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ADVANCES IN NEUROTECHNOLOGIES AND NEW RISKS TO RIGHTS AND FREEDOMS: ARE NEURORIGHTS THE SOLUTION?

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Summary: This paper studies the opportunity to recognize new fundamental rights as a solution to the risks posed by advances in neurotechnologies. Advances include the development of brain-computer interfaces that integrate artificial intelligence, advanced techniques for reading and recording brain activity, and techniques for modulating or stimulating the brain. While the benefits they can bring in the therapeutic field are notable, the possible uses of neurotechnologies in different areas entail risks for fundamental rights and human dignity, and pose ethical and legal challenges. To protect people and their brains from these risks, some authors defend the recognition of neurorights, among which are the right to mental privacy or mental integrity, arguing that they are necessary because current regulations and the configuration and interpretation made to date of the rights already recognized do not make express mention of neurotechnologies, nor of the protection of brain data or the protection of the brain from interference or manipulation. However, our legal systems already have mechanisms and instruments that allow the protection of the individual to be guaranteed without the need to create new rights. Neurotechnological advances affect legal rights that are in principle already protected and, through judicial interpretation of rights and principles, and where appropriate the deduction of new rights from existing ones, in the face of novel scenarios, new meanings can be incorporated into the rights already enshrined in our constitutions. Thanks to the open configuration of rights and principles, the Law can adapt to situations hitherto unknown and find legal solutions at any time, which is very useful in dynamic environments such as technological progress. As a consequence of the need for interpretation, judges take on special relevance in the system when it comes to providing solutions to progress. This is without prejudice to the need for other measures to better protect fundamental rights from the risks of neurotechnologies.

Keywords: neurotechnologies, risks and solutions, fundamental rights, neurorights, principles, judicial interpretation, ethical-legal challenges.

Abstract: This research examines the convenience to recognize new fundamental rights as a solution to the risks posed by advancements in neurotechnologies. These advancements include the development of brain-computer interfaces that integrate artificial intelligence, advanced techniques for reading and recording brain activity, and methods for brain modulation or stimulation. While the therapeutic benefits of these technologies are significant, their potential applications in various fields pose risks to fundamental rights and human dignity, raising ethical and legal challenges. In order to protect individuals and their brains from these risks, some authors advocate for the recognition of neurorights, such as the right to mental privacy or mental integrity. They argue that these rights are necessary because current laws and the existing interpretation of recognized rights do not explicitly address neurotechnologies or the protection of brain data or the protection of the brain against interference or manipulation. However, our legal systems already have mechanisms and instruments that ensure the protection of individuals without the need to create new rights. Neurotechnological advancements impact legal interests that are already protected, and through judicial interpretation of rights and principles, and if necessary, the deduction of new rights from existing ones, the essential content of current rights can be expanded to address new scenarios. Due to the open configuration of rights and principles, the law can adapt to previously unknown situations and find legal solutions as needed, which is highly useful in dynamic scenarios like technological progress. Consequently, judges play a crucial role in providing solutions in the face of progress, although it does not preclude the need for additional measures to protect fundamental rights against the risks of neurotechnologies.

Keywords: neurotechnologies, risks and solutions, fundamental rights, neurorights, principles, judicial interpretation, ethical-legal challenges.

LIST OF ABBREVIATIONS

CBE	Bioethics Committee of Spain
CDFUE	Charter of Fundamental Rights of the European Union
ECHR	European Convention on Human Rights
UDHR	Universal Declaration of Human Rights
AI	Artificial intelligence
IBC	International Bioethics Committee
ICC	Brain-computer interfaces
LOTC	Organic Law of the Constitutional Court
OECD	Organization for Economic Cooperation and Development
UN	United Nations Organization
GDPR	General Data Protection Regulation
ECHR	European Court of Human Rights
UNESCO	United Nations Educational, Scientific and Cultural Organization

YO. INTRODUCTION

Research and development of neurotechnologies has grown exponentially in recent years. Advances allow brain activity to be read and recorded, acted upon, and connect the brain with external reality. The potential uses are multiple and, although they can bring great benefits in the therapeutic field, the risks that neurotechnologies entail are high and directly affect the very essence of the human being, his dignity, and his fundamental rights.

Law, as a social tool and a driving force of progress, must adapt to advances and respond to the problems they pose. In particular, it must ensure respect for and guarantee of fundamental rights, the pillars of the political and social order. Constitutional Law deals with the recognition and configuration of rights and freedoms, and with the organization of the State and the legal tools it has at its disposal. That is why this work addresses, within the framework of Constitutional Law, the threats that neurotechnologies bring with them with respect to fundamental rights and public freedoms, and the way to address them.

To protect human rights from the risks posed by neurotechnological advances, a new catalogue of human rights, called “neurorights”, has been proposed, which has already had legal repercussions in various States. To this end, there are calls to regulate the development and use of neurotechnologies with frameworks that respect innovation while protecting against harmful uses.

This paper firstly approaches neurotechnological advances in order to understand their functionality and possible uses, and the main challenges they pose - specifically, for our rights and freedoms - in order to subsequently study the proposals for neuro-rights as a response to these challenges. What is the approach to neuro-rights? Is it necessary or appropriate to recognise a new catalogue of rights, in particular, in the Spanish legal system? What ethical-legal consequences would its recognition have? How can neuro-technological advances be addressed from a legal perspective? Is it more advisable to opt for new closed rules or to resort to principles integrated into the legal system? Are neuro-rights the solution?

For the preparation of the work, a comparative and multidisciplinary research has been carried out. After reading reports and publications on neurotechnologies and current advances, for the first part academic and scientific articles in English of a certain technical complexity have been analyzed, complemented on occasions with interviews and podcasts with the participation of scholars of the subject. For the other questions, a review of pronouncements, communications and legal instruments of different legislations and organizations has been carried out,has beendoctrinal articles and academic bibliography have been consulted - mainly in the field of Law and Ethics - and constitutional jurisprudence has been consulted, as well as case law from other legal systems.Given the nature of the subject matter and the time at which this work was undertaken, the research has required continuous updating of the information throughout the entire work process.

II. NEUROTECHNOLOGICAL ADVANCES AND THE CHALLENGES THEY PRESENT

1. NEUROTECHNOLOGICAL ADVANCES

Neurotechnology encompasses the broad set of devices and procedures that allow access, control, research, evaluation, manipulation and/or emulation of the structure and function of the neural systems of animals or humans.[1]. Neurotechnologies range from techniques that provide images of brain structure (neuroimaging) and those that measure brain activity, to neurodevices that interact with the nervous system or brain-computer interfaces (BCIs),that connect humans with machines that translate brain processes into desired results.

Neurotechnologies can be classified according to different criteria[2]One of the most relevant is that they are classified as invasive or non-invasive depending on whether they are surgically implanted devices or systems that operate from outside the skull.[3]; when the

[1]International Bioethics Committee,*Report on the Ethical Issues of Neurotechnology*, UNESCO, Paris, 2022, p. 13, (available at:https://doi.org/10.54678/QNKB6229).

[2]To learn more about the different criteria and ways of classifying neurotechnologies*vine.*"ICO tech futures: neurotechnology" published by the Information Commissioner's Office, 2023 (available at: https://ico.org.uk/about-the-ico/research-reports-impact-and-evaluation/research-and-reports/technologyand-innovation/ico-tech-futures-neurotechnology/).

[3]For a better understanding of these technologies*vine.* Lively, S.B., "Market Analysis: Neurotechnology",*TheNeurorightsFoundation*, 2023, (available in

Implants are placed inside the skull but outside the brain and are considered partially invasive.[4]—a cochlear implant, for example.

Artificial intelligence has also broken into this field and thanks to advances in data processing we can analyze data at an unprecedented speed and, to a certain extent, identify patterns of neural activity. The newinterfaces use AI to interpret brain signals, converting them into digital data using algorithms[5] which are then decoded on a machine or computer in real time[6], which improves fluid communication between the human mind and external devices. Progress in this field represents a paradigm shift in human-machine interaction, which in the near future could revolutionize not only the healthcare sector, but also the wellness, entertainment, marketing, security and defense sectors, the workplace, and even education.[7].

Neurotechnological advances are allowing us to significantly deepen our knowledge of the brain.The most advanced and complete has recently been published Brain Atlas, including areas that have never been "mapped" before[8]—, read it, act on it and connect it to other machines or devices. The greatest advances come from neurostimulation and neuromodulation and brain-computer interfaces.

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https://www.canva.com/design/DAFKWDyTHH0/h5RgsTiQ35zWCh2IiiebSA/view?utm_content=DAFKWDyTHH0&utm_campaign=designshare&utm_medium=link&utm_source=publishsharelink#1 ; last accessed May 28, 2024).

[4] International Bioethics Committee *op. cit.*, p. 20, https://doi.org/10.54678/QNKB6229).

[5] Royal Society, *iHuman Blurring lines between mind and machine*, 2019, p. 49, (available at: https://royalsociety.org/-/media/policy/projects/ihuman/report-neural-interfaces.pdf)

[6] Bastidas Cid, YV, "Neurotechnology: Brain-computer interface and protection of brain data or neurodata in the context of the processing of personal data in the European Union", *AEPD*, 2020, p. 12, (available at: https://www.aepd.es/documento/premio-emilio-aced-2020-yasna-vanessa-bastidas.pdf).

[7] Portillo-Lara, R., et al., "Mind the gap: State-of-the-art technologies and applications for EEG-based brain–computer interfaces", *APL Bioengineering,* vol. 5, n. 3, 2021, doi:https://doi.org/10.1063/5.0047237 ; UNESCO, *Unveiling the neurotechnology landscape: scientific advancements innovations and major trends*, 2023, p. 22, https://doi.org/10.54678/OCBM4164 .

[8] The Human Brain Project (HBP), a pioneering European project in digital brain research, concluded in September 2023. It has been an interdisciplinary project lasting ten years, which has led to significant progress in the knowledge and understanding of the brain and its pathologies and to improved medical treatments and technological innovations. *Vine*. Mendes, H., et al. (eds.), *Human Brain Project: Spotlights on major achievements*, Human Brain Project, 2023, (available at:https://sos-ch-dk-2.exo.io/public-website-production-2022/filer_public/74/94/74948627-6a92-4bed-91e0-3fab46df511d/hbp_spotlights_achievements_2023.pdf); and Inchingolo, R., et al. (eds.) *A closer look at scientific advances March 2023*, Human Brain Project, 2023 (available athttps://sos-ch-dk-2.exo.io/public-website-production-2022/filer_public/6f/70/6f706305-a2e3-45b8-a42bdfb476222a6a/230413_hpb22_digital.pdf).

Deep brain stimulation (*deep brain stimulation*)It has been used for years to treat Parkinson's and epilepsy, among other neurological pathologies, and its application is currently being studied to extend to the treatment of obsessive-compulsive disorders or chronic depression.[9], since neurotechnologies will allow us to modify emotions, memory and cognition. On the other hand,transcranial stimulation,Although it is not so precise[10], has allowed the treatment of migraines and is proliferating in the consumer industry for its potential tooptimize brain performance in a variety of cognitive tasks[11].

