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ARTICLE

Brain-Reading Technologies and the Right Against Self-Incrimination: A Challenge for the Distinction Between Testimonial and Real Evidence

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Abstract
The development of brain-reading technologies has raised expectations that it will finally be possible to detect lies. However, the existence of these new technologies has also raised fears that the authorities might use them to read people's minds without their consent and obtain evidence that could be used against them in criminal proceedings, a scenario that raises questions about possible violations of the right against self-incrimination. The aim of this Article is to analyze whether the obtaining of incriminating information through the non-consensual use of brain-reading technologies can violate the right against self-incrimination under its traditional interpretation, according to which the scope of application of this right includes only "testimonial evidence," thus excluding "real or physical evidence."

Keywords: Right against self-incrimination; right to remain silent; Brain-Reading Technology; fMRI; P300

A. Introduction

Technology is now present in almost every aspect of life. The criminal justice system is no exception.

However, the use of new technologies in this specific context is the source of many debates about the possible violation of fundamental rights of individuals. For example, the legitimacy of robot judges and robot lawyers,[1] the legality of using predictive models to anticipate the commission of crimes,[2] the limits on obtaining personal information from the social media of the defendant,[3] and the possibility of using technological systems to assess the dangerousness of

[1]Tania Sourdin, *Judge v. Robot? Artificial Intelligence and Judicial Decision-Making*, 41 UNIV. OF NEW S. WHALES L.J. 1114, 1114-1117 (2018); José Ignacio Solar, *¿Jueces-robot? Bases para una Reflexión Realista Sobre la Aplicación de la Inteligencia Artificial en la Administración de Justicia*, *in* EL IMPACTO DE LA INTELIGENCIA ARTIFICIAL EN LA TEORÍA Y LA PRÁCTICA JURÍDICA 245, 245-280 (José Ignacio Solar & María Olga Sánchez Martínez eds., 2022).

[2]Víctor Beltrán & David Preminger, *Inteligencia Artificial en el Sistema de Justicia Criminal: Algunas Reflexiones Sobre su Aplicación en el Derecho Chileno*, 5 REVISTA DE DERECHO APLICADO LLM UC 1, 10-13 (2020).

[3]Javier Escobar Veas, *Redes Sociales y Expectativa Legítima de Privacidad en la Jurisprudencia de la Corte Suprema Chilena*, 12 REVISTA CHILENA DE DERECHO Y TECNOLOGÍA 1, 11-19 (2023).

individuals,[4] determine their guilt[5] or the sanction to be applied,[6] among others, are being debated.

One type of new technology that has been discussed recently is brain-reading devices. Consider the following case: A person is the prime suspect in a murder investigation. In addition to forcing that person to submit to a blood test and hand over some documents, a judge also issues a warrant forcing the accused to submit to an examination by a brain-reading machine so that the prosecution can collect biometric and neurological information, which is then translated into a reading of mental states and thoughts.[7]

The situation described above is no longer a science fiction hypothesis, as brain-reading technologies already exist and are even used in criminal investigations in some countries, such as Japan.[8] According to Matsuda, Ogawa, and Tsuneoka, there are about 100 people in Japan who have been trained as examiners at the Forensic Science Training Center, an institution affiliated to the National Institute of Police Science Research. These examiners handle about 5,000 cases a year.[9]

As humanity has been trying to develop a mechanism to detect lies since ancient times,[10] the possibility that brain-reading technologies can distinguish truth from lies has created great expectations. However, their existence has also raised fears that the authorities could use them to read people's minds without their consent and obtain information that could criminally incriminate them. This possibility immediately poses questions about the right against self-incrimination. Could a person charged in a criminal case invoke his right against self-incrimination and legitimately refuse to submit to a brain-reading test? Could a court order him to take the test or punish him for refusing?

The purpose of this Article is to analyze whether the collection of incriminating information through the non-consensual use of brain-reading technologies violates the right against self-incrimination under its traditional interpretation, according to which the scope of application of this right includes only "testimonial evidence," thus excluding "real or physical evidence." It must be noted therefore that the Article does not address the possibility that the non-consensual use of brain-reading technologies can violate other rights, such as the rights to privacy and to freedom of expression.

In light of the above, this Article is not intended to critically analyze or support this interpretation,[11] nor is it intended to propose an alternative one, at least not in depth. On the contrary, the purpose of this Article is more modest: To illustrate the difficulties and challenges that brain-reading technologies raise for the aforementioned traditional interpretation of the right against self-incrimination. Because of this, the Article can be considered inquiring and descriptive. However, even if the stated purpose could be considered modest, I believe it can be useful because

[4]Serena Quattrocolo, Artificial Intelligence, Computational Modelling and Criminal Proceedings 146-152 (2020).

[5]María Sánchez, *Primeros Pasos de la Neuroimagen en el Proceso Penal Estadounidense*, 15 Política Criminal 230, 242-249 (2020).

[6]Deborah W. Denno, *The Myth of the Double-Edged Sword: An Empirical Study of Neuroscience Evidence in Criminal Cases*, 56 B.C. L. Rev. 493, 495-499 (2015).

[7]*See* Kiel Brennan-Marquez, *A Modest Defense of Mind Reading*, 15 Yale J.L. & Tech. 214, 216 (2013).

[8]Akemi Osugi, *Daily Application of the Concealed Information Test: Japan*, *in* Memory Detection Theory and Application of the Concealed Information Test 253, 253–275 (Bruno Verschuere, Gershon Ben-Shakhar, & Ewout Meijer, eds., 2011).

[9]Izumi Matsuda, Tokihiro Ogawa, & Michiko Tsuneoka, *Broadening the Use of the Concealed Information Test in the Field*, 10 Frontiers in Psychiatry 1, 2 (2019).

[10]On the historical development of lie detection *see* Elizabeth B. Ford, *Lie Detection: Historical, Neuropsychiatric and Legal Dimensions*, 29 Int'l J. L. and Psychiatry 159, 165 (2006); Martina Vicianova, *Historical Techniques of Lie Detection*, 11 Eur.'s J. Psych. 522, 523 (2015).

[11]*See* Javier Escobar Veas, *A Comparative Analysis of the Case Law of the European Court of Human Rights on the Right against Self-Incrimination*, 8 Revista Brasileira de Direito Processual Penal 869, 872-893 (2022) (giving a comparative analysis of the European Court of Human Rights case law on self-incrimination).

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it is quite likely that new and more effective brain-reading technologies will be developed in the future. Therefore, the relevant questions should be discussed and hopefully answered as soon as possible.

The Article is structured as follows: The first part describes and explains the performance of three currently available brain-reading technologies: Functional magnetic resonance imaging, P300, and semantic decoding. The second part addresses the problem of the scope of application of the right against self-incrimination, in particular what kind of evidence is covered by this right. As stated, the traditional interpretation of this right argues that its scope includes only "testimonial evidence," thus excluding "real or physical evidence." This interpretation has been adopted by the United States Supreme Court, the Canadian Supreme Court, the Constitutional Court of Spain, the Constitutional Court of Chile, and the ECHR. These courts have been chosen to illustrate that, even in different legal systems, a remarkably similar interpretation of the right against self-incrimination has developed. Finally, in the third part an attempt will be made to apply this traditional interpretation of the right against self-incrimination to cases of non-consensual collection of incriminating information through the non-consensual use of brain-reading technologies, in order to foresee how these cases would be resolved in the light of this majority interpretation.

B. Three Currently Available Brain-Reading Technologies: Functional Magnetic Resonance Imaging, P300 and Semantic Decoding

I. Functional Magnetic Resonance Imaging

Functional Magnetic Resonance Imaging (fMRI) is designed to measure brain activity by measuring blood flow. Because the brain needs oxygen to function, a higher presence of oxygen means a higher level of activity.[12]

In lie detection studies using this technology, people are asked to answer a series of questions while an fMRI scanner monitors their level of brain activity in different areas of the brain.[13] In some studies, the same question is asked twice and the subject is asked to answer differently each time.[14] In other studies, the questions are asked only once, but only some of them relate to true information about the crime under investigation, while other questions have a publicly known answer, such as the capital of a country.[15]

The hypothesis behind this technology is that telling the truth is the brain's natural response, so the level of brain activity should remain within normal parameters. In contrast, lying requires a higher level of brain activity because the person must first remember the truth, then suppress it while creating a lie, and finally express the latter.[16] To perform this higher level of activity, the brain needs more energy, which it gets from an increased flow of oxygenated blood. These changes can be seen with an fMRI scanner.[17]

[12]Jaime Acosta, *El FMRI como Detector de Mentiras, sus Implicaciones y Admisibilidad en los Tribunales*, 86 Revista Jurídica Universidad de Puerto Rico 271, 272 (2017); Sjors Ligthart, Coercive Brain-Reading in Criminal Justice: An Analysis of European Human Rights Law 13 (2022); Frederick Shauer, *Can Bad Science be Good Evidence - Neuroscience, Lie Detection, and Beyond*, 95 Cornell L. Rev. 1191, 1197 (2010); Michael S. Pardo & Dennis Patterson, Minds, Brains, and Law: The Conceptual Foundations of Law and Neuroscience 82–83 (2013).

