.*

²⁴ *Ibid.*



THE SECOND TOPIC: PROSPECTS FOR THE USE OF NEUROSCIENCE IN THE COURTS IN ALGERIA: THE NEED FOR A LEGAL FRAMEWORK

While the issues raised by the emergence of neurolaw and neurocriminology are widely debated abroad through numerous studies and abundant case law, as we have just seen, this is not the case in Algeria, where the subject seems to be ignored. Consequently, we believe it is appropriate to attempt to forecast the applications of neuroscience in the courts in our country in anticipation of the risks and challenges they may raise, and the need to provide specific legislation for the better administration of justice.

FIRST REQUIERMENT: THE RISKS AND CHALLENGES OF NEUROSCIENTIFIC APPLICATIONS

Despite their advances, the applications of neuroscientific techniques entails certain legal and technical risks, as well as ethical challenges.

Firstly: Legal and technical Risks

The risks and challenges of neuroscientific applications have already been raised in countries that have used them in their courts²⁵. There is no reason why they should not be replicated in our country when the use of brain imaging techniques such as MRI or brain scans becomes widespread in the courts, when the question of their admissibility and reliability arises before Algerian judges, especially when human rights are threatened precisely because of the intrusive nature of these techniques.

These neuroscientific techniques, which are now presented as more reliable than psychiatric expertise, therefore present several risks. The most significant of these risks is that they are likely to undermine the rights of the defence, more specifically the right of every person not to participate in their own conviction .

In the case of MRI (Magnetic Resonance Imaging), we already know that there are two types of brain imaging: "anatomical" brain imaging, which provides images of the structure, topography and anatomy of the brain, making it possible to

²⁵ Chneiweiss Hervé, *Neurosciences et neuroéthique, des cerveaux libres et heureux*, Paris, Alvik éditions, 2006 ; Larrieu Peggy, « La réception des neurosciences par le droit », *AJ Pénal*, 2011, p. 231 et s. ; Oullier Olivier, Sauneron Sarah, « Le cerveau et la loi : éthique et pratique du neurodroit », Note d'analyse n° 282, Centre d'analyse stratégique, septembre 2012 ; Penavayre Marie., « De la neurocriminologie au neurodroit : le droit pénal à l'ère du sujet cérébral », *Lexsociété*, 23 avril 2024 : <https://hal.science/hal-04555883> (Accessed May 10, 2026).



identify the location of a brain lesion, for example, and “functional” brain imaging, which provides images of the brain in action, i.e. thinking, deciding, imagining, etc., and lying !

However, while the first type of brain imaging is more or less accepted by the courts, the second raises risks for human dignity and the rights of the defence, as it allows the detection of lies in an accused person, who has the right to remain silent in their defence .

Another risk associated with the use of brain imaging techniques is that they may mislead the judge and jury in their assessment of the facts before them. We have already seen how these techniques can be used to understand the deliberative mechanisms in a trial. A person may be found guilty or, conversely, found not guilty, depending on the power of fascination that neuroscientific evidence exerts on the judge and jury. Furthermore, giving precedence to neuroscientific evidence somehow devalues the worth of written and oral evidence, since it is considered that what the brain says is more important than what is said in words or language. How, then, can this problem be remedied?

Furthermore, we might also question the functioning of the neuroscientific devices that measure brain activity. For example, what happens if the settings of these devices are biased, or if the software designed to read and analyse the data encounters a bug? The conclusions of the brain tests will inevitably be flawed and may therefore distort the judge's decision.

Secondly: Ethical Issues

In addition to technical risks and problems, neuroscientific applications also raise ethical issues, as since the 2000s, experiments have been carried out in the United States on the brains of criminals with a high degree of aggression and violence in order to “correct” their criminal behaviour, in particular through Deep Brain Stimulation (DBS). This is a neurosurgical treatment that involves regulating brain activity using electrodes implanted in the brain and connected to a control box, which stimulates or inhibits certain regions of the brain responsible for controlling behaviour or moral judgement²⁶.

²⁶ Choy Olivia, Raine Adrian, Hamilton Roy H., « Stimulation of the Prefrontal Cortex Reduces Intentions to Commit Aggression : A Randomized Double-Blind, Placebo-Controlled, Stratified, Parallel-Group Trial », *Journal of Neuroscience*, 2018, 38(29): 6505-12 ; Dambacher Franziska, Teresa, Schuhmann Jill Lobbstaël, Arnoud Arntz, Suzanne Brugman, Alexander T. Sack, « Reducing Proactive Aggression Through Non-Invasive Brain Stimulation », *Social Cognitive and Affective Neuroscience*, 2015, 10(10): 1303-9 ; Hortensius Ruud, Dennis J. L. G., Schutter and Eddie Harmon-Jones, « When Anger Leads to Aggression : Induction of Relative Left Frontal Cortical Activity



Here again, what would happen if we decided to generalise this type of intervention? Is the consent of the individuals concerned sufficiently free and informed for this type of experiment to be carried out? Ultimately, don't these intrusive practices remind us of the lobotomies performed in the past?

In reality, these risks and issues stem from confusion, in the sense that brain imaging does not establish a direct cause-and-effect relationship between brain impairment and criminal behaviour, but only shows simple correlations. In other words, describing or recording brain activity does not mean explaining or demonstrating criminal behaviour²⁷. Subjective issues such as discernment or intent remain highly complex, and it would be presumptuous, if not erroneous, to reduce them to simple brain mechanisms.

Furthermore, neuroscientific evidence overlooks the role of the social environment in explaining criminal behaviour. The family environment, neighbourhood, school, peer group, etc. all these variables have a major influence on the formation of an individual's personality and psychological functioning²⁸.