TheMore advanced ICCs are designed to assist people or increase or repair their cognitive, sensory or motor functions.[12]These technologies can operate in a brain-machine sense, allowing the brain to control smart devices and robotic limbs, or vice versa, consisting of software introducing certain information into the organic brain.[13]Some authors consider that the incorporation of AI into these interfaces can lead to the hybridization of the brain and these devices, which adapt to each other creating hybrid minds (*hybrid minds*)[14].

Neurotechnological advances represent an extraordinary improvement in the quality of life of people whose abilities have been damaged. Beyond the restoration or replacement of sensory and motor abilities or the treatment of diseases, it is now possible to send text messages and emails from the brain, carry out banking transactions, shop online, communicate care needs, and more.[15], translate brain activity into language without actively thinking

[9]International Bioethics Committee,*op. cit.*, p. 19.
[10]Dura-Bernal, S., "Introduction to part I: State of the art and challenges of neurotechnology" in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, pp. 12-13, https://doi.org/10.54678/POGS7778 .
[11]Andorno, R., and Ienca, M., "Towards new human rights in the age of neuroscience and neurotechnology", *Life Sciences, Society and Policy*, 2017, p. 5.
[12]International Bioethics Committee,*op. cit.*, p. 11.
[13]Morente Parra, V., "Hybrid intelligence: towards the recognition and guarantee of neuro-rights?" in Llano Alonso, FH and Garrido Martín, J. (coords.),*Artificial Intelligence and Law. The jurist facing the challenges of the era*digital, Thomson Reuters Aranzadi, Pamplona, p. 260.
[14]Bublitz, C. et al., "On the Verge of the Hybrid Mind",*Morals and Machines*, vol. 1, n. 1. pp. 30-43, (https://doi.org/10.5771/2747-5174-2021-1-30)
[15]Mitchell P., "Assessment of Safety of a Fully Implanted Endovascular Brain-Computer Interface for Severe Paralysis in 4 Patients: The Stentrode With Thought-Controlled Digital Switch (SWITCH) Study," *JAMA Neurology*and, vol. 80, no. 3, 2023, pp. 270-278, doi:10.1001/jamaneurol.2022.4847.

necessarily[16] and reconstruct images perceived and processed by the brain[17] Elon Musk's company Neuralink has developed an implant - first implanted in a human being in January 2024 - that allows people with quadriplegia to control a *smartphone* or computer, and through them from almost any device, just by thinking. Although it is not the first, it leads the advances in this field by being less invasive and more efficient than others, and it is implanted by a robot specifically created to place these chips in a short time, which contributes to making the implant more viable.[18].

Non-invasive neurotechnologies are booming. More and more of them allow brain monitoring and their potential is such that numerous technology companies have joined in their development with aims outside the therapeutic field and are incorporating brain activity sensors into everyday devices such as headphones, bracelets or headbands. Apple has patented headphones that could be controlled directly from the brain, without touching them or even controlling them by voice.[19] — and that other companies have also developed[20] — and Meta has created a bracelet that would allow precise control over digital interfaces with minimal physical movement[21] and it is expected that users will be able to use it to write (*type*) faster than if they were doing it on a keyboard.

It is presumable that these *neurogadgets* will seduce many users - just as has happened with gadgets that incorporate biometric sensors - and, as already predicted,

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[16] Tang, J., et al., "Semantic reconstruction of continuous language from non-invasive brain recordings", *Nature Neuroscience*, vol. 26, 2023, pp. 858-866 (https://doi.org/10.1038/s41593-023-01304-9).

[17] Benchetrit, Y., Banville, H.J., and King, J.R., "Towards real-time decoding of images of brain activity," *Goal*, October 18, 2023, (available at https://ai.meta.com/blog/brain-ai-imagedecoding-meg-magnetoencephalography/).

[18] *Vine*. Neuralink (https://neuralink.com/ , last accessed on May 27, 2024) and De la Prida, L., "Elon Musk's brain implant is not the first, but it is less invasive and more efficient than others", interview by Teresa Guerrero, *The World*, January 30, 2024, available at https://www.elmundo.es/ciencia-y-salud/salud/2024/01/30/65b90966e4d4d8e57c8b45cd.html , last accessed April 1, 2024).

[19] Achiakh, Y., and Sarda Dutilh, L. "Industry News - Apple patents a next-generation AirPods Sensor System", *Wisear*, July 27, 2023, available at https://www.wisear.io/posts/industry-news-applepatents-a-next-generation-airpods-sensor-system , last accessed May 27, 2024).

[20] *See W*isear (available in: https://www.wisear.io/ , last accessed on May 27, 2024). The AEPD also mentions Emotiv, Neurosky, Nextmind, OpenBCI, NexTem, Unicorn-bi, Brainattach. *Vine.* AEPD "Neurodata and neurotechnology: privacy and protection of personal data", *AEPD*, (available at: https://www.aepd.es/prensa-y-comunicacion/blog/neurodatos-y-neurotecnologia-privacidad-y-protection-of-personal-data , last accessed May 27, 2024).

[21] Innovate Forge, "Meta's AR wristband", *Medium* [[web article], March 1, 2024, (available at: https://medium.com/@InnovateForge/metas-ar-wristband-12eae52bae13).

Some authors in 2010, will gradually replace the keyboard, touch screen, mouse and voice command device as preferred ways to interact with devices.[22]. Likewise, direct connections with the brain open up the possibility that individuals can communicate with each other through thought or be constantly connected to the Internet.[23], and it is not ruled out that in a few years authentication on different platforms will be carried out through brain biometric data[24].

In addition to the risks and adverse effects inherent in the application of neurotechnologies and the surgical interventions to implant them - for example, long-term viability, biocompatibility, risk of infections, or failure of the ICC once the implant has been introduced[25]— the ethical and legal issues they raise, and the dilemmas and conflicts for fundamental rights and public freedoms, are numerous.

The brain is the central organ of the nervous system and it is where the mind and all mental and cognitive activities of the human being are generated; ideas, emotions and desires, imagination, memories, dreams, and the very experience of the world are made possible by the brain. Neuronal activity, mind and personality go hand in hand to the point that a minimal change in the organ can imply a radical change in the person.[26]. Reading the brain means, therefore, accessing the last recess of intimacy and freedom of the human being, and intervening in it is penetrating into traits inherent to human nature and dignity. The brain is much more than an organ, it is the place where

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[22]Chang, CC, et al., "National technology foresight research: a literature review from 1984 to 2005", *International Journal of Foresight and Innovation Policy*, vol. 6, no. 1, 2010, pp. 5 -35 cited in Andorno, R., and Ienca, M.,*op. cit.*, p. 4.

[23]Fernández Jover, E., "Intervening in the brain: challenges and future prospects", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, p. 18, https://doi.org/10.54678/POGS7778 .

[24]Farahany, N., "Nita Farahany on the neurotechnology already being used to convict criminals and manipulate workers", interview by Rodriguez, L., The*80,000 Hours Podcast*, December 7, 2023, (available athttps://80000hours.org/podcast/episodes/nita-farahany-neurotechnology/#top (Last accessed May 29, 2024).

[25]This is what happened in the case of the first person to receive the Neuralink implant.*Vine.* Mann, J., "Neuralink's brain-chip implant malfunctioned, and the company reportedly considered removing it from its human patient,"*Business Insider*, May 9, 2024, (available at: https://www.businessinsider.com/neuralink-weighed-removing-patient-brain-chip-implant-aftermalfunction-report-2024-5 , last accessed May 28, 2024).

[26]Eagleman, D.,*The brain. Our history*, trans. D. Alou, Anagrama, Barcelona, 2017, pp. 11-14.

creates human identity: individuality, personality, autonomy, free will, responsibility or conscience[27].

2. CHALLENGES

2.1. Preliminary considerations

Interventions on the brain affect a wide range of fundamental rights and values provided for in our legal systems and call into question essential concepts of law and pillars of Western morality. This section describes the risks to human rights and the dilemmas posed by neurotechnological advances, as well as other issues of relevance when addressing the debate on the solutions to be adopted from the law.

2.2. Unprecedented threats to fundamental values and rights

2.2.1. Right to freedom of thought or conscience

Concern about freedom of thought or conscience is one of the major issues raised by neurotechnologies. As explained, these allow the brain to be read and the information generated in it to be recorded. Even in totalitarian regimes, the mind and thought have been free because it was a space in which third parties could not interfere; a sphere free from intrusions from those in power and outside the scope of the law: *cogitationis poenam nemo patitur*((No one suffers punishment for their thoughts.) Are we witnessing the end of the existence of an ultimate sphere of freedom? Can we read minds thanks to these advances?

Science can decode our thoughts and our internal language, but it cannot access them. On the one hand, we do not know what thoughts are. On the other, we do not know how the physical activity of the brain is transformed into mental experience.[28], and, although progress is being made in identifying certain neural activities with specific states of consciousness[29], it is not yet possible to relate neuronal activity with our thoughts. Although the ultimate and most hidden "I" is more

[27]Morente Parra, V.,*op.cit.*, p. 266.
[28]Nunez Party, JP,*The mind: the final frontier,*2nd ed., Madrid: Comillas Pontifical University, 2020, p.270.
[29]Eagleman, D.,*op. cit.*, p. 44.

accessible—we can read brain data and decipher internal language—thought is not accessible. For some, in fact, the mind escapes physics[30]and will never be fully accessible.

Regardless of whether or not that possibility is realized in the future, the algorithms of *machine learning*They are increasingly better at translating brain activity into what we are feeling, seeing, imagining or thinking.[31], making it possible to infer mental content from brain data in a much more precise way thanks to improved methods for measuring brain activity and analyzing the data using AI.[32]. So it is clear that we have tools that allow us to interfere in a very personal sphere of human beings like never before in history.

2.2.2. Influence on the free development of personality, identity, mental integrity and capacity for action. Brain-hacking and brain-jacking

Does the fact that some technologies can stimulate the brain or create 'hybrid minds' imply that free will, the capacity for action, can be acted upon?*agency*), the free development of personality and the formation and continuity of identity? If the answer is yes, what right or rights would be affected?

To answer this question, let us take as a starting point the disturbing case of an epileptic patient who had an implant removed because the company that manufactured it went bankrupt. The implant was part of a CCI that warned the patient in advance when she was going to have an epileptic attack, so she could avoid it by taking medication, and her quality of life improved considerably. When the implant that read these signals was removed, the patient suffered a loss of identity, changes in her psychological state—disorientation, emotional insecurity, and sadness—and a loss of control over her abilities and actions.*agential discontinuity*—. This is because the

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[30]Díaz Dorronsoro, J., "How far are we, scientifically, from reading thoughts", *The Conversation*, February 18, 2024, (available at:https://theconversation.com/a-que-distancia-estamoscientificamente-de-leer-los-pensamientos-22282).

[31]Farahany, NA, *The Battle for Your Brain: Defending the Right to Think Freely in the Age of Neurotechnology*, St. Martin's Press, New York, 2023, p. 17.

[32]Kellmeyer, P., "Neurotechnology and fundamental rights: conceptual and ethical foundations", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.), *The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, p. 41, https://doi.org/10.54678/POGS7778 .

Removing the implant breaks down that identity created by the combination of the artificial component with the biological one, which could constitute a violation of (neuro)rights.[33].

This assumption demonstrates that serious harm can occur even when neurotechnologies are used legitimately and in the medical field.