[13]Martha J. Farah, J. Benjamin Hutchinson, Elizabeth A. Phelps, & Anthony D. Wagner, *Functional MRI-Based Lie Detection: Scientific and Societal Challenges*, 15 Nature Reviews Neuroscience 123, 123 (2014); Ligthart, *supra* note 12, at 13.

[14]Sean A. Spence, Catherine J. Kaylor-Hughes, Martin L. Brook, Sudheer T. Lankappa, & Iain D. Wilkinson, *'Munchausen's Syndrome by Proxy' or a 'Miscarriage of Justice'? An Initial Application of Functional Neuroimaging to the Question of Guilt versus Innocence*, 23 Eur. Psychiatry 309, 311 (2008).

[15]Ligthart, *supra* note 12, at 13; F. Andrew Kozel, Kevin A. Johnson, Emily L. Grenesko, Steven J. Laken, Samet Kose, Xinghua Lu, Dean Pollina, Andrew Ryan, & Mark S. George, *Functional MRI Detection of Deception After Committing a Mock Sabotage Crime*, 54 J. Forensic Sci. 220, 222–223 (2009).

[16]Acosta, *supra* note 12, at 272; Ligthart, *supra* note 12, at 13.

[17]William A. Woodruff, *Evidence of Lies and Rules of Evidence: The Admissibility of fMRI-Based Expert Opinion of Witness Truthfulness*, 16 N.C. J. L. & Tech. 105, 109 (2014).

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Scientists have generally associated the prefrontal region of the brain with the process and action of lying,[18] at least spontaneously.[19] Therefore, by identifying the areas of the brain that are activated when a question is answered, it would be possible to reasonably infer whether the answer is a lie or not. In other words, if it is determined that the area of the prefrontal cortex has been activated, by detecting increased blood flow to it, there will be a higher probability that the answer in question is a lie.

II. P300

Event-related potentials are very small voltages generated in the brain structures in response to specific events or stimuli.[20]

The P300 wave is an event-related potential that occurs approximately 300 miliseconds after the presentation of a significant stimulus.[21]

Tests based on the P300 wave, such as the Concealed Information Test (CIT)[22] or Brain Fingerprinting,[23] aim to determine whether or not a person recognizes specific information related to a crime by detecting the P300 wave in an electroencephalogram.[24]

In a CIT, the subject is presented with several stimuli divided into three categories: a relevant stimulus, actually related to the crime; irrelevant stimuli, unrelated to the crime in question and belonging to the same category as the relevant stimulus, such that an innocent person would not be able to distinguish them from the object related to the crime; and, finally, a stimulus that has been made relevant by the test instructions, the purpose of which is to secure the subject's cooperation.[25] If the presentation of the relevant stimulus elicits a significant physiological

[18]Spence, Kaylor-Hughes, Brook, Lankappa, & Wilkinson, *supra* note 14, at 312; Ahmed A. Karim, Markus Schneider, Martin Lotze, Ralf Veit, Paul Sauseng, Christoph Braun & Niels Birbaumer, *The Truth About Lying: Inhibition of the Anterior Prefrontal Cortex Improves Deceptive Behavior*, 20 Cerebral Cortex 205, 205 (2010); Sean A. Spence, Tom F. D. Farrow, Amy E. Herford, Iain D. Wilkinson, Ying Zheng, & Peter W. R. Woodruff, *Behavioural and Functional Anatomical Correlates of Deception in Humans*, 12 Neuroreport 2849, 2852 (2010); F. Andrew Kozel, Kevin A. Johnson, Qiwen Mu, Emily L. Grenesko, Steven J. Laken, & Mark S. George, *Detecting Deception Using Functional Magnetic Resonance Imaging*, 58 Biological Psychiatry 605, 605 (2005); Said Jiménez & Juan José Sánchez, *Engaño: Mecanismos Cerebrales y Psicología de la Salud*, 31 Psicología y Salud 5, 6 (2021); Matthias Gamer, *Detecting of Deception and Concealed Information Using Neuroimaging Techniques, in* Memory Detection Theory and Application of the Concealed Information Test 90, 97 (Bruno Verschuere, Gershon Ben-Shakhar, & Ewout Meijer, eds., 2011).

[19]*see* G. Ganis, S. M. Kosslyn, S. Stose, W. L. Thompson, & D. A. Yurgelun-Todd, *Neural Correlates of Different Types of Deception: An fMRI Investigation*, 13 Cerebral Cortex 830, 835 (2003) (regarding studies showing brain activity in different areas depending on whether the lie is spontaneous or memorized).

[20]Shravani Sur & V. K. Sinha, *Event-Related Potential: An Overview*, 18 Indus. Psychiatry J. 70, 70 (2009).

[21]J. Peter Rosenfeld, *P300 in Detecting Concealed Information and Deception: A Review*, 57 Psychophysiology 1, 1 (2020); J. Peter Rosenfeld, *P300 in Detecting Concealed Information, in* Memory Detection Theory and Application of the Concealed Information Test 63, 64 (Bruno Verschuere, Gershon Ben-Shakhar, & Ewout Meijer, eds., 2011); Odette Terola, Miguel Álvarez, Noelia Melgar, & Antonio L. Manzanero, *Detección de Información Oculta Mediante Potenciales Relacionados con eventos*, 24 Anuario de Piscología Jurídica 49, 49–50 (2014); Lawrence A. Farwell, *Brain Fingerprinting: A Comprehensive Tutorial Review of Detection of Concealed Information with Event-Related Brain Potentials*, 6 Cognitive Neurodynamics 115, 115 (2012); Erich Taylor, *A New Wave of Police Interrogation? "Brain Fingerprinting," the Constitutionality Privilege Against Self-Incrimination, and Hearsay Jurisprudence*, 2 Univ. Ill. J.L., Tech. & Pol'y 287, 291 (2006).

[22]*See* John B. Meixner & J. Peter Rosenfeld, *Detecting Knowledge of Incidentally Acquired, Real-World Memories Using a P300-Based Concealed-Information Test*, 25 Psych. Sci. 1994, 1994-2002 (2014) (providing a study on the application of CIT in the real world).

[23]On brain-fingerprinting technology, see Farwell, *supra* note 21; Taylor, *supra* note 21.

[24]Ligthart, *supra* note 12, at 14; Ewout H. Meijer, Gary Bente, Gershon Ben-Shakhar, & Andreas Schumacher, *Detecting Concealed Information from Groups Using a Dynamic Questioning Approach: Simultaneous Skin Conductance Measurement and Immediate Feedback*, 4 Frontiers in Psychiatry 1, 1 (2013).

[25]Meixner & Rosenfeld, *supra* note 22, at 149–150; Ewout H. Meijer, Fren Smulders, Harald Merckelbach, & Ann G. Wolf, *The P300 is Sensitive to Concealed Face Recognition*, 66 Int'l J. Psychophysiology 231, 231 (2007); Ana Sánchez, *El uso del test P300 en el Proceso Penal Español: Algunos Aspectos Controvertidos*, 18 Revista Electrónica de Ciencia Penal y

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response in the subject, it can be concluded that they recognizes the stimulus. As Farwell explains it: "When a subject recognizes and takes note of something significant in the present context, the brain emits an 'Aha!' response."[26]

For example, in a murder case where the victim was stabbed in the heart with a chisel, a chisel would be a relevant stimulus, a knife would be an irrelevant stimulus, and an example of a stimulus made relevant by the test instructions would be a red apple, where the test subject has been instructed to report whenever it sees such an apple.

Although it is possible for an innocent person to respond with a greater physiological response to the relevant stimulus, the possibility of a false positive can be reasonably reduced by increasing the number of questions.[27]

Supporters of tests based on the P300 wave argue that they are not designed to detect lies, but only to determine whether a person recognizes information that is presumably known only to the perpetrator.[28] This type of test does not seek to determine what information should have been stored in the person's brain, nor how the information stored in the brain got there.

The test result could indicate that the subject has lied, but this will not always be the case, as the subject can have a plausible explanation for possessing this knowledge, such as a newspaper report.[29]

In addition to helping to investigate offences committed in the past, CIT can also help to prevent future terrorist attacks.[30]

III. Semantic Decoding

The combination of techniques such as fMRI with neurological etiologies has revolutionized our understanding of how semantic concepts are encoded in the brain. This new understanding of how our brains encode semantic concepts has given rise to semantic decoding, a new field of study defined as the decoding of semantic concepts from recordings of our brain activity.[31]

In 2023, researchers created a new artificial intelligence system called "semantic decoder," which can translate a person's brain activity while listening to a story or silently imagining telling a story into a continuous stream of text.[32] This system might help people who are mentally conscious yet unable to physically speak to communicate intelligibly again.[33]

Unlike other language decoding systems, this semantic decoder does not require subjects to have surgical implants, making the process non-invasive. In addition, participants are not restricted to using only words from a prescribed list.[34]

How does the semantic decoder work? First, brain activity is measured using fMRI after extensive training of the decoder, in which the individual listens to 16–non-consecutive–hours of speech input by listening to a series of "naturally spoken narrative stories":

Criminología 1, 6 (2016); Melissa Littlefield, *Constructing the Organ of Deceit: The Rhetoric of fMRI and Brain Fingerprinting in Post-9/11 America*, 34 Sci., Tech., & Hum. Values 365, 369 (2009).