In view of all this, Algerian judges will have to deal with it. That is why it is necessary to provide specific legislation to regulate the use of neuroscientific techniques in order to ensure better administration of justice.

SECOND REQUIERMENT: THE NEED FOR SPECIFIC LEGISLATION FOR BETTER ADMINISTRATION OF JUSTICE

One of the objectives of the administration of justice is to guarantee individual rights and freedoms. In the case of Algeria, this objective becomes all the more important given the limitations of current judicial expertise and the need to establish a legal framework governing the use of neuroscientific techniques.

Firstly: The Limitations of Current Judicial Expertise

In Algerian law, there are several provisions whereby the investigating or trial court may call on an expert to provide clarification on technical issues (Art. 239 et

With Transcranial Direct Current Stimulation Increases the Anger-Aggression Relationship », *Social Cognitive and Affective Neuroscience*, 2012, 7(3): 342-47 ; Riva Paolo, Leonor J Romero Lauro, C Nathan DeWall, David S. Chester, Brad J. Bushman, « Reducing Aggressive Responses to social Exclusion Using Transcranial Direct Current Stimulation », *Social Cognitive and Affective Neuroscience*, 2015, 10(3): 352-56.

²⁷ Penavayre Marie, « De la neurocriminologie au neurodroit : le droit pénal à l'ère du sujet cérébral », *op. cit.*

²⁸ Penavayre Marie, *Enjeux épistémologique de l'usage judiciaire des neurosciences : une analyse du pouvoir explicatif de la neurocriminologie*, thèse de doctorat, Université de Bordeaux, 2020.



seq. of the new Code of Criminal Procedure). Similarly, during the investigation phase, the investigating judge may order a 'medical examination', a 'medical-psychological examination', or a psychiatric assessment in accordance with Article 141 of the new Code of Criminal Procedure. Finally, under Article 46 of the new Code of Criminal Procedure, the public prosecutor may, within the scope of his or her powers, "seek assistance on technical matters from qualified persons chosen from among specialists... [to receive] their verbal and/or written observations... in the form of summary or analysis reports'...

However, despite Article 349 of the new Code of Criminal Procedure, which specifies that '... offences may be established by any means of evidence...', the provisions just cited seem inadequate when a 'neurological' issue arises '. In Algeria, judges most often call on psychiatric expertise to assess a person's dangerousness, risk of recidivism, or discernment due to "dementia" (Art. 47 of the Criminal Code) or 'mental disorder' (Art. 21 of the Criminal Code). However, psychiatric expertise is not comparable to neuroscientific expertise. While the former involves demonstrating a mental disorder through clinical interviews with the person in question, the latter studies the functioning of the brain using brain imaging techniques. The two therefore do not follow the same approach.

Secondly: The Imperative of a Legal Framework Governing Neuroscientific Techniques

In any case, Algerian lawmakers will one day be called upon to legislate to regulate the use of brain imaging techniques for evidentiary purposes, precisely to prevent their misuse. For example, what will be the attitude of Algerian judges towards victims or defendants who, in order to prove the veracity of their testimony, request to undergo a brain imaging test? This question is worth asking, as we know that certain brain tests can detect lies. Conversely, one may also wonder whether, in the context of seeking the truth, the investigating judge or a magistrate may compel an accused or a victim to undergo a brain examination in order to extract a confession from them?

The new legislation will therefore have to regulate the issue of 'consent' with regard to the use of neuroscientific techniques. It will also need to specify the 'purposes' for which these techniques may be used and set clear limits to ensure that data obtained from brain imaging is not exploited or used outside the context of forensic expertise, scientific research or therapeutic care, for example. Without specific legislation on all these issues, discriminatory practices are likely to arise.



Some may use personal brain data to refuse to hire someone or deny insurance coverage following an accident, for example.

Better administration of justice therefore requires anticipating all scenarios in which brain imaging could be exploited for purposes that violate human rights. To this end, the recently established National Council on Health Science Ethics, should be involved in providing opinions or recommendations on ethical issues related to the use of neuroscientific techniques²⁹.

Finally, better administration of justice also requires that judicial actors (judges, lawyers, juries) be trained and made aware of the risks and issues associated with new brain exploration technologies.

Conclusion :

The advent of neurolaw and neurocriminology marks a turning point in the history of justice and scientific research on criminal behaviour. Brain imaging techniques are therefore completely challenging the rules of evidence and the fundamental concepts of criminal law that were previously thought to be immutable, such as the concepts of accountability, guilt, and free will. In terms of results, our prospective study showed that not only have the courts in Algeria not yet adopted these new techniques (electroencephalography, hypnosis, lie detectors, brain scans, MRIs, etc.), but that debates on 'neuroscientific' evidence are not yet on the agenda. This observation therefore confirms our initial hypothesis. However, brain imaging techniques raise several legal, ethical and scientific issues, and our current legislation is not adapted to them. The Algerian legislator cannot therefore remain indifferent to this state of affairs if it wishes to guarantee an effective justice system that respects individual rights and freedoms.

In light of this study, we make the following recommendations:

- Introduce specific legislation in Algeria to regulate the use of brain imaging techniques, specifying, among other things, the 'purposes' of these techniques and the 'probative value' of neuroscientific evidence.
- Involve the 'National Council for Health Science Ethics' in issues related to the use of brain imaging techniques, particularly in a judicial context.

²⁹ Executive Decree No. 22-213 establishing the composition, missions, organization and functioning of the National Council for Health Science Ethics, Official Journal of the Algerian Republic, No. 62, pp. 13–14.



- Conduct professional training sessions for magistrates and criminal court juries on evidence from brain imaging for better administration of justice.

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