Considering that ICCs are potentially vulnerable to cybercrime, when they are used illegitimately, the risks to physical and mental security, self-identification and user behavior will increase.[34]. It may happen that neurodevices implanted or linked to a human being are controlled by third parties outside the knowledge of the patient.[35], or that deep brain stimulation interferes with the decision-making process — especially when the devices operate autonomously thanks to AI software —[36]These possible remote controls are called*brain-jacking*and to "unlawful access to and manipulation of information and neural computing"*brain hacking*[37].

2.2.3. Neurodata and privacy

Another relevant aspect is that related to neurodata and its privacy and security. Brain data is understood as information about the structure of the brain and its activity; and it would include both conscious data and unconscious data or data outside the knowledge and control of the individual. From a legal point of view, there are no definitions and only the new privacy law in Colorado refers to them.

A specificity of this type of data is that, while in any other field the information shared by people has passed the filter of consciousness - as a general rule - the brain information read and extracted by neurotechnologies may (i) not even be known by the subject, and (ii) be obtained without the subject being aware of it.

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[33]Cook, M., et al., "How I became myself after merging with a computer: Does human-machine symbiosis raise human rights issues?"*Brain Stimulation*, vol. 16, 2023, pp. 783-789, https://doi.org/10.1016/j.brs.2023.04.016 .

[34]Ienca, M., and Haselager, P., "Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity",*Ethics and Information Technology*, vol. 18, 2016, pp. 117-129, https://doi.org/10.1007/s10676-016-9398-9 .

[35]International Bioethics Committee,*op. cit.*, p. 27

[36]Ibid., p. 29.

[37]Ienca, M., and Haselager, P., "Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity",*op. cit.*, p. 117.

This is because it is not possible to filter it.[38]. In these cases there would be no faculty (*ability*) real to consent to the obtaining and use of such brain data[39]. Furthermore, their ability to give consent may itself be vitiated by neurotechnology.[40], so even consented access would raise dilemmas.

Neurodata makes it possible to distinguish or track an individual identity[41]They provide information about the physiology, health and mental states of the individual, and may contain information about their cognitive performance and their political preferences, sexual orientation, tolerance level or way of dealing with risk, including their biases, reactions and emotions.[42]. In the age of surveillance, neurodata is therefore a very attractive raw material for technology companies whose business is based on data, for governments around the world, for employers who want to track the productivity of their employees or learn about their ideas, and for insurers who decide to accept or reject insuring a person or determine their insurance premiums based on that person's data.[43]. Of course also for the*hackers*, are data highly susceptible to theft by hackers.

A recent report, published in 2024, on 30 companies with neurotechnological products available to consumers indicates that 60% of them do not provide any information to users about how their neurodata is used and the rights they hold, and more than 66% mention in their privacy policies the possibility of sharing user data with third parties.[44].

The vast amount of data that neurotechnologies can obtain poses a risk to privacy and data protection. Their use, in addition to privacy violations, can lead to discrimination and bias. The International Bioethics Committee warns that the risks related to neurodata include the following:

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[38]International Bioethics Committee*, op. cit.*, p. 46.
[39]Andorno, R., and Ienca, M.,*op. cit*, p. 14.
[40]*Ibid*, p. 46.
[41]*Idem.*
[42]Farahany, NA,*op. cit.*, pp. 24-25.
[43]Ienca, M., "Neuroprivacy, neurosecurity and brain-hacking: Emerging issues in neural engineering", *Bioethics Forum*, vol. 8, no. 2, 2015, p. 52, DOI: 10.24894/BF.2015.08015.
[44]Genser, J., et. al., "Safeguarding Brain Data: Assessing the Privacy Practices of Consumer Neurotechnology Companies"*Neurorights Foundation*, 2024 p. 43 and 53, (available at: https://www.perseus-strategies.com/wpcontent/uploads/2024/04/FINAL_Consumer_Neurotechnology_Report_Neurorights_Foundation_April-1.pdf).

"*reidentification, hacking, unauthorized reuse, asymmetric commodification, privacy sensitive data mining, digital surveillance, trading-rights-for-services, co-option for non-benign purposes and other misuses*"[45].

In terms of its protection, Andorno or Genser et al. believe that we are dealing with a type of data that is much more sensitive and valuable than any other, and therefore with more risks associated with it in terms of privacy and security.[46].

2.3. Artificial intelligence and brain-machine hybridization

The field of ICCs is an area of research that will require special attention in relation to AI.[47]On the one hand, the use of AI in combination with neurotechnologies raises issues of bias, discrimination and privacy.[48]On the other hand, the combination of artificial intelligence with organic intelligence from these artifacts places us on the verge of creating hybrid minds and intelligences, which, as already anticipated, raises various ethical questions regarding our autonomy, privacy and perception of reality.[49].

2.4. The risks of neurotechnologies within the reach of consumers

While research and technological development in the medical field are well regulated by a guarantor model, the products available on the market are mainly governed by consumer regulations, which offer weaker protection.[50]. Legal safeguards for commercially available neurotechnologies are subpar in every way and could put people at risk in a number of ways: by over-promising the potential to improve health and well-being;

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[45]International Bioethics Committee*, op. cit.*, p. 14.
[46]Andorno, M., "Why human rights are crucial in responding to the challenges posed by neurotechnologies", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, p.30,https://doi.org/10.54678/POGS7778 ; Genser, J., et. al., "Safeguarding Brain Data: Assessing the Privacy Practices of Consumer Neurotechnology Companies,"*op cit.,*p. 43.
[47]Bandini, S., "Regulating AI? The EU's first steps and future BCI-based scenarios", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, p. 24, https://doi.org/10.54678/POGS7778 .
[48]International Bioethics Committee,*op. cit.*, p. 24.
[49]Royal Society,*op. cit.,*p. 49.
[50]Reche Tello, N.,*Mens iura fundamentalia: neurotechnology before the Constitution,*Colex, ebook, 2024, p. 18.

causing direct harm to health when a person has several health conditions; or, exploiting the brain data collected by these devices for commercial or neurosurveillance purposes (the granting of consent by users can exempt the stronger party from liability in the relationship).[51]. In addition, they can be manipulated more easily, either by the user or by third parties.[52].

2.5. On human perfection

Some argue that the ability that neurotechnologies provide to alter the brain and modify behaviour, emotions or abilities, or brain-machine hybridisation, can be used to improve human capabilities and intelligence. This is part of the debate on transhumanism, a movement based on a desire to overcome human nature. Nick Bostrom, a professor at Oxford and one of the leading exponents of transhumanism today, stated in 2002 that "a day will come when we will have the possibility of increasing our intellectual, physical, emotional and spiritual capacity, far beyond what seems possible today."[53]That day could be closer than far.

From an ethical point of view, human improvementisThe subject of a great debate which we cannot go into in depth. However, we will give some details later on about this and its fit in our legal system.

III. THE LAW IN THE FACE OF NEUROTECHNOLOGIES

1. NEUROTECHNOLOGIES IN THE SPOTLIGHT

Given the rapid and significant neurotechnological advances and the awareness of the risk that these pose to the essence of the human being and, therefore, to his rights and freedoms, the free development of personality, the very concept of dignity and equality,

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[51]Kellmeyer, P., "Neurotechnology and fundamental rights: conceptual and ethical foundations", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, p. 40, https://doi.org/10.54678/POGS7778 .

[52]Andorno, R. and Ienca, M.,*op. cit.*, p. 19.

[53]Bostrom, N.,*Human Reproductive Cloning from the Perspective of the Future*, 2002, (available at: https://nickbostrom.com/views/cloning), cited in Ferry, L.,*The transhumanist revolution*, trans. Martorell, A., Alianza Editorial, Madrid, 2018, pp. 35-36.

Some researchers in the scientific, legal and ethical fields, as well as international organisations and States, are already studying the issue and taking action.

The International Bioethics Committee has published a report addressing the ethical and legal issues raised by the development of neurotechnologies and has proposed guidelines for their global governance.[54]UNESCO has analyzed the progress in this industry, identifying its key players and trends in which the growth of this market and its drift can be clearly seen.[55]. The UN General Assembly[56]has requested studies on the opportunities and challenges of neurotechnologies and how they can be addressed by the Human Rights Council in order to subsequently be able to evaluate them together with the interested parties. The Council of Europe has also requested[57]and the European Union[58]have spoken out on this matter, suggesting guidelines for responsible neurotechnological innovation, centred on human beings and oriented towards their rights. In the Declaration of León, the EU updates the objectives included in other Community instruments (reliability, transparency, rights) and advocates high-level expert debates and the study of the need to create standards for neurotechnologies and cybersecurity in relation to them.

For its part, the OECD was the first organization to address the challenge of neurotechnologies. In 2019, it published the*Recommendation for responsible innovation*[59]. He subsequently published the report*Brain-computer interfaces and the governance*

[54] International Bioethics Committee of UNESCO, *op. cit.*, (available in: https://doi.org/10.54678/QNKB6229).
[55]Hain, D.S., Jurowetzki, R., Squicciarini, M., Xu, L,*Unveiling the Neurotechnology Landscape Scientific Advancements Innovations and Major Trends*, UNESCO, Paris, 2023, (available at: https://doi.org/10.54678/OCBM4164).
[56]UN Human Rights Council,*Resolution of 6 October 2022 of the Human Rights Council*,A/HRC/RES/51/3,(available at: https://undocs.org/Home/Mobile?FinalSymbol=A%2FHRC%2FRES%2F51%2F3&Language=E&DeviceType=Desktop&LangRequested=False ; last accessed May 31, 2024).
[57]Ienca, M.,*Common human rights challenges raised by different applications of neurotechnologies in the biomedical field*, Council of Europe, 2021, (available at:https://rm.coe.int/report-final-en/1680a429f3).
[58]Council of the European Union,*The León Declaration on European Neurotechnology: A human-centred and rights-based approach*, October 2023, (available at:https://spanishpresidency.consilium.europa.eu/media/5azj0e2h/declaraci%C3%B3n-de-le%C3%B3n.pdf).
[59]*Recommendation of the Council on Responsible Innovation in Neurotechnology*, of December 11, 2019, OECD/LEGAL/0457,2022, (available at: https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457).

system[60] in order to "help develop a responsible and anticipatory governance approach to promote innovation, while shaping the trajectory of technology through a set of mechanisms, including soft law, standardization and ethical approaches by design, corporate self-governance and participatory experiments for early governance"; and has recently shared an implementation guide for the Recommendation for Policymakers[61]. Among other elements of *Soft law* Also noteworthy is the Recommendation on the Ethics of Neurotechnologies that is being worked on within the framework of UNESCO. [62].

Steps have also been taken within some States.[63]. Chile has been the first country to recognize neuro-rights constitutionally. Within the right to life and physical and mental integrity, it has included the following:

> Scientific and technological development will be at the service of people and will be carried out with respect for life and physical and mental integrity. The law will regulate the requirements, conditions and restrictions for its use in people, especially safeguarding brain activity, as well as the information derived from it.[64].

In the legislative field, France, Argentina, Brazil, Peru, the states of Colorado and Minnesota, and again Chile, have adopted measures. Most of them relate to privacy and the protection of neurodata. In the case of France, the Penal, Civil and Public Health Codes have been reformed.