[26]Farwell, *supra* note 21, at 115.

[27]J. Peter Rosenfeld, Xiaoqing Hu, Elena Labkovsky, John Meixner, & Michael R. Winograd, *Review of Recent Studies and Issues Regarding the P300-Based Complex Trial Protocol for Detection of Concealed Information*, 90 Int'l J. Psychophysiology 118, 119 (2013).

[28]Farwell, *supra* note 21, at 115; Rosenfeld, Hu, Labkovsky, Meixner & Winograd *supra* note 27, at 118; Matsuda Ogawa & Tsuneoka, *supra* note 9, at 1.

[29]Rosenfeld, Hu, Labkovsky, Meixner & Winograd, *supra* note 27, at 118.

[30]Meixner & Rosenfeld, *supra* note 22, at 153; Meijer, Gary Bente, Ben-Shakhar & Schumacher, *supra* note 24.

[31]Milan Rybář & Ian Daly, *Neural Decoding of Semantic Concepts: A Systematic Literature Review,* 19 J. Neural Eng'g 1, 2 (2002).

[32]Jerry Tang, Amanda LeBel, Shailee Jain & Alexander G. Huth, *Semantic Reconstruction of Continuous Language from Non-Invasive Brain Recordings*, 26 Nature Neuroscience 858, 858 (2023).

[33]*Id.* at 858.

[34]*Id.* at 858.

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> 'Decoding continuous language thus requires solving an ill-posed inverse problem, as there are many more words to decode than brain images. Our decoder accomplishes this by generating candidate word sequences, scoring the likelihood that each candidate evoked the recorded brain responses and then selecting the best candidate. To compare word sequences to a subject's brain responses, we used an encoding model that predicts how the subject's brain responds to natural language. We recorded brain responses while the subject listened to 16 h of naturally spoken narrative stories, yielding over five times more data than the typical language fMRI experiment. We trained the encoding model on this dataset by extracting semantic features that capture the meaning of stimulus phrases and using linear regression to model how the semantic features influence brain responses. Given any word sequence, the encoding model predicts how the subject's brain would respond when hearing the sequence with considerable accuracy.'[35]

Then, provided that the participant is open to having their thoughts decoded, their listening to a new story or imagining telling a story allows the machine to generate corresponding text from brain activity alone.[36]

It is important to note that the resulting text is not a perfect word-for-word transcript. Instead, the semantic decoder is designed to capture the overall essence of what is said or thought. The decoder produces text that closely—and sometimes exactly—matches the intended meaning of the original words about 50% of the time. For example, in experimental trials, when a person heard the sentence "I don't have my driver's license yet," her thoughts were translated as "She has not even started to learn to drive yet."[37]

The researchers also addressed concerns about the potential misuse of the semantic decoder. In particular, the decoder has raised questions about the possibility of unauthorized access to people's thoughts. However, the researchers emphasized that the decoder was only effective with cooperative individuals who willingly participated in the training of the decoder. When tested on untrained individuals or those who actively resisted by thinking other thoughts, the results were incomprehensible and unusable. Nevertheless, the researchers noted that the technology could overcome this limitation in the future and, therefore, pointed out that there are acute reasons to be concerned about the mental privacy issues associated with this new technology.[38]

C. The Distinction Between Testimonial and Real Evidence as a Key Feature of the Interpretation About the Right Against Self-Incrimination: A Comparative Overview

The right against self-incrimination can be understood, in a broad sense, as the right to remain silent and not to contribute to incriminating oneself.[39]

The importance of the right against self-incrimination has been universally recognized. The European Court of Human Rights (ECtHR) has ruled that the right in question is a generally accepted international standard that lies at the heart of the notion of a fair proceeding.[40] Similarly, the United States Supreme Court has stated that the right against self-incrimination "registers an important advance in the development of our liberty-one of the great landmarks in man's struggle to make himself civilized."[41]

[35]*Id.* at 858
[36]*Id.* at 858–860.
[37]*Id.* at 859.
[38]*Id.* at 862.
[39]O'Halloran and Francis v. the United Kingdom, App. No. 15809/02 and 25624/02, ¶ 45 (June 29, 2007), https://hudoc.echr.coe.int/eng?i=002-2657; Escobar Veas, *supra* note 11, at 870.
[40]Murray v. the United Kingdom, App. No. 18731/91, ¶ 45 (Feb. 8, 1996), https://hudoc.echr.coe.int/eng?i=001-2577.
[41]*Ullmann v. United States*, 350 U.S. 422, 426 (1956).

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Despite its fundamental relevance and the apparent simplicity of its definition, the right against self-incrimination has been characterized as one of the most complex guarantees in the entire body of fundamental rights applicable in the context of criminal proceedings.[42] Similarly, some authors have affirmed that the self-incrimination clause of the Fifth Amendment to the United States Constitution "is an unsolved riddle of vast proportions, a Gordian knot in the middle of our Bill of Rights."[43]

Moreover, the development of new technologies has led to other complex scenarios. Can a defendant be compelled to disclose the password to her smartphone? Can a defendant be compelled to decrypt their smartphone by placing their finger on it? Can a defendant be compelled to sign a document authorizing the prosecution to ask national and international banks for their financial records? Can an accused person be forced to sit still while the prosecution carries out a brain fingerprinting test on them in order to detect the presence of information related to the crime under investigation?

According to the traditional interpretation of the right against self-incrimination, its scope of application includes only "testimonial evidence," thus excluding "real or physical evidence."[44] Consequently, for example, the prosecution cannot compel a person to make an incriminating statement, but it can compel him to give a blood sample in order to carry out a scientific examination, or to tolerate the taking of a photograph of his body in order to carry out a recognition procedure.

This interpretation has been adopted by the Supreme Court of the United States, the Supreme Court of Canada, the Constitutional Court of Spain, the Constitutional Court of Chile, and the ECtHR. Of course, majority does not mean right, and minority does not mean wrong. However, the fact that different courts belonging to different legal systems follow a remarkably similar approach illustrates how widespread and well-established this approach is.

I. The United States Supreme Court

The Fifth Amendment to the United States Constitution declares: "No person [. . .] shall be compelled in any criminal case to be a witness against himself [. . .]."

According to the United States Supreme Court, the word "witness" in the Fifth Amendment limits the protection to testimonial evidence.[45] Therefore, the right in question "applies only to preventing a person from having to give testimony against himself or herself."[46]

In *Holt v. United States*, the Supreme Court held that "the prohibition of compelling a man in a criminal court to be witness against himself is a prohibition of the use of physical or moral compulsion to extort communications from him, not an exclusion of his body as evidence when it may be material."[47]

[42]Stefan Trechsel, Human Rights in Criminal Proceedings 341 (2005). *See also* Georganne R. Higgins, *Business Records and the Fifth Amendment Right Against Self-Incrimination*, 38 Ohio St. L.J. 351, 351 (1977).

[43]Akhil Reed Amar & Renee B. Lettow, *Fifth Amendment, First Principles: The Self-Incrimination Clause*, 93 Mich. L. Rev. 857, 857 (1995).

[44]Brennan-Marquez, *supra* note 7, at 217; Kara Goldman, *Biometric Passwords and the Privilege Against Self-Incrimination*, 33 Cardozo Arts & Ent. L. J. 211, 214 (2015); Carlos Castellví, *¿Están Prohibidos los Engaños Policiales que no se Encuentran Expresamente Permitidos? Infiltraciones Policiales, Agentes Encubiertos y Derechos Fundamentales*, 17 Política Criminal 173, 187 (2022); Raila Cinda Brejt, *Abridging the Fifth Amendment: Compelled Decryption, Passwords, & Biometrics*, 31 Fordham Intell. Prop., Media and Ent. L. J. 1154, 1160 (2021); Alex Stein & Daniel J. Seidmann, *The Right to Silence Helps the Innocent: A Game-Theoretic Analysis of the Fifth Amendment Privilege*, 114 Harv. L. Rev. 430, 475 (2020).

[45]*United States v. Hubbell*, 530 U.S. 27, 34 (2000); Escobar Veas, *supra* note 11, at 890; Erwin Chemerinsky & Laurie L. Levenson, Criminal Procedure 733 (2022); Andrew Choo, The Privilege Against Self-Incrimination and Criminal Justice 50 (2013).

[46]Chemerinsky & Levenson, *supra* note 45, at 736.

[47]*Holt v. United States*, 218 U.S. 245, 252–53 (1910).

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In *Schmerber v. California*, the Supreme Court distinguished between testimonial and real evidence. In that case, the defendant, who had been convicted of driving under the influence of alcohol, argued that his right against self-incrimination had been violated when a blood sample was extracted from him at the hospital despite his refusal to consent.[48]

The Supreme Court affirmed the conviction, holding that "the privilege protects an accused only from being compelled to testify against himself, or otherwise provide the State with evidence of a testimonial or communicative nature, and that the withdrawal of blood and use of the analysis in question, in this case, did not involve compulsion to these ends."[49] In other words, a compulsion which makes a defendant the source of "real evidence" does not violate the right against self-incrimination.[50]

Since *Schmerber*, the Supreme Court has decided several cases allowing a defendant to be forced to stand in a lineup,[51] provide handwriting samples,[52] give voiceprints,[53] take sobriety tests that measure mental acuity and physical coordination,[54] and produce documents.[55]

Notwithstanding, in *Fisher v. United States*, the Supreme Court recognized that the act of producing evidence in response to a request from the authority has communicative aspects of its own, because compliance with the request tacitly concedes the existence of the evidence demanded and its possession or control by the person in question, as well as the belief that the evidence delivered is the evidence requested.[56] However, compulsion of these implied admissions alone does not warrant Fifth Amendment protection with respect to the act of production, because the right against self-incrimination "only applies when the accused is compelled to make a testimonial communication that is incriminating."[57]

Therefore, the *Fisher* test consists of three elements: (i) Compulsion; (ii) a testimonial communication; and (iii) incrimination.[58] If any one of the three elements is lacking, the right is unavailable.[59]

Nevertheless, in *Fisher* the Supreme Court established the "foregone conclusion" doctrine, which holds that however incriminating some documents may be, the act of producing them does not amount to the level of testimony within the protection of the Fifth Amendment where the existence and location of the papers are a foregone conclusion. In that case, the defendant adds little or nothing to the sum of the government's information by conceding that she in fact has the documents.[60] Under those circumstances, the act of production does not amount to testimony, but to surrender.

The "foregone conclusion" doctrine was reaffirmed in *United States v. Hubbel*. In that case, the prosecution obtained a broad-reaching subpoena for production of evidence—duces tecum—from the grand jury investigating the defendant's criminal misconduct. After the prosecution granted the defendant use immunity, he produced more than 13,000 pages of documents. The contents of the documents provided the prosecution with the information that led to a second prosecution against him for tax offences and mail and wire fraud.[61]

[48]*Schmerber v. California*, 384 U.S. 757, 758 (1966).
[49]*Id.* at 761.
[50]*Id.* at 764.
[51]*United States v. Wade*, 388 U.S. 218, 221–23 (1967).
[52]*Gilbert v. California*, 388 U.S. 263, 266–67 (1967).
[53]*United States v. Dionisio*, 410 U.S. 1, 7 (1973).
[54]*Pennsylvania v. Muniz*, 496 U.S. 582, 592 (1990).
[55]*Fisher v. United States*, 425 U.S. 391, 411 (1976).
[56]*Id.* at 410.
[57]*Id.* at 408; Ronald J. Allen & M. Kristin Mace, *The Self-Incrimination Clause Explained and Its Future Predicted*, 94 J. Crim. L. and Criminology 243, 246 (2004).
[58]Katherine K. Andritsakis, *Corporate Record-Keepers and the Right against Self-Incrimination: An Equitable Approach to Fifth Amendment Analysis*, 27 Santa Clara L. Rev. 411, 426 (1987).
[59]Higgins, *supra* note 41, at 361.
[60]*Fisher*, 425 U.S. at 411; Escobar Veas, *supra* note 11, at 892.
[61]*United States v. Hubbell*, 530 U.S. 27, 29–31 (2000).

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At the outset, the Supreme Court recalled that the word "witness" in the constitutional text limits the relevant category of compelled evidence to those that are "testimonial" in character.[62]

The Court then applied the reasoning of *Fisher* to the facts of the case. Regarding the "foregone conclusion" doctrine, the Supreme Court held that the prosecution had not shown any "prior knowledge of either the existence or the whereabouts of the 13,120 pages of documents ultimately produced."[63] Therefore, the Court concluded that the defendant's act of producing those documents had been testimonial in nature, and when the prosecution used the documents against him the granted immunity had been violated.[64]

Trying to explain the new doctrine, Pinto has stated that disclosure will be deemed to be a foregone conclusion if the government can demonstrate knowledge of (i) the existence of the evidence demanded; (ii) the possession of and control over the evidence in question by the defendant; and (iii) the defendant´s belief that the documents are those requested by the authority—authenticity. If the government can satisfy all three elements, then compelling the production of such evidence does not violate the right against self-incrimination.[65]

II. The Canadian Supreme Court

Section 11(c) of the Canadian Charter of Fundamental Rights provides that any person charged with an offence has the right not to be compelled to be a witness in proceedings against him or her in respect of that offence.

This provision should be read in conjunction with Section 13, which states that any witness who testifies in any proceeding has the right not to have any incriminating evidence so given used to incriminate him or her in any other proceeding, except in a prosecution for perjury or giving contradictory evidence. Moreover, the Supreme Court has ruled that Article 7 of the Canadian Charter, according to which everyone has the right to life, liberty, and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice, also provides a residual protection against improper compelled testimony, because it is well-established that the principles of fundamental justice include the right against self-incrimination.[66]

In order to determine whether the right against self-incrimination has been infringed, relevant factors include the presence or absence of: (1) Real coercion by the state in obtaining the statements; (2) an adversarial relationship between the accused and the state at the time the statements were obtained; (3) an increased risk of unreliable confessions; and (4) an increased risk of abuses of power by the state.[67]

Regarding the scope of application of the right in question, the Supreme Court has held that Section 11(c) protects the accused from oral or testimonial compulsion.[68] Consequently,

[62]*Id.* at 34.

[63]*Id.* at 45.

[64]*Id.* at 45–46.

[65]*See* Javier Escobar Veas, *De Legé v. the Netherlands: The ECtHR Adopts a Line of Reasoning Similar to that of the United States Supreme Court on Compelled Production of Real or Physical Evidence*, 30 MAASTRICHT J. EUR. & COMPAR. L. 653, 663-668 (2023) (criticizing the "foregone conclusion" doctrine).

[66]R. v. AT (M.B.), [1994] S.C.R. 555, 577 (Can.); R. v. S. (R.J.), [1995] S.C.R. 451, 512 (Can.); R. v. Jarvis, [2002] 3 S.C.R. 757, 794–95 (Can.).

[67]R. v. Fitzpatrick, [1995] S.C.R. 154, 166–169 (Can.); R. v. White, [1999] S.C.R. 417, 441 (Can.).

[68]Amway Corp. v. Can., [1989] S.C.R. 21, 40 (Can.) (stating:

> Applying a purposive interpretation to s. 11(c), I am of the opinion that it was intended to protect the individual against the affront to dignity and privacy inherent in a practice which enables the prosecution to force the person charged to supply the evidence out of his or her own mouth. Although disagreement exists as to the basis of the principle against self-incrimination, in my view, this factor plays a dominant role.)

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compelling a defendant to give fingerprints[69] or breathalyzer evidence,[70] or the introduction into evidence of the accused's private journals,[71] does not engage Section 11(c).

III . The Spanish Constitutional Court and the Chilean Constitutional Court

The Spanish Constitutional Court has also interpreted the right against self-incrimination from a testimonial perspective, stating that it should be interpreted as the right not to testify against oneself and not to confess guilt.[72]

According to the Constitutional Court, the essential content of these rights is the prohibition of compulsion to testify against oneself and the recognition of the freedom to testify or not to testify, and to do so as one thinks best.[73]

Based on this interpretation, the Spanish Constitutional Court has held that the obligation to submit to a breathalyzer test did not violate the right against self-incrimination, because the defendant was not compelled to make a self-incriminating statement.[74] In another case, the Spanish Constitutional Court ruled that an obligation on a taxpayer to produce or submit accounting documents could not be considered a violation of the right against self-incrimination because such behavior did not amount to an expression of will.[75]

In the same vein, the Chilean Constitutional Court has also interpreted the right against self-incrimination from a testimonial perspective.[76]

The Chilean Constitutional Court has held that the scope of application of the right against self-incrimination under the Chilean Constitution is quite narrow, with the only scope defined in Article 19 No. 7 (f) of the Constitution, which prohibits compelling the defendant in a criminal case to testify under oath.[77]

For the above reasons, the Constitutional Court has held that the criminal offence of unjustified refusal to submit to a test for alcohol or narcotics, provided for and punished by Article 195 bis of the Traffic Law, does not violate the right against self-incrimination,[78] because it simply does not compel the defendant to make a self-incriminating statement.[79]

[69]R. v. Beare, [1988] S.C.R. 387 (Can.).

[70]R. v. Gaff, 1984 CanLII 2423 (Can. Sask. C.A.).