In Spain, the 2021 Digital Rights Charter dedicates an article to neurotechnologies with the intention of promoting a debate on new non-personal rights.

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[60] García, L. and D. Winickoff, "Brain-computer interfaces and the governance system: Upstream approaches", *OECD Science, Technology and Industry Working Papers*, n. 2022/01, 2022, https://doi.org/10.1787/18d86753-en .

[61] OECD, *Neurotechnology Toolkit*, 2024, (available in: https://www.oecd.org/health/emergingtech/neurotech-toolkit.pdf).

[62] UNESCO, *Towards a draft text of a recommendation on the ethics of neurotechnology* [[Working document], 2024, (available at: https://unesdoc.unesco.org/ark:/48223/pf0000389438)

[63] All actions to date can be consulted at Reche Tello, N., *op. cit.*, pp. 73-153.

[64] Constitutional Reform Act No. 21,383, amending the Chilean fundamental charter to establish scientific and technological development at the service of people, 2022, (available at: https://www.bcn.cl/leychile/navegar?idNorma=1166983).

positivized to date and the way in which they should be modulated[65]The Charter merely establishes limits and guarantees for its implementation.

2. THE PROPOSALS FOR NEURORIGHTS

2.1. Definitionand approach

The proposal to recognize neuro-rights is, among the solutions to protect the brain and mind from the misuse of neurotechnology and preserve rights and freedoms, the one with the greatest impact in public debate and the media. The term*neurorights*It was introduced by Ienca and Andorno in 2017 to refer to a set of rights that must be proclaimed to protect the brain.

According to Ienca and AndornoExisting human rights catalogues are not "normatively sufficient" (*normatively sufficient*)[66]because they don't make references explicit to neuroscience[67]. In the same sense, Yuste, Genser and Herrmann (hereinafter, Genser et al.) argue that the current protection system is incomplete and imprecise because, although dignity, privacy, different freedoms or equality are already recognized,Effective protection against threats to our rights posed by technology requires specificity in regulatory instruments and rights because general concepts are open to interpretation.[68]. They all defend the inclusion in legal texts of references to neurotechnology and other concepts related to its use and effects.for the sake of uniform interpretations and greater security .

What are neuro-rights? Academic literature in this field is scarce and there is no unanimous definition of the concept. Ienca has explained the concept as follows: "*the ethical, legal, social, or natural principles of freedom or entitlement related to a*

[65]Barrio, M., "The Digital Bill of Rights of Spain", Public Writing, n. 135, 2022, (available at https://escriturapublica.es/la-carta-de-derechos-digitales-de-espana-por-moises-barrio-andres/ ; last consulted on 12/02/2024).

[66] Ienca, M., "On neurorights",*Frontiers in Human Neuroscience*, vol. 15, 2021, p. 2, https://doi.org/10.3389/fnhum.2021.701258 .

[67]Andorno, R., and Ienca, M.,*op. cit.*, pp. 7-8.

[68]Genser, J., et al., "It's time for neuro-rights",*Horizons*, vol. Winter, no. 18, pp.160-161, (available at: https://www.cirsd.org/files/000/000/008/47/7dc9d3b6165ee497761b0abe69612108833b5cff.pdf).

person's cerebral and mental domain; that is, the fundamental normative rules for the protection and preservation of the human brain and mind'[69].

On the other hand, there is no academic consensus on what neuro-rights should be. The same terms are not even used to address identical situations.

The most relevant proposals for "catalogues of rights" are those of Genser et al., also promoted by the *Neurorights Foundation*—a project led by Rafael Yuste to promote ethical uses of neurotechnology and AI and respect for human rights that has already influenced the UN, Chile, Spain, Mexico and Brazil—[70]and that of Ienca and Andorno. Paradoxically, the first is the most widespread and the one that has had the greatest impact but, as Bublitz criticizes[71], is based on brief and vague statements and not on substantive publications. The second, on the contrary, is an elaborate proposal that develops in detail the rights raised and the arguments in favour of their recognition -or, sometimes, of their extensive interpretation -; it refers to ECHR jurisprudence and formulates different assumptions that invite us to think about the application of these neuro-rights in different scenarios.

The initiative of Genser et al. and the *Neuroights Foundation* proposes the proclamation of five new human rights:

1) right to personal identity;
2) to action or freedom of thought and free will (*agency, or the freedom of thought and free will*);
3) to mental privacy (*mental privacy*[72]);
4) equitable access to neuroenhancement techniques and technologies;

[69]Ienca, M., *op. cit.*, p.1.
[70]Neurorights Foundation [website], https://neurorightsfoundation.org/.
[71]Bublitz, J.C., "Novel Neurorights: From Nonsense to Substance," *Neuroethics*, vol. 15, n.7, 2022, pp. 23, https://doi.org/10.1007/s12152-022-09481-3 .
[72]It is worth clarifying that the idea of privacy varies according to contexts and cultures. For example, while in the EC the right to privacy is the right not to be known by others in certain situations, in other legal systems it is conceived in a very different way. *Privacy* In the United States, it refers to the right to protection from external interference in both a negative and positive sense: it recognizes a sphere of individual self-determination from which others may be excluded and over which the individual may decide freely. *Vine.* De Montalvo Jääskelaïnen, F., "Individual rights and freedoms (I)", in Álvarez Vélez, M. (coord.), *Lessons in Constitutional Law*, 6th ed., Tirant lo Blanch, Valencia, 2018, p. 373.

5) Right to protection against algorithmic biases. As we will see, although they use the term “right”, they often refer simply to the adoption of measures that they consider necessary but do not constitute rights. *strictly speaking*.

For their part, Ienca and Andorno propose four rights:

1) right to cognitive freedom;
2) to mental privacy;
3) to mental integrity;
4) to psychological continuity.

2.2. The right to cognitive freedom or free will

The right that was first raised in relation to the brain and the mind in the face of technological advances is the right to cognitive freedom, defended by various authors long before Ienca and Andorno included it in their catalogue.[73] Some consider it as a right independent of other neuro-rights, while for others it is the main right that integrates the right to mental privacy, individual self-determination and freedom of thought.[74], but for everyone it constitutes a right prior to other freedoms that seeks to protect what underlies the mental and cognitive processes of a person[75].

There is no single conception of the right to cognitive freedom. Generally, all agree that it is a right of sovereignty over one's own mind or mental self-determination. Sententia defined it as "the fundamental right of every person to think independently, to use the full spectrum of their mind and to have autonomy over their own brain chemistry "[76]. Advocates of the recognition of this right consider that individuals should be able to make decisions about their minds in the manner

[73]Authors include Sententia, Boire, Bublitz and Farahany.
[74]Farahany, NA,*op. cit.*, p. 8.
[75]Andorno, R., and Ienca, M.,*op. cit.*, p. 10.
[76]Sententia, W., “Neuroethical Considerations. Cognitive Liberty and Converging Technologies for Improving Human Cognition”,*Annals of the New York Academy of Sciences*, 1013, p. 223, https://doi.org/10.1196/annals.1305.014 .

the same way they can do with their bodies: freely and without any limitations other than those derived directly from human dignity.

Cognitive freedom is therefore an extension of the traditional freedom of thought, and is complex due to its multidimensionality: it can be understood both in a negative and a positive sense.It is embodied, on the one hand, in the freedom of the subject to make decisions about his cognitive domain and his mental integrity without interference and manipulation or limitations or prohibitions - the right to have no one interfere with his brain and mind - and, on the other hand, in the freedom to take control over his mental life.
— right to alter one's own neuronal activity —[77].

In the negative sense, cognitive freedom protects against unauthorized intrusions into mental integrity and the intimate sphere in which mental processes occur, and against the imposition or prohibition of certain mental states—Bublitz exemplifies this by referring to thought crimes in the novel *1984*—. This is the only sense in which cognitive freedom should be understood for Ienca and Andorno, who support its recognition forto ensure the protection of the individual against attempts at coercion and pressure when forming his or her will and acting [78]. If this is the basis of cognitive freedom, could it have effects beyond protecting the use of neurotechnologies in a coercive and non-consensual manner? Ienca and Vayena argue that in the digital and social media ecosystem the cognitive dimension—including preferences, choices and beliefs—is already permanently threatened and they propose cognitive freedom as a way of protecting against manipulation in social media and in the online world in general, regardless of the results they produce in the functioning of the brain.[79].

Self-determination in a positive sense goes beyond the autonomy of the individual in the traditional sense of autonomy to think independently and use the full spectrum of one's mental faculties.[80]; implies having the freedom to decide to alter one's own mental states or capacities and, consequently, all

[77]Andorno, R., and Ienca, M.,*op. cit.,*p. 11.
[78]*Ibid*, p. 24.
[79]Ienca, M., and Vayena, E., "Cambridge Analytica and Online Manipulation",*Scientific American*, vol. 30, New York, (available at:https://www.scientificamerican.com/blog/observations/cambridge-analyticaand-online-manipulation/)
[80]International Bioethics Committee,*op. cit*,p. 53.

conscious and unconscious cognitive, emotional and conative phenomena[81]. All of this outside the therapeutic scope and reasons.

"Alter" can mean to enhance, diminish, or excite. Most authors defending this freedom refer exclusively to the right to neurocognitive augmentation or enhancement of human capabilities given[82]. Therefore, cognitive freedom in its positive dimension must be understood as the right to improve one's intellectual function, as well as the right not to do so [83].

Bublitz, in order to justify the right, starts from the premise that, just as it is not forbidden to have criminal thoughts or deviant desires and the means for individuals to develop their free thought must be allowed, neither is it forbidden to have one or another mental state, nor the use of means to achieve them. Secondly, he argues that, if the law treats people as self-determined and makes them responsible for the consequences of their mental states, it must grant them the legal powers of self-determination; therefore, cognitive freedom corresponds to the right to free will (*free will*) because it protects its fundamental pillars. The starting point of the proposal is the liberal presumption that every person is free to seek and determine his or her personality, which includes, in its opinion, the free decision about his or her body and mind.[84].

The *Neurorights Foundation* and Genser et al. do not make an express reference to the right to cognitive freedom but they do propose the recognition of a right to fair and equitable access to cognitive augmentation and, in the work of Genser et al., the "right to identity or the ability to control one's own mental and physical integrity" is raised.

[81] Bublitz, C., "Cognitive Liberty or the International Human Right to Freedom of Thought", cited in Ienca, M., "On neurorights", *op. cit.* p.7.
[82] *Vine.* Farahany, NA, *op.cit.*, pp. 11-130; and Bublitz, C., "My mind is mine!? Cognitive Liberty as a Legal Concept", in Franke, AG, and Hildt, E., (eds.), *Cognitive Enhancement*, Springer, Dordrecht, 2013, pp. 1-2 (available in: https://www.researchgate.net/publication/259912348_My_Mind_Is_Mine_Cognitive_Liberty_as_a_Legal_Concept ; last accessed March 22, 2024).
[83] Bublitz, C., "My mind is mine!? Cognitive Liberty as a Legal Concept", *op. cit.*, pp. 19.
[84] *Ibid*, pp. 4-5,

2.3. The right to mental privacy and the ability (*ability*) to keep neurodata out of the reach of third parties

Mental privacy has to do with theAccess, collection and disclosure of neural data, and consent thereto .