[71]R. v. Anderson, 2002 CanLII 23591 (Can. Ont. C.A.).

[72]S.T.C., Feb. 15, 2021 (R.J., No. 21, FJ 4) (Spain).

[73]S.T.C., Dec. 14, 2020 (R.J., No. 181, FJ 2) (Spain) (citing Judgment S.T.C., Oct. 2, 1997 (R.J., No. 161) (Spain) and S.T.C., June 15, 2009 (R.J., No. 142) (Spain)).

[74]S.T.C., Oct. 4, 1985 (R.J. No. 103, FJ 3) (Spain).

[75]S.T.C., Apr. 26, 1999 (R.J. No. 76, FJ 10) (Spain).

[76]*See* Javier Escobar Veas, *Aplicación del derecho a no autoincriminarse en procedimientos administrativos sancionatorios: Análisis comparado de la jurisprudencia del Tribunal Europeo de Derechos Humanos y del Tribunal Constitucional chileno*, 34 Revista de Derecho Administrativo Económico 39, 54-60 (2021) (critically analyzing the Chilean Constitutional Court case law).

[77]Constitución Política de la República de Chile [C.P.] art. 19(7)(f).

[78]Tribunal Constitucional [T.C.] [Constituional Court], 26 de junio de 2018, "Requerimiento de inaplicabilidad por inconstitucionalidad presentado por Hector Guarda Olivera respecto del artículo 195 bis de la Ley N° 18.290 (Ley de Tránsito), en el proceso RUC 1610006323-2, RIT 162-2017, seguido ante el Tribunal de Juicio Oral en lo Penal de Concepción," Rol de la causa: 3449-2017, INA Requerimiento (Chile).

[79]Tribunal Constitucional [T.C.] [Constituional Court], 20 de octubre de 2016, "Requerimiento de inaplicabilidad por inconstitucionalidad presentado por Juvenal Gómez Gómez respecto del artículo 195 bis, inciso primero de la Ley N° 18.290, Ley de Tránsito, en los autos sobre delitos de conducción en estado de ebriedad con resultado de daños y negarse a la realización de alcoholemia, RIT N° 1841-2015, RUC N° 1510027986-7 del Juzgado de Garantía de Castro," Rol de la causa: 2936-2015, INA Requerimiento (Chile).

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IV. The European Court of Human Rights and the Court of Justice of the European Union

Currently, the right against self-incrimination is explicitly recognized in Article 7 of EU Directive 2016/343, which requires EU Member States to guarantee the right to remain silent and not to incriminate oneself. However, this was not always the case.

In contrast to other international instruments that explicitly recognize the right against self-incrimination, such as the International Covenant on Civil and Political Rights[80] and the American Convention on Human Rights,[81] the European Convention on Human Rights does not explicitly recognize the right against self-incrimination.[82]

The ECtHR recognized the existence of the right against self-incrimination in *Funke v. France*, decided in 1993.[83] In *Funke*, the ECtHR did not address the rationale of the right against self-incrimination or its scope of application.[84]

Three years later, in *John Murray v. United Kingdom*, the ECtHR attempted to provide a fuller explanation of its reasons for incorporating the right against self-incrimination into the right to a fair trial.[85] In that case, the ECtHR characterized the right against self-incrimination as a recognized international standard that lies at the heart of the notion of a fair trial. Therefore, it must be understood that the right against self-incrimination is part of the general right to a fair trial provided for in Article 6 of the European Convention.[86] This is the current position of the ECtHR.[87]

The Court of Justice of the European Union (CJEU) has ruled along the same lines. The right against self-incrimination first appeared in EU competition law in the 1989 case *Orkem v. Commission*. In that case, the defendant challenged a Commission decision requesting information, arguing that it infringed upon her right against self-incrimination. The CJEU noted that even though such a right was not included in the European Convention on Human Rights, the Community law prevented the Commission from undermining the right of defense of the defendant.[88] Therefore, the CJEU ruled that the Commission "may not compel an undertaking to provide it with answers which might involve an admission on its part of the existence of an infringement which it is incumbent on the Commission to prove."[89]

Over the years, the position of the CJEU has become increasingly similar to that of the ECtHR. In *Consob*, the CJEU deliberately aligned its interpretation of Articles 47 and 48 of the European Union Charter of Fundamental Rights with the case law of the ECtHR on Article 6. First, the CJEU reaffirmed that Articles 47 and 48 of the Charter, which recognize the right to a fair trial and other procedural safeguards, are equivalent to Article 6 of the European Convention on Human Rights, which provides for the right to a fair trial. Second, the CJEU noted that although Article 6 of the European Convention does not refer to the right against self-incrimination, it is "a generally

[80]G.A. Res. 2200 A, International Covenant on Civil and Political Rights (Mar. 23, 1976), art. 14(3)(g).

[81]Organization of American States, American Convention on Human Rights, Nov. 22, 1969, O.A.S.T.S. No. 36, 1144 U.N.T.S. 123, art. 8.2 (g).

[82]Antonio Balsamo, *The Content of Fundamental Rights, in* Handbook of European Criminal Procedure 99, 117 (Roberto E. Kostoris ed., 2018).

[83]Funke v. France, App. No. 10828/84, ¶ 44 (Feb. 25, 1993), https://hudoc.echr.coe.int/eng?i=001-57809.

[84]Andrew Ashworth, *Self-Incrimination in European Human Rights Law. A Pregnant Pragmatism*, 30 Cardozo L. Rev. 751, 753 (2008).

[85]Mark Berger, *Self-Incrimination and the European Court of Human Rights: Procedural Issues in the Enforcement of the Right to Silence*, 5 Eur. Hum. Rts. L. Rev. 514, 516 (2007).

[86]John Murray v. the United Kingdom, App. No. 18731/91, ¶ 45 (Feb. 8, 1996), https://hudoc.echr.coe.int/eng?i=001-2577.

[87]Bajić v. North Macedonia, App. No. 2833/13, ¶ 64 (June 10, 2021), https://hudoc.echr.coe.int/eng?i=001-210320; Chambaz v. Switzerland, App. No. 11663/04, ¶ 52 (Apr. 5, 2012), https://hudoc.echr.coe.int/eng?i=001-199698; Gäfgen v. Germany, App. No. 22978/05, ¶ 168 (June 1, 2010), https://hudoc.echr.coe.int/eng?i=001-99015; Allan v. United Kingdom, App. No. 48539/99, ¶ 50 (Nov. 5, 2002), https://hudoc.echr.coe.int/eng?i=001-60713.

[88]Case C-374/87, Orkem v Comm'n, ¶ 34 (Oct. 18, 1989), https://curia.europa.eu/juris/liste.jsf?language=en&num=C-374/87.

[89]*Id.* at ¶ 35.

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recognized international standard which lies at the heart of the notion of a fair trial" and has long been recognized like that by the ECtHR. Given that, according to Article 52 of the European Union Charter, the rights set forth therein shall have the same meaning as the rights set forth in the European Convention on Human Rights, the CJEU held that Articles 47 and 48 of the Charter must be construed as including the right against self-incrimination.[90]

In *K.B. and F.S.*, the CJEU reiterated that the right against self-incrimination is safeguarded not only by Article 48 of the European Charter, which recognizes the presumption of innocence and right of defense, but also by the second paragraph of Article 47, which concerns the right to a fair hearing.[91]

With regard to the scope of the right in question, the ECtHR first addressed the issue of material evidence and the right against self-incrimination in the case of *Funke v. France*. In that case, the customs authority issued an order requiring the defendant to produce bank statements from his foreign accounts. The defendant refused to produce such documents and was subsequently sanctioned for failure to do so. The penalty was a fine, which increased for each day that he continued to refuse to produce the evidence.[92]

The ECHR noted that the customs authority had sanctioned the defendant in order to obtain certain incriminating documents which it believed to exist, although it was not sure that they did. Unable to obtain them by other means, the authority sought to compel the defendant to hand over the documents. The ECtHR held that such use of coercion was contrary to the right against self-incrimination and found a violation of Article 6.[93]

In *Saunders v. United Kingdom*, the ECtHR drew a distinction between the compelled production of testimonial and real evidence.[94] The ECtHR held that the right against self-incrimination is primarily concerned with respecting the will of an accused person to remain silent. Therefore, it does not extend to evidence "which may be obtained from the accused through the use of compulsory powers but which has an existence independent of the will of the suspect such as, inter alia, documents acquired pursuant to a warrant, breath, blood and urine samples and bodily tissue for the purpose of -DNA- testing."[95]

The distinction drawn in *Saunders* might seem clear. In fact, it was literally transposed into Article 7(3) of Directive EU 2016/343,[96] according to which the exercise of the right against self-incrimination shall not prevent the authorities from gathering evidence that can be lawfully obtained through coercive methods and that has an existence independently of the will of the persons charged.[97]

In *Consob*, the CJEU emphasized the testimonial aspect of the right against self-incrimination, stating that since the:

[90]Case C-481/19, DB v. Commissione Nazionale per le Società e la Borsa (Consob), ¶¶ 37–38 (Feb. 2, 2021), http://curia.europa.eu/juris/liste.jsf?language=en&num=C-481/19; Javier Escobar Veas, *Derecho a no autoincriminarse y procedimientos administrativos sancionatorios: Comentario a la sentencia C-481-19 del Tribunal de Justicia de la Unión Europea y sus repercusiones*, 35 Revista de Derecho Administrativo Económico 291, 294–97 (2022).