The*Neurorights Foundation*includes under the right to mental privacy the confidential nature of neurodata, they propose the right to deletion ("*if stored, there should be a right to have it deleted at the subject's request*"), and call for strict regulation of the sale or commercial transfer of this data, as well as its misuse[85].

Ienca and Andorno, when making their proposal in 2017, considered that the regulation on data protection was insufficient and therefore claimed,against unauthorized access and leaks, a concrete right tomental privacy that protects brain waves as data in themselves—both primary data and secondary data generated or inferred from them—and as data generators [86]They justify the need for the law in the special nature of neurodata and the way to obtain it.

Faced with these positions, Bublitz[87]Bublitz believes that what the defenders of the right to mental privacy really intend is to establish the scope, strength and limits of the protection of brain information rather than to recognise a new right. In his opinion, the right is already recognised and it would simply be necessary to correct or improve the existing legal frameworks. When examining the community protection of sensitive data, Bublitz concludes that most neurodata are already protected by the current data protection system and it would only be necessary to amend article 9 of the GDPR by adding the term "neurodata" to extend protection to everyone. We cannot go into this issue in greater depth, but there are publications that study the protection of neurodata under European regulations.[88].

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[85]Neurorights Foundation [website]https://neurorightsfoundation.org/mission .
[86]Andorno, R., and Ienca, M.,*op. cit.*, p. 14.
[87]Bublitz, J.C., "Novel Neurorights: From Nonsense to Substance,"*op. cit.,*p. 10.
[88]*Vine.*Bastidas Cid, YV,*op. cit.*; Dato, A., "Brain Computer Interface: a Data Protection Perspective", Tilburg University [LL.M. Thesis], 2018, (available at: http://arno.uvt.nl/show.cgi?fid=146398); and, Paun, AMC, "Brain Computer Interface manufacturers under the data protection lens", Tilburg University [LL.M. Thesis], 2022, (available at: http://arno.uvt.nl/show.cgi?fid=160486).

The rights to privacy and protection of natural persons in relation to the processing of personal data are relative. Ienca and Andorno[89]They ask whether the same can be said of the right to mental privacy. They examine the risks of treating it as a relative right, based on the following premise: access to neurodata without consent not only affects the right to privacy but also the right not to confess guilt and not to testify against oneself.

In criminal investigations, they point out, it is legitimate to affect the right to privacy in order to link a subject to a specific crime that he is suspected of having committed, but evidence obtained against the will of the person under investigation by methods that require his active cooperation is prohibited when it has a directly incriminating content. If the mind of a person under investigation or accused were to be entered into, justifying the intrusion into his private sphere on the basis of the existence of a higher interest or another right, the information obtained could constitute an incriminating statement in itself, they point out.

They also warn that privacy can be interfered with without consent when a law provides for it and it constitutes a measure that in a democratic society is necessary for national security or public safety. At this point they question whether the same protection regime should be applied to mental privacy or whether it should be given a different status. In order to answer this and other questions and find a balance between the public and private interests at stake, they are in favour of an extensive public debate.

2.4. The right to mental integrity

This right is expressly found in Article 3 of the CFREU and in the doctrine of the ECHR. It currently focuses on protecting mental health, but, given the advances in neurotechnologies, some authors have proposed revising its content.to extend its protection to mental activity against illegitimate and harmful alterations .They consider that direct, non-consensual access to brain waves that results in physical or psychological injuries would be a violation of this right. [90]. They later add thatEven if there has been informed consent, this right could be violated. ; they put as

[89]Andorno, R., and Ienca, M.,*op. cit.*, p. 16-17.
[90]*Ibid*, p. 18.

example that during the course of a medical intervention, disproportionate damage is generated to the therapeutic benefit obtained[91].

Other authors refer to mental integrity in different terms. LavazzaIt protects under its definition mental privacy and cognitive freedom because they are closely interrelated and dependent on each other. It highlights the importance of the mind as that individual space in which, regardless of the coercion, threats or violence to which an individual may be exposed, the private sphere of thought is preserved as the place where one preserves one's identity, dignity and autonomy. If the mind is invaded, the person could end up in a state of absolute submission to others.[92].

Its definition is this: "*mental integrity is the individual's mastery of his mental states and his brain data so that, without his consent, no one can read, spread, or alter such states and data in order to condition the individual in any way*"[93]. Therefore,From his point of view, the production of damage would not be a necessary requirement when assessing a violation of the right. .

For Genser et al. mental integrity is subsumed in the right to identity: "*the right to identity, or the ability to control both one's physical and mental integrity*"[94].

2.5. The right to identity and psychological continuity

Identity is a concept that refers to the uniqueness of a person. It can be defined from different approaches and disciplines, and can be static or dynamic.[95]The continuity of personality is considered by many to be a constitutive feature of identity.

Ienca and Andorno propose a right that protects personal identity and mental continuity—of habitual thoughts, preferences and choices—against

[91] *Ibid,*p. 19.
[92] Lavazza, A., "Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis",*Frontiers in Neuroscience*, February 19, 2018, p. 1, DOI: https://doi.org/10.3389/fnins.2018.00082
[93] *Ibid,*p. 4.
[94] Genser, J., et al., "It's time for neuro-rights",*op. cit.*, p. 160.
[95] International Bioethics Committee,*op. cit.*, p. 26.

alterations in neuronal functioning that are not consented to[96]. The risk is greater outside the clinical setting, and especially in the context of military actions. They believe that the current configuration of personality rights does not protect what is threatened by neurotechnological advances: a mental alteration resulting from misuse of brain stimulation does not act on the link between mental process and action, but on the mental process itself, and while existing rights protect the former - the translation of mental states into action -Psychological continuity is necessary to protect raw neuronal functioning, which is something prior[97].

The right to psychological continuity is closely related to mental integrity, butFor it to be understood as violated, it is not necessary that there be an attack on integrity or that mental damage be caused. .

They do not take a position on the relative or absolute nature of this right. Could certain personality changes in, for example, serial killers or paedophiles, induced by neurotechnology, be tolerated? Ienca and Andorno advocate addressing this issue in a broad public debate.

For their part, Genser et al. propose the right to identity or the ability to control one's own mental and physical integrity.[98]and the*Neurorights Foundation*[99]He advocates setting boundaries to prevent technology from interfering with personal identity or the sense of self and warns that connecting people to digital networks can blur the line between a person's consciousness and external technological influences—which has already happened, as mentioned—mental hybridization in the terms of other authors.

2.6. Equal and fair access to cognitive enhancement and protection from bias

The*Neurorights Foundation*states: "*there should be established guidelines at both international and national levels regulating the use of mental enhancement neurotechnologies. These guidelines should be based on the principle of justice and*

[96]Andorno, R., and Ienca, M.,*op. cit.*, p. 21.
[97]*Ibid,*p. 22.
[98]Genser, J., et al., "It's time for neurorights",*op. cit.*, 160.
[99]Neurorights Foundation [website]https://neurorightsfoundation.org/mission .

guarantee equality of access"[100].The legal asset protected by this right would be the distributive justice[101]And, as you can see, it is not a question of proposing a right but of a Regulation to ensure equitable and fair access to cognitive enhancement , whose recognition it presupposes.

On the other hand, it advocates the right to protection against discrimination based on prejudices and stereotypes that may come from algorithms.

2.7. Criticisms and objections

These proposals have received various objections. Bublitz has studied the current configuration of different rights in the European sphere and the opportunity to recognise neuro-rights or not.[102]and is especially critical of the neuro-rights proposal led by Rafael Yuste. In his work*Novel Neurorights: From Nonsense to Substance* criticizes the proposal in general as well as each neuro-right in particular, requests the cessation of the activity of the*lobby*of neuro-rights and calls for academic debate.

The vast majority of authors who have addressed the issue agree on the need for collective reflection and deep academic, and even social and political, deliberation to take place, involving different*stakeholders*. The IBC and the OECD also agree. Calmer deliberation in academia would be helpful in informing policy and avoiding sensationalist statements and ill-advised measures.

The lack of legal justification and specificity of the proposals has been criticized.[103]and the existence of contradictions between rights. As can be deduced from the proposal itself and as has been pointed out by Borbón et al, cognitive freedom or the right to mental self-determination could interfere with the fundamental right to psychological continuity, since if cognitive functioning is altered there is a

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[100]*Idem.*

[101]Morente Parra, V.,*op. cit.*, p, 273.

[102]*Vine.*Bublitz, C., and Merkel, R., "Crimes Against Minds: On Mental Manipulations, Harms and a Human Right to Mental Self-Determination",*Criminal Law, Philosophy*, vol. 8, 2014, pp. 51 et seq.; and Bublitz, C.et al.,"Forensic Brain-Reading and Mental Privacy in European Human Rights Law: Foundations and Challenges",*Neuroethics*, no. 14, 2021, pp. 191 et seq.

[103]*Vine.*Zuñiga-Fajuri, A., et al.., "Neurorights in Chile: Between neuroscience and legal science",cited inDe Asís, R., "On the proposal of neuro-rights",*Rights and freedoms*, n. 47, 2022, p. 62, https://doi.org/10.20318/dyl.2022.6873 .

possibility that your identity may be modified[104]Regarding protection against algorithmic bias, it has been questioned why not also protect against human bias.

Although Bublitz recognizes the good faith that motivates the work of the *Neurorights Foundation*, criticizes the lack of legal preparation and competence of those proposing neuro-rights, their ignorance of the legal context in which they have been drafted and the lack of verification of their starting premise. In his opinion, a systematic and detailed review of the law and rights must be carried out, and it would be advisable for more jurists to participate in the study and development of proposals to address the risks posed by neurotechnologies - he specifically mentions experts in human rights, constitutional law and public law -[105].

Furthermore, in the proposal of "rights" of the *Neurorights Foundation* The terms can be confusing. Reference is made to the establishment of limits (*boundaries*), guidelines (*guidelines),* countermeasures (*countermeasures*), and directly to the need to regulate certain extremes ("*should be strictly regulated*"*)*, for which creating rights is not the solution. As Borbón and Borbón comment[106]If the aim is to effectively regulate neurotechnological progress, the solution does not involve promulgating rights, but rather adopting clear and extensive standards - preferably international - that create a regulatory framework for neurotechnologies.

On the other hand, it has been argued that neuro-rights are unnecessary and promote the inflation of rights, both of which will be discussed in the fourth section. Finally, the proposal for the right to cognitive freedom raises a major ethical-legal question framed within the debate on improvement and transhumanism, which is also discussed later; in addition to the fact that the possibility of "increasing oneself" would generate differences and would increase discrimination between rich and poor, advantaged and disadvantaged, as the IBC points out. The recognition of neuro-rights as human rights could also increase inequalities since

[104] *Vine*. Borbón, D., et al. "Critical analysis of the NeuroHuman Rights to free will and equitable access to enhancement technologies", *Ius et Sciencia,* vol. 6, no. 2, 2020, p.154.
[105] Bublitz, "Novel Neurorights: From Nonsense to Substance," *op. cit.,* p. 4.
[106] Borbón D., and Borbón, L., "A Critical Perspective on Neurorights: Comments Regarding Ethics and Law", *Frontiers in Human Neuroscience*, 2021, p. 3, (DOI:https://doi.org/10.3389/fnhum.2021.703121)

This would force States to guarantee rights without having the capacity to do so, a circumstance that could be exploited in a harmful way.

3. THE CONFIGURATION OF FUNDAMENTAL RIGHTS IN THE SPANISH LEGAL SYSTEM

This section cannot attempt to carry out a detailed study of the system of fundamental rights in our legal system, but we do consider it necessary and appropriate to make a brief, certainly incomplete, reference to the constitutional framework in which to try to incorporate, where appropriate, the neuro-rights already referenced.

3.1. Preliminary considerations

3.1.1. Human and fundamental rights

Neuro-rights have been claimed as "new human rights". The expression "human rights", in addition to being frequently used in the field of Philosophy of Law, generally refers to those rights declared by international treaties – whether universal or regional – and must be distinguished from the term "fundamental rights", which is more commonly used to refer to rights recognised and protected in a specific legal system. It could be said that fundamental rights are those human rights positivised in state constitutions.[107], with the not insignificant difference that the legal system and the mechanisms for protecting rights vary depending on where they are recorded.[108].

International treaties, with the exception of some regional treaties, do not usually provide procedures available to individuals to safeguard their rights.[109] States that ratify UN human rights treaties are obliged to promote respect for human rights and to refrain from restricting or interfering with their realization, so their protection in practice is less effective as

[107]Perez Luño, A.,*Human Rights, Rule of Law and Constitution*, Tecnos, Madrid, 9th ed., 2005, p. 33.

[108]Diez-Picazo, LM,*Fundamental rights systems*, 4th ed., Thomson Reuters Civitas, Pamplona, 2013, p.32.

[109]*Ibid*, p.155.

It is the internal legal systems that are primarily responsible for the legal protection of rights.[110].

There is a connection and communication between the "human rights" and the "fundamental rights" of an order. Not only because everyone seeks to define those rights inherent to human beings and to protect common values, but also because human rights have become a "worldwide secular religion"—[111]which imposes minimum standards.

Article 10.2 CE orders to interpret the rules relating to fundamental rights recognized in our Magna Carta in accordance with the UDHR and the international treaties and agreements on the same matters ratified by Spain. The TC itself has established that international texts serve "*to configure the meaning and scope of the rights included in the EC*"[112]However, they do not enjoy the legal regime of constitutional rights in the Spanish legal system; they simply oblige the state powers to adopt the interpretation of fundamental rights that is most in line with the treaty.[113].

In the European context, it is different. On the one hand, because there is a jurisdictional body, the ECHR, with jurisdiction to judge violations of rights recognized in the ECHR. The ECHR allows individuals to appeal to the ECHR for violations of rights that have not been remedied at the state level, which has given rise to a vast body of essential jurisprudence to also address issues relating to fundamental rights at the domestic level, and which also tends to unify the meaning and interpretation of rights in Europe.[114]However, since States differ in their understanding of certain rights and freedoms due to their different historical, cultural, political and economic circumstances, the ECHR has developed a doctrine that, on certain matters, gives flexibility to States when interpreting individual rights and freedoms and resolving conflicts: the doctrine of the margin of

[110]United Nations, "Foundation of International Human Rights Standards", *UN*, [web page], (available at:https://www.un.org/es/about-us/udhr/foundation-of-international-human-rights-law , last accessed June 5, 2024).
[111]Ignatieff, M., "Human Rights: The Midlife Crisis", *Foreign Policy*, no. 70, 1999, (available at:https://www.politicaexterior.com/articulo/derechos-humanos-la-crisis-de-los-cincuenta/).
[112]STC 254/1993, of June 20, (FJ 6º).
[113]Diez Picazo Gimenez, LM, *op. cit.*, p.156.
[114]*Ibid*, p.161.

national appreciation[115]. On the other hand, within the EU framework, the CJEU can also intervene when a violation of rights occurs - in this case, those recognised in the CFREU - in application of European Union law or a national rule issued within the scope of Community law. It is presumed that the protection of rights by the ECHR and the CFREU is equivalent.[116].

3.1.2. Rights as principles

Rights are often open and generic descriptions. They are not formulated as norms but as principles, which implies greater vagueness. This particular feature is motivated by the need for rights to be able to adapt to changing situations resulting from the new demands of each time and ideological pluralism.[117].

3.2. Fundamental rights in the Spanish Constitution: guarantees and effectiveness

The EC recognizes as fundamental rights the right to physical and moral integrity (article 15), to freedom of thought or conscience - which although it does not appear expressly in the constitutional text is protected under the formula "ideological, religious or worship freedom"[118]— (Article 16.1), privacy (Article 18.1), and confidentiality (Article 18.4). It also includes the rights referred to by Ienca and Andorno not to testify against oneself and not to confess guilt (Article 24.2) and recognises equality (Article 14) as a principle and as a person's right not to be treated in a discriminatory manner.

Our Magna Carta dedicates its Title I to "fundamental rights and duties". Title I begins with article 10 CE, which proclaims: "*The dignity of the person, the inviolable rights inherent to him, the free development of personality, respect for the law and the rights of others are the foundation of the political order and of the*

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[115]Macías Jara, M. and De Montalvo Jääskelaïnen, F., "General theory of fundamental rights" in Álvarez Vélez, M. (coord.),*Lessons in Constitutional Law*, 7th edition, Tirant lo Blanch, Valencia, 2020, pp. 337-338.
[116]Alonso García, R., "The Strasbourg doctrine on equivalent protection following Luxembourg's veto of EU accession to the ECHR (regarding Avotins v. Latvia)",*Institute for European Law and Regional Integration (IDEIR)*, No. 32, 2017, (available at: https://www.ucm.es/data/cont/docs/595-2017-05-03-RAG%20Postbosphorus.pdf) .
[117]Diez Picazo Gimenez, LM,*op. cit.,*p.156.
[118]*vine.*Prieto Sanchís, L.,*The constitutionalism of rights*, Trotta, Madrid, 2013, p. 288.

social peace"Dignity is the foundation of the order, it is a central value to which all inviolable rights are reduced and from which they germinate.[119]. Dignity and the free development of personality have operated as a guiding principle during our constitutional history, but, according to the recent jurisprudence of the TC, it would cease to operate as a principle "forbecome, not just a "general principle of freedom", a question that would be far from being peaceful in doctrine, but a true "general fundamental right of freedom", in short, as a norm of closure of the system of public freedoms"[120].

Chapter II of Title I is entitled "Rights and freedoms". It begins by recognizing the principle of equality before the law of all Spaniards and the prohibition of discrimination based on certain circumstances or conditions; then, Section 1 recognizes the "fundamental rights and public freedoms"[121](Articles 15 to 29) and Section 2 contains the "rights and duties of the citizen" (Articles 30 to 38). All of these constitute the rights that can be described as fundamental.[122], but the constituent endowed the rights of Section 2 with a "lesser degree of fundamentality"[123], by providing different levels of guarantees.

As already mentioned, the rights that are claimed to be affected*a priori* Neurotechnologies are fundamental rights. Since they are all recognized in the first Section of Chapter II of Title I, we will now focus on the protection provided for them in the Constitution. There are three levels of protection.

Firstly, fundamental rights are immediately effective – they bind all public powers (article 53.1 CE), which must guarantee their effectiveness and protection under article 9.1 CE – and can only be regulated by organic law (article 53.1

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[119]*Vine*.STC 231/1988, of December 2, and Alegre Martínez, MA,*The dignity of the person as the foundation of the Spanish constitutional order*, University of León, 1996, pp. 45 et seq.
[120]Sieira Mucientes, S., "The free development of personality as a general fundamental right of freedom (self-determination): euthanasia and abortion in the Constitutional Court rulings 19/2023 and 44/2023", *Journal of the Cortes Generales*, n. 116, 2023, p. 261, (available at:https://orcid.org/0000-0002-0595-6832)

[121]For Díez Picazo, in our legal system "public freedoms" does not have a consolidated technical meaning and must be understood as a synonym for "fundamental rights". *Vine.*Diez Picazo Gimenez, LM,*op. cit.,*p.32.
[122]*Vine*. STC 247/2007, of December 12, 2007, (FJ 13th).
[123]Macías Jara, M. and De Montalvo Jääskelaïnen, F.,*op. cit.,*p. 328.

in relation to art. 81 CE) that respects at all times the essential content of the right.

Secondly, Article 53.2 of the Spanish Constitution provides that any citizen may seek protection of these freedoms and rights by taking legal action before the ordinary courts. These procedures are also characterised by being preferential and summary - in the sense of being fast - and are regulated by different rules.

Finally, and as a subsidiary measure, when the jurisdictional avenues have been exhausted, the possibility of appealing to the Constitutional Court for protection is granted. "One of the reasons for this recourse is the central place that fundamental rights have in the constitutional construction and in its system of values"[124].

A controversial issue is the effectiveness of fundamental rights against individuals. The Constitutional Court has declared that the holder of fundamental rights is also a holder in social life, since constitutionally protected assets must also be respected by citizens in accordance with the provisions of Articles 9 and 10 of the EC.[125]. Thus, in the event of a violation, rights and freedoms can be defended before the Courts of Justice. The question is whether they have direct effectiveness or require a law to develop them beforehand. In some areas and in certain relationships, a "nuanced direct effectiveness" is applied, justified by the imbalance of power in the relationship, which refutes the myth of natural freedom and equality on which the dogma of private autonomy is based.[126]This happens in worker-business or consumer-business relationships. Today there are private power centers that are no less important than the public one.[127], and even more relentless than the State in violating rights[128]. If we look at the foundation of rights and the context in which they arise, we must remember that they are born as moral and legal conquests of freedom, identity and dignity in the face of power. And

[124]Álvarez Vélez, M., "Constitutional guarantees" in Álvarez Vélez, M. (coord.),*op. cit.,*p. 518.
[125]First Chamber of the Constitutional Court, STC 2/1982, of January 29, (FJ 5th).
[126]Presno Linera, M.A., "Minimal notes on the general theory of fundamental rights in the Spanish Constitution. The horizontal effectiveness of fundamental rights",*The right and the wrong side* [blog post], March 15, 2021, (available at: https://presnolinera.wordpress.com/2021/03/15/apuntes-minimos-sobre-teoria-general-de-los-derechosfundamentales-en-la-constitucion-espanola-18-la-eficacia-horizontal-de-los-derechos-fundamentales/).
[127]Perez Luño, A.E.,*Fundamental rights*, 9th edition, Tecnos, Madrid 2007, pp. 22-23.
[128]Perez Luño, A.E.,*op. cit.*, 2005, p. 320.

Power is "even if it comes in a T-shirt and sneakers and proclaims utopia from Silicon Valley," as Vanesa Morente clearly reflects.[129].

However, in relations between individuals, the Constitutional Court may consider a fundamental right violated only if the judicial bodies have failed to comply or improperly fulfilled their duty of protection, given that the LOTC requires that the violation arise directly and immediately from an act or omission of a judicial body (Article 44).[130].

3.3. The essential content of fundamental rights

The essential content of a fundamental right is, on the one hand, that part "without which it loses its peculiarity, or, in other words, what makes it recognizable as a right belonging to a certain type. It is also that part of the content that is unavoidably necessary for the right to allow its holder to satisfy those interests for whose attainment the right is granted."[131].