[91]Case C-660/21, K.B. and F.S. (Relevé d'office dans le domaine pénal), ¶ 31 (June 22, 2023), http://curia.europa.eu/juris/liste.jsf?language=en&num=C-660/21.

[92]Funke v. France, App. No. 10828/84, ¶¶ 7–12 (Feb. 25, 1993), https://hudoc.echr.coe.int/eng?i=001-57809.

[93]*Id.* at ¶ 44; Balsamo, *supra* note 82, at 118; Tobias Lock, *Article 48 CFR*, *in* The EU Treaties and the Charter of Fundamental Rights: A Commentary 2227, 2229 (Manuel Kellerbauer, Marcus Klamert, & Jonathan Tomkin, eds., 2019).

[94]Ashworth, *supra* note 84, at 758; Escobar Veas, *supra* note 11, at 887.

[95]Saunders v. United Kingdom, App. No. 19187/91, ¶ 69 (Dec. 17, 1996), https://hudoc.echr.coe.int/eng?i=001-58009; Balsamo, *supra* note 82, at 118.

[96]Giulia Lasagni, Banking Supervision and Criminal Investigation. Comparing the EU and US Experiences 251 (2019).

[97]André Klip, *Fair Trial Rights in the European Union: Reconciling Accused and Victims' Rights, in*EU Criminal Justice 3, 14 (Tommaso Rafaraci & Rosanna Belfiore, eds. 2019).

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> [P]rotection of the right to silence is intended to ensure that, in criminal proceedings, the prosecution establishes its case without resorting to evidence obtained through methods of coercion or oppression in defiance of the will of the accused [. . .], this right is infringed, inter alia, where a suspect is obliged to testify under threat of sanctions and either testifies in consequence or is sanctioned for refusing to testify.[98]

The latest case in which the ECtHR addressed the problematic relationship between the right against self-incrimination and the compelled production of documents was *de Legé v. the Netherlands*. In that case, the ECtHR resolved the complaint of a person who had been compelled by the Dutch Tax Authority to submit evidence relating to his finances. The evidence provided by the person was used by the Dutch Tax Authority to set tax fines imposed on him.[99]

The ECtHR found no violation of the right against self-incrimination, holding that the use of the evidence produced by the applicant to the authorities did not fall within the scope of the right against self-incrimination because the evidence produced concerned pre-existing documents—therefore not created as a result of the compulsion exerted by the authorities—of whose existence the authorities were already aware.[100]

By deciding the case in that way, the ECtHR adopted a line of reasoning similar to the "foregone conclusion" doctrine of the United States Supreme Court described above.[101]

D. Given the Distinction Between Testimonial and Real Evidence, Does Coercive Brain-Reading Violate the Right against Self-Incrimination?

As stated above, the purpose of this Article is to analyze whether the collection of incriminating information through the non-consensual use of brain-reading technologies violates the right against self-incrimination under its traditional interpretation, according to which the scope of application of this right includes only "testimonial evidence," thus excluding "real or physical evidence."

Given that the traditional interpretation of the right against self-incrimination includes only "testimonial evidence," the answer to the question of whether the collection of incriminating information through the non-consensual use of brain-reading technologies violates the right in question depends on whether the incriminating information obtained through these technologies should be qualified as testimonial evidence. If so, the collection of such information would violate the right against self-incrimination. If not, the evidence would not violate that right.

When should evidence be considered as testimonial? What does it mean for evidence to be testimonial? Unfortunately, distinguishing between testimonial and real evidence is not an easy task, mainly due to the lack of a common concept of "testimony." In fact, it is possible to identify several different existing concepts.[102] This is a problem, because if there is no clarity on the concept of testimonial evidence, the application of the traditional interpretation of the right against self-incrimination will not be easy. The same United States Supreme Court recognized as early as 1966 that there would be many cases in which the distinction between testimonial and real evidence would not be easy to make because some "tests seemingly directed to obtain 'physical evidence,' for example, lie detector tests measuring changes in body function during interrogation, may actually be directed to eliciting responses which are essentially testimonial."[103]

[98]Case C-481/19, DB v. Commissione Nazionale per le Società e la Borsa (Consob), ¶ 39 (Feb. 2, 2021), http://curia.europa.eu/juris/liste.jsf?language=en&num=C-481/19.

[99]de Legé v. the Netherlands, App. No. 58342/15, ¶¶ 8–22 (Oct. 4, 2022), https://hudoc.echr.coe.int/eng?i=001-179509.

[100]*Id.* at ¶ 76.

[101]*See* Escobar Veas, *supra* note 65 (critically analyzing the case and the ECtHR's reasoning).

[102]Michael S. Pardo, *Neuroscience Evidence, Legal Culture, and Criminal Procedure*, 33 Am. J. Crim. L. 301, 329-332(2006); Allen & Mace, *supra* note 57, at 266-269; Brennan-Marquez, *supra* note 7, at 246.

[103]*Schmerber v. California*, 384 U.S. 757, 764 (1966).

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The analysis of the case law of the ECtHR shows that the application of the distinction drawn in *Saunders* has not been entirely consistent, as evidenced by *J.B. v. Switzerland* and *Chambaz v. Switzerland*, two cases decided after *Saunders*.

In *J.B. v. Switzerland*, the tax authority sanctioned the defendant in an administrative procedure for refusing to hand over documents and information relating to his income. The applicant claimed that the imposition of such sanctions violated his right against self-incrimination.[104] Regarding the defendant's argument, the ECtHR found that the authorities were attempting to compel him to give evidence against himself.[105] The ECtHR concluded that the authorities had indeed compelled the defendant to incriminate himself, and therefore found a violation of the right against self-incrimination.[106] It must be emphasized that the ECtHR explicitly affirmed that the present case did not involve evidence whose existence was independent of the suspect's will.[107]

A decade later, the ECHR issued its decision in *Chambaz v. Switzerland*. In that case, the tax authority assessed the applicant's taxable income for the year 1989–1990 and found that he had not declared all of his income because the growth of his assets was disproportionate to his stated income. During the proceeding, the applicant was asked to produce evidence, but he refused. As a result, the tax authority sanctioned him. The ECtHR found that, by imposing a fine on the applicant for refusing to provide all the items requested, the authorities had compelled him to produce documents which would have provided information on his income and assets for tax assessment purposes, thereby forcing him to incriminate himself. Once again, the ECtHR found a violation of the right against self-incrimination in a case of compelled production of documentary evidence.[108]

Was the existence of the evidence produced by the defendants in *J.B.* and *Chambaz* "independent of the will of the suspect"? Because both cases involved financial documents, one might think that their existence was independent of the defendant's will. However, the fact that the ECtHR found a violation of the right against self-incrimination points in the opposite direction.

Some legal scholars have proposed to read the Saunders exception in the sense that the right against self-incrimination would prohibit compelling a person to actively cooperate with an investigation against herself.[109] For example, Trechsel has suggested that the right against self-incrimination "only covers assistance from the suspect which could not be substituted by employing direct force."[110] In this view, because bodily samples can be obtained without the active cooperation of the defendant—for example, by using force to take them—that would not violate the right against self-incrimination.[111] The same is true when the government, by means of an entry and search warrant, seizes documents or evidence from the home of the defendant, from whom active cooperation is not required. On the contrary, when the government orders a person to hand over documentary evidence in their possession, threatening them with the imposition of sanctions if they refuse to comply, the government is demanding active cooperation from the defendant in the investigation, which is contrary to the right against self-incrimination.[112]

[104]J.B. v. Switzerland, App. No. 31827/96, ¶ 52 (May 3, 2001), https://hudoc.echr.coe.int/eng?i=001-59449.

[105]*Id.* at ¶ 66.

[106]J.B. v. Switzerland, App. No. 31827/96, ¶ 71 (May 3, 2001), https://hudoc.echr.coe.int/eng?i=001-59449; Heloisa Rodrigues Lino de Carvalho, *Fundamento central do direito à não autoincriminaçãop*, 4 Revista Brasileira de Direito Processual Penal 731, 737 (2018).

[107]J.B., App. No. 31827/96 at ¶ 68.

[108]Chambaz v. Switzerland, App. No. 11663/04, ¶¶ 53–58 (Apr. 5, 2012) https://hudoc.echr.coe.int/eng?i=001-199698; Stijn Lamberigts, *The Privilege Against Self-Incrimination: A Chameleon of Criminal Procedure*, 7 New J. Eur. Crim. L. 418, 431 (2016).