The definition of the essential content in each case can be reached by two complementary routes. Firstly, by referring to the legal nature or way of conceiving a right. Fundamental rights pre-exist the constituent moment, they pre-exist the legislative moment, so that one can speak of a recognizability of these abstract types pre-existing in the specific regulation; in determining the conception of the right, attention must be paid to the "convictions generally accepted among jurists, judges and in general specialists in Law, all of this referring to the historical and social context."[132], which implies, as Banacloche Palao explains, "that the essential content is never totally and definitively determined, but can progressively broaden its scope as society becomes aware of the existence of new dimensions of the same"[133].

The second way is to identify the legally protected interests as the core of the rights. Thus, the essential content is that part of the right

[129]Morente Parra, V., "*op. cit.*, p. 274.
[130]Constitutional Court Decision 382/1996, of December 18, 1996, (FJ 3rd).
[131]Plenary Session of the Constitutional Court, STC 117/1981, of April 8 (FJ 10º).
[132]*Ibid,*(FJ 8th).
[133]Banacloche Palao, J., "The Development of Fundamental Rights by the Legislative Branch, the Judicial Branch and the Constitutional Court",*Deusto Studies*, vol. 66, n.2, 2018, p. 9, http://dx.doi.org/10.18543/ed-66(2)-2018pp17-46 .

absolutely necessary for the legally protectable assets or values that give life to the right to be effectively protected[134].

The essential content of fundamental rights has been defined by jurisprudence on many occasions, due to the lack of laws implementing them. In all these cases, it is up to the ordinary Courts to define the essential core in the first place - shifting this creative task from the legislative power to the judicial power - and, on a subsidiary basis, to the TC.[135]In practice, it has been the Constitutional Court that has been responsible for delimiting the scope and content of fundamental rights and freedoms in the light of each particular case, which makes this task progressive, incomplete and*ad hoc*, and sometimes forces them to rectify or expand their doctrine[136].

We could continue carrying out an exhaustive analysis of the configuration in our legal system of dignity and the free development of personality, and of the aforementioned rights.*a priori*affected by neurotechnological advances: examine their legal development if they have it, their configuration by the TC and their configuration by the ECHR — as Ienca and Andorno do — and resort to legal and even philosophical doctrine. But, if what is intended with this is to analyze the scope of the protection of rights, taking into account the aforementioned evolutionary capacity of the content of rights and what is explained below, analyzing the existing doctrine is, in my opinion, dispensable.

3.4. Interpretation of rights

The indeterminacy arising from considering fundamental rights as principles requires a special type of argumentation (weighting) different from the traditional rule-based interpretation (subsumption).[137].

Rights demarcate absolute moral demands*prima facie*[138]In practice, there is often a collision between fundamental rights or between these and collective interests. These conflicts must be resolved by taking into account the principle of proportionality.

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[134]Plenary Session of the Constitutional Court, STC 117/1981, of April 8 (FJ 7º).
[135]Banacloche Palao, J.,*op. cit.,*p. 29.
[136]*Ibid*, pp. 37-38.
[137]García Figueroa, A., "Fundamental principles and rights", in Betegón, J., et al (coords.),*Constitution and fundamental rights*, Center for Political and Constitutional Studies, Madrid, 2004,p. 235.
[138]Laporta, F., "On the concept of human rights",*Doxa. Notebooks on the Philosophy of Law*, No. 4, 1987, p. 41.

However, the coexistence of all the values in play is not always possible and there are increasingly more frequent *hard cases*: cases that normally do not allow a balanced solution to the conflict and result in the sacrifice of one of the rights or values involved[139]. In this task, the judge's arguments are essential because there are no solutions in the rules.[140]; "In difficult cases, the debate revolves around legal interpretation, the meaning of the law is discussed"[141].

3.5. The Constitutional Court as a creator of rights

The Constitutional Court has incorporated fundamental rights into our catalogue by "creating" them under the protection of other rights already recognised in the constitutional text. To do so, the "new" right must be recognised by the ECHR, be connected to dignity and be able to be deduced from a right already proclaimed in the EC.[142]. This path, followed, for example, in the field of data processing[143], again leads to a shift of the power to create law to the Constitutional Court and is criticized by a sector of the doctrine.

4. NEURORIGHTS BEFORE THE SPANISH LEGAL SYSTEM

4.1. The inflationary phenomenon of rights: flaws in our systems

Farahany's argument for supporting the creation of a human right to cognitive freedom is that, as others have argued,[144], the recognition of a human right has a symbolic value and is beneficial from a strategic point of view because it gives relevance and publicity to a certain issue and strengthens the ability to demand accountability. In addition, including a right in a normative instrument

[139] De Montalvo Jääskelaïnen, F., "Can the law confront disruption with rules?: a reflection on the role of principles in the legal system", *Legal News Uria Menendez*, n. 54, 2020, pp. 12-13.

[140] *Idem.*

[141] De Montalvo Jääskelaïnen, F., *Bioconstitutionalism: a reflection on genome editing from (and for) the theory of Constitutional Law*, Thomson Reuters Aranzadi, Pamplona, 2020, p.80.

[142] Macías Jara, M. and De Montalvo Jääskelaïnen, F., *op. cit.*, pp. 332-333.

[143] Bioethics Committee of Spain, *Report of the Spanish Bioethics Committee on the Draft Digital Rights Charter*, 2021, p. 9, (available at: https://comitedebioetica.isciii.es/wpcontent/uploads/2023/10/Informe-CBE-sobre-el-Borrador-de-Carta-de-Derechos-Digitales.pdf).

[144] Garrett, BL, Helfer, LR, and Huckerby, JC, "Closing International Law's Innocence Gap," *Southern California Law Review*,2021,(available at: https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6816&context=faculty_scholarship)

International law often promotes changes in state legislation and makes its implementation or respect more effective, as well as the mechanisms to achieve it.[145].

Indeed, in Western cultures, ethics and politics are based on human rights, and the discourse of rights has a very powerful persuasive force.[146], but rights are much more than symbols or strategic instruments. Rights are a necessary condition for a person to be able to function as a moral agent in a given context.[147]Their fundamental and priority nature makes them a strong bargaining chip, but if we begin to convert every claim, desire or even legitimate interest into a right, the notion and effectiveness of rights will be devalued.

Numerous authors have drawn attention to the risk of diluting the value of human rights and their effectiveness. In the words of Pablo de Lora, "*The universe of human rights has revealed itself in recent decades as an infinite inflationary universe, which has pernicious consequences, such as the possible collapse*"[148].

In our societies, the proclamations of rights are perceived as authentic social conquests.[149]and, from a political point of view, they turn out to be useful instruments because when a political demand is enshrined as a right it implies that it becomes non-negotiable and irreconcilable.[150].

Our Bioethics Committee has clarified that in order to face the challenges posed by technology, new rights can be proclaimed when necessary, but avoiding the inflation of these rights, and leaving room for the Courts to interpret and, where appropriate, proclaim new rights in response to specific conflicts.[151]. He also warns that "*Not every wish, however plausible it may be, is*

[145]Garrett, B, et al.,*op. cit.*, p. 212, cited in Farahany, A.,*op. cit.*, p. 212.
[146]De Lora, P.,*Rights in jest*, Deusto, Madrid, 2023, pp. 107-151.
[147]Hierro, L., "Human rights or human needs? Problems of a concept. S*ystem,*46 ,1982 pp. 45-61, cited in Colomer, JL, "Autonomy and human rights", in Betegón, J., et al (coords.),*op. cit.,*p. 141.
[148]De Lora, P.*op. cit.*, p.147.
[149]Bioethics Committee of Spain,*op. cit.,*p. 8.
[150]Ignatieff, M., "Human Rights as Politics",*The tanner lectures on human values*[delivered at Princeton University April 4-7 2000] p. 300, (available at:https://tannerlectures.utah.edu/_resources/documents/ato-z/i/Ignatieff_01.pdf).
[151]Bioethics Committee of Spain,*op. cit.,*p. 9.

an imperative need and must also inevitably become a right"[152], and, as Ignatieff has pointed out, "*Good causes are not made better by confusing needs with rights*"[153].

Conceptual inflation threatens to lose sight of the distinctive idea conveyed by a particular concept and subsume ideas or demands that are alien to it or must be placed at a different level, warns Tasioulas.[154], who, in the specific case of human rights, has declared: it "*leaves us poorly positioned to identify the distinct values that are at stake in any given decision. It also obscures the agonizing conflicts that exist among these values in particular cases*".

Over the past 70 years, lists of human rights have grown progressively, proclaiming rights that were not previously contemplated. The liberal revolutions of the 18th and 19th centuries introduced declarations of individual rights—innate, inherent and inviolable—constituted on the idea of individual freedom from absolute monarchies.[155]. A second generation of economic, social and cultural rights based on the idea of equality subsequently emerged. In the second half of the 20th century, third generation rights appeared—contested by jurists who did not consider them authentic human rights—focused on global solidarity.[156], and today we are talking about fourth generation rights as a result of scientific and technological advances. This generation responds to the need to protect identity and privacy.[157]and is made up of newly emerging rights, as well as traditional rights whose content has changed or has been affected by advances[158].

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[152] *Ibid,* p. 8.

[153] Ignatieff, M., "Human Rights: The Midlife Crisis", *Foreign Policy* https://www.politicaexterior.com/articulo/derechos-humanos-la-crisis-de-los-cincuenta/

[154] Tasioulas, J. The inflation of concepts, *Aeon*, January 29, 2021, (available at: https://aeon.co/essays/conceptual-overreach-threatens-the-quality-of-public-reason).

[155] Villarino Marzo, J., "Fourth generation of rights: reflections on freedom of expression on the Internet", *Journal of the Cortes Generales*, no. 100-101-102, 2017, p. 49.

[156] Ruiz Miguel, C., "The third generation of fundamental rights", *Journal of Political Studies*, n. 72, 1991, p. 302, (available at:https://www.cepc.gob.es/sites/default/files/2021-12/16657repne072302.pdf).

[157] University of Deusto, *Deusto Declaration on Human Rights in Digital Environments*, sf, (available at: https://www.deusto.es/es/inicio/privacidad/declaracion-deusto-derechos-humanos-en-entornos-digital ; last accessed April 6, 2024).

[158] Villarino March, *op. cit.*, pp. 50 and 54-60.

In relation to the creation of rights, the CBE has insisted that what is relevant is not so much creating rights but being able to guarantee them.[159], and for this there must be the resources and institutional channels that make them effective.[160]. If rights cannot be enforced due to profusion, they would lose their content and value. In Bublitz's words, "*in a world of scarcity, inflating human rights may thus impact the enforcement and thereby, the effects, of existing human rights*"[161].

Those who think that the challenges of our time can be resolved by providing the legal system with more and more rights are therefore mistaken, since the notion of human or fundamental rights can be trivialised and, in practice, run the risk of losing their effectiveness. This latter would be the real risk in the opinion of Rafael de Asís, who states that the danger is not so much inflation itself – its consequences are not clear – but the establishment of a good system of guarantees.[162]However, it is important not to forget that human rights are affirmations of basic and priority values and interests.[163]and turning any interest into an essential right, "would reduce the real value of the language of rights"[164].