[109]Mike Redmayne, *Rethinking the Privilege Against Self-incrimination*, 27 Oxford J. Legal Stud. 209, 214–215 (2007). *See also* Escobar Veas, *supra* note 11, at 888.

[110]Trechsel, *supra* note 42, at 341.

[111]Ashworth, *supra* note 84, at 759.

[112]Escobar Veas, *supra* note 11, at 888.

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This reading of the *Saunders* exception, which suggests that the right against self-incrimination prohibits compelling a person to cooperate actively in an investigation against herself, makes it possible to understand the judgments in *J.B.* and *Chambaz*. However, this is not the case in two other ECtHR decisions: *Allen v. the United Kingdom* and *Van Weerelt v. the Netherlands*.[113] In these two post-*Saunders* cases, the ECtHR found no violation of the right against self-incrimination, even though the tax authorities compelled the applicant to produce documents relating to his assets and business. In *Allen*, the ECtHR held that the right against self-incrimination:

> [D]oes not per se prohibit the use of compulsory powers to require persons to provide information about their financial or company affairs [. . .] The obligation to make disclosure of income and capital for the purposes of the calculation and assessment of tax is indeed a common feature of the taxation systems of Contracting States and it would be difficult to envisage them functioning effectively without it.[114]

The same reasoning was followed in *Van Weerelt*.[115]

The ECtHR even explicitly recognized in *Van Weerelt* that the tax authority had compelled the applicant "to give information that could not be obtained from any other source than the applicant himself for the purpose of levying taxes and interest in accordance with the applicable tax legislation."[116] This is of paramount importance because it means that the ECtHR recognized that the tax authority would not have been able to obtain the information sought without the applicant's cooperation.[117] In both *Allen* and *Van Weerelt*, the fact that taxes were involved seems to have been the decisive argument for dismissing the application.

Considering the decisions in *J.B.*, *Chambaz*, *Allen*, and *Van Weerelt*, it can be stated that the scope and application of the distinction drawn in *Saunders* between evidence whose existence is independent of the suspect's will and that which is not is unclear.

In an attempt to provide some clarity, the United States Supreme Court, in *Doe v. United States*, offered a concept of testimonial evidence, holding that the policies underlying the right against self-incrimination[118] "are served when the privilege is asserted to spare the accused from having to reveal, directly or indirectly, his knowledge of facts relating him to the offense or from having to share his thoughts and beliefs with the Government."[119]

In that case, the defendant was asked to produce records of transactions in accounts at three foreign banks. The defendant produced some bank records and testified that no other records were in his possession. When asked about the existence of additional records, the defendant refused to answer, invoking his right against self-incrimination. The government asked the court to order the defendant, without admitting the existence of any account, to sign a consent form authorizing the banks to disclose records of all of his accounts.[120]

[113]Escobar Veas, *supra* note 65, at 659-660.

[114]Allen v. the United Kingdom, App. No. 76574/01, ¶ xx (Sept. 10, 2002), https://hudoc.echr.coe.int/eng?i=002-7633.

[115]Van Weerelt v. the Netherlands, App. No. 784/14, ¶ 56 (June 16, 2015), https://hudoc.echr.coe.int/eng?i=001-156022.

[116]*Id.* at ¶ 61.

[117]LIGTHART, *supra* note 12, at 162.

[118]*Doe v. United States*, 487 U.S. 201, 212–213 (1988) (stating

> The Court in *Murphy v. Waterfront Comm'n of New York Harbor*, 378 U.S. 52 (1964), explained that the privilege is founded on 'our unwillingness to subject those suspected of crime to the cruel trilemma of self-accusation, perjury or contempt; our preference for an accusatorial rather than an inquisitorial system of criminal justice; our fear that self-incriminating statements will be elicited by inhumane treatment and abuses; our sense of fair play which dictates 'a fair state-individual balance by requiring the government to leave the individual alone until good cause is shown for disturbing him and by requiring the government in its contest with the individual to shoulder the entire load,'[. . .]; our respect for the inviolability of the human personality and of the right of each individual 'to a private enclave where he may lead a private life.')

[119]*Id.* at 213.

[120]*Id.* at 202–03.

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Applying the above concept of testimony, the Supreme Court held that the defendant's execution of the consent form did not have testimonial significance:

> [B]ecause neither the form, nor its execution, communicates any factual assertions, implicit or explicit, or conveys any information to the Government. The consent directive itself is not 'testimonial.' It is carefully drafted not to make reference to a specific account, but only to speak in the hypothetical. Thus, the form does not acknowledge that an account in a foreign financial institution is in existence or that it is controlled by petitioner. Nor does the form indicate whether documents or any other information relating to petitioner are present at the foreign bank, assuming that such an account does exist.[121]

If a court were to apply the concept of testimonial evidence from *Doe v. United States* to cases involving the collection of incriminating information through the non-consensual use of brain-reading technologies, the conclusion would likely be that the information obtained through fMRI and P300 technologies should be classified as non-testimonial or real evidence, because the relevant information obtained in these cases is not the communicative content expressed, but the brain function of the defendant: Which areas of the brain the blood is flowing to, if it is an fMRI, or whether or not it is possible to detect a P300 wave, if it is a CIT.[122] On the contrary, the information obtained through a semantic decoder would constitute testimonial evidence, because in this case the relevant information is indeed the content of what the person in question expresses.

The above reasoning would find support in *United States v. Dionisio*. In that case, a grand jury subpoenaed approximately twenty persons, including the defendant, to provide voice samples for identification purposes. The defendant refused to comply on Fourth and Fifth Amendment grounds. The district court rejected both claims and held the defendant in contempt.[123] The United States Supreme Court held that the claim that compelled production of the voice samples would violate the Fifth Amendment was correctly rejected because the "voice recordings were to be used solely to measure the physical properties of the witnesses' voices, not for the testimonial or communicative content of what was to be said."[124]

However, the picture is not so simple. In *Pennsylvania v. Muniz*, the police asked the defendant the date of his sixth birthday to verify his sobriety, a question he was unable to answer correctly. The government argued that this incriminating inference did not trigger the protection of the Fifth Amendment privilege because the inference concerned the physiological functioning of the defendant's brain, which should be considered "real or physical evidence," not testimonial.[125] The Supreme Court held that the above characterization addressed the wrong question because it analyzed the fact to be inferred rather than the defendant's act. According to the Court, "the question is not whether a suspect's 'impaired mental capacity' can fairly be characterized as an

[121] *Id.* at 201, 215.

[122] *See, e.g.,* Sarah E. Stoller & Paul Root Wolpe, *Emerging Neurotechnologies for Lie Detection and the Fifth Amendment*, 33 AM. J. L. & MED. 359, 374 (2007); Brennan-Marquez, *supra* note 7, at 226-250; Sean Kevin Thompson, *A Brave New World of Interrogation Jurisprudence?*, 33 AM. J. L. & MED. 341, 345-347 (2007); Aaron J. Hurd, *Reaching Past Fingertips with Forensic Neuroimaging–Non-Testimonial Evidence Exceeding the Fifth Amendment's Grasp*, 58 LOY. L. REV. 213, 236-244 (2012). *But see* Mara Boundy, *The Government Can Read Your Mind: Can the Constitution Stop It*, 63 HASTINGS L. J. 1627, 1638–39 (2012); Matthew Baptiste Holloway, *One Image, One Thousand Incriminating Words: Images of Brain Activity and the Privilege against Self-Incrimination*, 27 TEMP. J. SCI., TECH. & ENV'T L. 141, 166-174 (2008); Jody C. Barillare, *As Its Next Witness, the State Calls the Defendant: Brain Fingerprinting as Testimonial under the Fifth Amendment*, 79 TEMP. L. REV. 971, 996 (2006) (arguing that evidence obtained through brain-reading technologies must be considered testimonial).

[123] *United States v. Dionisio*, 410 U.S. 1, 3–5 (1973).

[124] *Id.* at 7.

[125] *Pennsylvania v. Muniz*, 496 U.S. 582, 593 (1990).

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aspect of his physiology, but rather whether Muniz's response to the sixth birthday question, which gave rise to an inference of such impairment, was testimonial in nature."[126]

In light of the foregoing, the Supreme Court rejected the argument that the relevant information was only the physical impossibility of answering the question and not the content of the answer. On the contrary, the Court held that the sixth birthday question in this case required a testimonial answer:

> The content of his truthful answer supported an inference that his mental faculties were impaired, because his assertion (he did not know the date of his sixth birthday) was different from the assertion (he knew the date was (correct date)) that the trier of fact might reasonably have expected a lucid person to provide. Hence, the incriminating inference of impaired mental faculties stemmed, not just from the fact that Muniz slurred his response, but also from a testimonial aspect of that response.[127]

It could be argued that there is a contradiction between the decisions in *Muniz* and *Dionisio*, because in the latter case the defendant also had to perform a testimonial act—speaking—but the Supreme Court ruled out a violation of the right against self-incrimination. Perhaps for this reason, some scholars have been critical of the *Dionisio* decision on the grounds that it was really a case of testimonial evidence.[128]

Applying now the reasoning in *Muniz* rather than the approach in *Doe*, it could be argued that obtaining incriminating information through the non-consensual use of brain-reading technologies that require the subject to perform testimonial acts, such as answering questions, would violate the right against self-incrimination. Conversely, technologies that do not require the subject to perform any testimonial acts, such as the semantic decoder, would not violate this right.

Returning to the question posed at the beginning of this Article, does the collection of incriminating information through the non-consensual use of brain-reading technologies violate the right against self-incrimination according to its traditional interpretation? In my opinion, the review of the case law of the ECtHR and the United States Supreme Court shows that this question is not easy to answer. It will depend on the approach adopted and the concept of testimony advocated, whether the act of the accused or the information obtained should be qualified as testimonial or not. From this perspective, the clarity and certainty that the traditional interpretation of the right against self-incrimination can offer certainly does not seem much.

There is no doubt that technological progress both raises questions that were difficult to imagine until recently and challenges our dogmatic structures and traditional interpretations. Nevertheless, the legal system has the fundamental task of resolving the new problems with coherence and predictability. In view of the difficulties in applying the traditional interpretation of the right against self-incrimination and the limited certainty it provides, it could be time to critically discuss this traditional interpretation, particularly because of its inability to address the problems raised by the development of new technologies.

Although developing an alternative interpretation is beyond the scope of this Article, I believe that such an interpretation should focus on whether the defendant was compelled to cooperate rather than on the nature of the evidence. In fact, such approaches already exist.

For example, in the context of the United States, Nagareda has proposed to abandon the distinction between testimonial and real evidence for the purposes of the right against self-incrimination. Instead, the right in question should be interpreted as a prohibition for the authority to compel the accused to provide evidence, regardless of its nature. In the author's

[126] *Id.* at 593–94.

[127] *Id.* at 598–99.

[128] Michael S. Green, *The Paradox of Auxiliary Rights: The Privilege against Self-Incrimination and the Right to Keep and Bear Arms*, 52 DUKE L. J. 113, 151 (2002).

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opinion, the expression "to be a witness" of the Fifth Amendment should be understood as "to give evidence."[129] Along the same lines, Lin has proposed to understand that the "Self-Incrimination Clause bars the admission of compelled evidence, testimonial or otherwise. At the time the Fifth Amendment was ratified, there was no semantic difference between "being a witness" and "giving evidence," and no such difference existed before that time either."[130]

In a concurring opinion written in *United States v. Hubbell*, Justices Thomas and Scalia supported this interpretation, stating that there is:

> [S]ubstantial support for the view that the term "witness" meant a person who gives or furnishes evidence, a broader meaning than that which our case law currently ascribes to the term. If this is so, a person who responds to a subpoena duces tecum would be just as much a "witness" as a person who responds to a subpoena ad testificandum.[131]

In the same vein, Justice Marshall complained in 1972 that he could not "accept the notion that the Government can compel a man to cooperate affirmatively in securing incriminating evidence when that evidence could not be obtained without the cooperation of the suspect."[132]

The interpretation described above is analogous to the alternative reading of the Saunder exception, according to which the right against self-incrimination would prohibit compelling a person to actively cooperate with an investigation against herself.

The proposed interpretation is also similar to that developed by German case law, according to which the right against self-incrimination prohibits compelling the defendant to actively cooperate with the prosecution.[133] For this reason, the scope of the right against self-incrimination in Germany has been extended from oral statements to other acts that require the defendant to perform an activity,[134] such as producing incriminating documents, actively participating in a psychological or psychiatric examination, providing a voice or handwriting sample, or providing a urine sample. Even exhaling has been considered an "activity," meaning that no one can be compelled to provide a breath sample for analysis.[135] However, those forms of evidence gathering that are deemed "passive" on the part of the defendant are therefore permissible even without her consent. As a result, a defendant can be physically forced to submit to the extraction of a blood sample or be held in place so that a search of her body can be undertaken.[136]

If a court were now to apply this alternative interpretation to cases involving the collection of incriminating information through the non-consensual use of fMRI and P300 technologies, as well as through a semantic decoder, the conclusion would likely be a violation of the right against

[129]Richard A. Nagareda, *Compulsion "To Be a Witness" and the Resurrection of Boyd*, 74 N.Y.U. L. Rev. 1575, 1603 (1999).

[130]Caleb Lin, *Silence and Nontestimonial Evidence*, 58 Am. Crim. L. Rev. 387, 388 (2021).

[131]*United States v. Hubbell*, 530 U.S. 27, 49 (2000) (Thomas, J., concurring, joined by Scalia, J.).

[132]*United States v. Mara*, 410 U.S. 19, 33 (1972) (Marshall, J., dissenting).

[133]Bundesgerichtshof [BGH] [Federal Court of Justice] Apr. 9, 1986, 3 StR 551/85, Entscheidungen des Bundesgerichtshofes in Strafsachen [BGHSt] 34, 39, 46 (Ger.); Bundesgerichtshof [BGH] [Federal Court of Justice] Feb. 24, 1994, 4 StR 317/93, Entscheidungen des Bundesgerichtshofes in Strafsachen [BGHSt] 40, 66, 71–72 (Ger.); Bundesgerichtshof [BGH] [Federal Court of Justice] Jan. 21, 2004, 1 StR 364/03 Entscheidungen des Bundesgerichtshofes in Strafsachen [BGHSt] 49, 56 (Ger.); Claus Roxin, *Involuntary Self-Incrimination and the Right to Privacy in Criminal Proceedings*, 31 Israel L. Rev. 74, 83 (1997) [hereinafter Roxin, *Involuntary Self-Incrimination*]; Claus Roxin, La Evolución de la Política Criminal, el Derecho Penal y el Proceso Penal 173 (2000) [hereinafter Roxin, La Evolución]; Thomas Weigend, *The Potential to Secure a Fair Trial Through Evidence Exclusion: A German Perspective*, *in* Do Exclusionary Rules Ensure a Fair Trial? 61, 79 (Sabine Gless & Thomas Richter, eds., 2019).

[134]Thomas Weigend, *The Suspect as a Source of Information, in* Interrogation, Confession, and Truth 11, 21 (Lutz Eidam, Michael Lindemann, & Andreas Ransiek, eds., 2020).

[135]Thomas Weigend & Khalid Ghanayim, *Human Dignity in Criminal Procedure: A Comparative Overview of Israeli and German Law*, 44 Israel L. Rev. 199, 207–08 (2011); Weigend, *supra* note 133, at 79.

[136]Roxin, *Involuntary Self-Incrimination*, *supra* note 133, at 83; Roxin, La Evolución, *supra* note 133, at 173; Weigend, *supra* note 134, at 208.

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self-incrimination, because all of these technologies require the person to cooperate. For example, fMRI requires the person to answer some questions; P300 technologies, such as CIT or Brain Fingerprinting, need the person to engage with the three different stimuli; and the semantic decoder developed in 2023 is only effective with cooperative people who have willingly participated in the training of the decoder.

E. Conclusions

The development of brain-reading technologies has raised concerns that the authorities could use them to read the minds of defendants in criminal proceedings and obtain incriminating information, posing questions about the right against self-incrimination.

The purpose of this Article was to analyze whether the collection of incriminating information through the non-consensual use of brain-reading technologies violates the right against self-incrimination under its traditional interpretation, according to which the scope of application of this right includes only "testimonial evidence," thus excluding "real or physical evidence." Therefore, for example, the prosecution cannot compel a person to make an incriminating statement, but it can compel him to give a blood sample for scientific testing. The Supreme Court of the United States, the Canadian Supreme Court, the Constitutional Court of Spain, the Constitutional Court of Chile, and the European Court of Human Rights have all ruled along these lines.

As a result, the answer to the question of whether the collection of incriminating information through the non-consensual use of brain-reading technologies violates the right against self-incrimination depends on whether the incriminating information obtained through these technologies should be qualified as testimonial evidence.

Unfortunately, a review of the case law of the United States Supreme Court and the ECtHR shows that distinguishing between testimonial and real evidence is not an easy task, mainly due to the lack of a common concept of "testimony." It is also not clear what should be considered testimonial, whether it is the information obtained by the authority or the act that the person concerned is required to perform. From this perspective, the clarity and certainty that the traditional interpretation of the right against self-incrimination can offer certainly does not seem much.

Given the difficulties in applying the traditional interpretation of the right against self-incrimination and the limited certainty it provides, it may be time to abandon this traditional interpretation and develop a different one that focuses on whether the defendant was compelled to cooperate rather than on the nature of the evidence. If the right against self-incrimination were understood to prohibit compelling a person to cooperate in an investigation against himself or herself, and if such an interpretation were applied by courts to cases involving the collection of incriminating information through the non-consensual use of fMRI and P300 technologies, as well as a semantic decoder, the conclusion would likely be a violation of the right against self-incrimination, because all of these technologies require the person's cooperation.

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