4.2. The ethical-legal issue of human development

4.2.1. The debate on improvement

Although, as has been said, there is no agreed definition of the right to mental self-determination or cognitive freedom, it is often presented as the right to neurocognitive enhancement - a minority sector has also proposed the option of moral improvement, but today this is an unlikely scenario.[165]—, which places us within the framework of human perfection or liberal eugenics[166].

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[159]Bioethics Committee of Spain, *op. cit.*, p.8.
[160]Bublitz, "Novel Neurorights: From Nonsense to Substance," *op. cit..,* p. 4.
[161]*Idem.*
[162]From Assisi, R., *op. cit.*p. 68
[163]Laporta, F., "On the concept of human rights", *Doxa. Notebooks on the Philosophy of Law*, No. 4, 1987.
[164]Ignatieff, M., *op. cit.*
[165]International Bioethics Committee, *op. cit.,* p. 35; Darby, R., and Pascual-Leone, A., "Moral Enhancement Using Non-invasive Brain Stimulation", *Frontiers in Human Neuroscience*, 2017, https://doi.org/10.3389/fnhum.2017.00077 .
[166]Morente Parra, V., *op. cit.*, p. 273.

Enhancement advocates mainly put forward two arguments. From a libertarian point of view, they argue that the individual is and should be free to make his or her own decisions, including that of self-determination. On the other hand, from a utilitarian position, they maintain that evolution through enhancement would allow both man and humanity to reach and realize their maximum potential in a period of time much shorter than that corresponding to natural evolution and with much less effort.[167].

Opponents of enhancement are opposed to this position. The bulk of academics have spoken out on this in relation to gene editing, and the arguments have been replicated by those who have criticized the right to mental self-determination. Authors such as Habermas and Sandel have argued that we are facing a new type of eugenics based not on coercion but on individual and economic freedom.[168]; "t *he one-sided triumph of willfulness over giftedness, of dominion over reverence, of molding over beholding*"Sandel said[169].

Opponents of neuroenhancement highlight the dangers and attacks on dignity[170] which would mean not accepting the limitations of nature and trying to overcome them, and they warn of the differences this would generate in social, work and educational environments, and which would harm the freedom of those who do not wish to improve, paradoxically contradicting the right to free will.

Finally, these claims may be contrary to religious, ethical and ideological sensibilities, and may not fit into all countries' cultural and legal systems, so recognizing a right to mental self-determination, and therefore declaring it a human right, does not seem viable or advisable.[171].

4.2.2. The role of mental self-determination in Spain

When considering the fit of non-therapeutic mental alteration into our legal system, it is useful to refer to the regulations on biotechnology, since the

[167]International Bioethics Committee, *op. cit.,* p. 35.
[168]Morente Parra, V., *op. cit*, p.275.
[169] Sandel, M., "The case against perfection", *The Atlantic monthly,* April 2004, p.60 https://cyber.harvard.edu/cyberlaw2005/sites/cyberlaw2005/images/Case_Against_Perfection.pdf.
[170]It is common for those who support one or the other position to refer to dignity in ethical, political and legal debates. Dignity is an indefinite concept that is open to conflicting conceptions.
[171]Bourbon et al., *op cit.,* p. 153.

The ethical and legal issues raised by neurotechnology are similar to those raised by the former. The IBC itself, in its Report on the implications of neurotechnology, refers to the Universal Declaration on Bioethics and Human Rights[172], which includes guiding principles for the practice of medicine, biomedical research and other areas related to human life and health, provides a general framework suitable for analyzing the ethical and legal implications of neurotechnology.[173].

Article 13 of the Oviedo Convention on Human Rights and Biomedicine establishes the European legal framework for the protection of human rights in the field of biomedicine and reduces the possibility of modifying the human genome to preventive, diagnostic and therapeutic reasons.[174]In the EU, eugenic practices are prohibited by Article 3.2.b) of the CDFUE and the Spanish Penal Code punishes acts of genetic manipulation when the genotype is altered for purposes other than the elimination or reduction of serious defects or illnesses (Articles 159 et seq. of the Criminal Code).

Regarding mental disorders, the Spanish Bioethics Committee considers that "*An express prohibition of the use of neurotechnologies for non-therapeutic purposes should be promoted*"[175]And, for her part, Vanesa Morente has called on public authorities to regulate technology markets with the aim, always and everywhere, of protecting and respecting human dignity, which for the author means respecting and guaranteeing human nature.

4.3. Redundant rights in the face of a "living Constitution"

One of the main criticisms of neuro-rights is that they would not be necessary: if what is intended is to protect certain legal assets, it must be studied whether they are already protected or can be protected by incorporating new meanings to those already proclaimed, if what is intended is to regulate the use of neurotechnologies, it must be

[172]UNESCO, *Universal Declaration on Bioethics and Human Rights*, 2005.
[173]International Bioethics Committee, *op. cit.,* p. 15.
[174]Instrument of Ratification of the Convention for the Protection of Human Rights and Dignity of the Human Person with Regard to the Application of Biology and Medicine (Convention on Human Rights and Biomedicine), done in Oviedo on 4 April 1997.
[175]Bioethics Committee of Spain, *op. cit.,* p. 18.

resort to regulation in other instruments and not the proclamation of new rights[176].

Regarding the first, Morente has stated that, if the legal assets that neurorights seek to guarantee are intimacy, privacy, freedom, human dignity and equitable access to scientific resources, these are the classic values of modernity enshrined in practically all Western countries, at least formally.[177]. Zúñiga-Fajuri et al. explain, in the same sense, that, in the same way that the emergence of new forms of killing does not change the content of the right to life nor justify the creation of new rights, the threats of neurotechnologies to the aforementioned rights — whether they come from the State or a multinational— are not grounds for creating new human rights because what they do is affect the old ones but in new ways.[178].

Ienca and Andorno have stated that neurotechnology is a *terra incognita* for the Right of Human Rights[179] because there are no express references to neurotechnologies in the declarations of rights, constitutions and normative elements of different kinds, and they have carried out an analysis of the doctrine of the ECHR and the current configuration of some rights to justify the creation of new ones or a reconceptualization of the old ones. These authors forget that rights can be interpreted broadly and that as social, political and technological circumstances change, rights can be adapted to them and understood in new ways if constitutions are considered to be living texts (doctrine of the *living constitution*). Bublitz himself has recalled that the Law, and especially the human rights law, is applicable to cases not contemplated by the legislator thanks precisely to the abstract and general nature of human rights norms.[180]: "*It's difficult*

[176] Bourbon Rodriguez, et al., *op. cit.*, p. 156, https://doi.org/10.12795/IETSCIENTIA.2020.i02.10 .
[177] Morente Parra, V., *op. cit.* p. 273.
[178] Zúñiga-Fajuri, A., Villavicencio Miranda, L. & Salas Venegas, R., "Neurorights? Reasons for not legislating", *Ciper,* December 11, 2020, (available at: https://www.ciperchile.cl/2020/12/11/neuroderechos-razones-para-no-legislar/#_ednref3 .; last accessed 6 April 2024).
[179] Andorno, R., and Ienca, M., *op. cit.*, p. 8.
[180] Bublitz, "Novel Neurorights: From Nonsense to Substance," *op. cit.*, p. 6.

to delimit a priori and with precision where the area protected by a fundamental right ends"[181].

Doctrine and jurisprudence have been delimiting the content, essential core and limits of rights, but this does not prevent, in the face of new contexts such as technological advances, new interpretations of already recognized rights. "Constitutional guarantees represent an open catalogue from a hermeneutical point of view," both in Spain and in countries around us such as Germany.[182].

5. RESPONDING TO NEUROTECHNOLOGICAL ADVANCES IN A CONTEXT OF RISKS AND UNCERTAINTY

5.1. Ethical legal solutions and the dilemma of *dual-use*

Ethics must guide technological development, as recognized in the Universal Declaration on Bioethics and Human Rights[183], and the law must be based on and learn from it. Any legal decision taken in relation to scientific and technological advances must go hand in hand with ethics. The Recommendation on AI Ethics states: "Ethical issues relating to AI-based systems used in neurotechnologies and brain-computer interfaces must be taken into account in order to preserve human dignity and autonomy."[184].

In this context, it is useful to resort to the dilemma of *dual-use.* Dual use refers to scientific knowledge and technologies that can be used for harmful as well as beneficial purposes, giving rise to a dilemma. Neurotechnologies are affected by this possible dual use: the phenomena already mentioned of *brainhacking* and the *brainjacking*.

The Spanish Bioethics Committee explains that "in the development of a technology [which involves both researchers and the authorities that authorize the research work] attention must be paid not only to the main purposes for which it is intended to be used

[181] Diez-Picazo, LM, *op. cit.,* p. 45.
[182] Reche Tello, N., *op. cit.*., p. 247.
[183] UNESCO, *Universal Declaration on Bioethics and Human Rights*.
[184] UNESCO, *Recommendation on the Ethics of Artificial Intelligence*, 2022, p. 37, (available at: https://unesdoc.unesco.org/ark:/48223/pf0000381137_eng)

the same, but also the possibility of being used in the military field or, in general, to harm human beings"[185]. Raise the ethical dilemma of *dual-use* This involves studying and anticipating potential risks from the outset and rigorously and constantly assessing the potential for misuse, together with establishing policies and controls that minimise risks, and promoting a balance between innovation and global security. Thus, neurotechnology developers must be the first to consider this, but companies and governments must also face it.

Although the benefits achieved by BCIs currently significantly outweigh the risks associated with brain hacking and other "neurocrimes," the harmful use of neurotechnologies is expected to increase exponentially in the near future, which is why it is necessary to analyze possible harmful uses and discuss appropriate safeguards to ensure neurotechnological progress is as safe as possible.[186].

In considering the dilemma, the European Group on Ethics in Science and New Technologies has pointed out as guiding principles respect for human dignity, principles of security, sustainability, justice, precaution, proportionality, freedom of research (progress) and transparency.[187].

In relation to neurotechnologies, Ienca and Haselager[188] They warn of the importance of drawing attention to the risks associated with ICC, designing regulatory mechanisms that improve the security and protection of current and future ICC applications, and raising awareness among the general public. Among the measures they propose to mitigate perverse uses and the risks they entail are the development of mechanisms and methods to anonymize neural signals, the implementation of mechanisms for *machine learning* that self-monitor by detecting inconsistencies in the way the brain organizes and categorizes sensory and cognitive information, or the

[185] Bioethics Committee of Spain, *op. cit.*, 2021, pp.17-18.
[186] Elger, B.S., et al. "From Healthcare to Warfare and Reverse: how should we regulate dual-use neurotechnology?" *Neuroview*, vol. 97, no. 2, 2018, p. 271, https://doi.org/10.1016/j.neuron.2017.12.017 .
[187] Rodrigues, R., "Principles and approaches in ethics assessment: dual use in research", *Stakeholders Acting Together on the Ethical Impact Assessment of Research and Innovation - SATORI*, 2015, p. 7, (available at https://satoriproject.eu/media/1.g-Dual-use-in-research.pdf)
[188] Ienca, M., and Haselager, P., "Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity", *op. cit.*, pp. 124-125.

training of clinical users of ICCs against potentially unsafe stimuli.

5.2. Law in contexts of uncertainty and progress

5.2.1. Regulating progress?

International organisations have urged that potential risks or damages arising from these technologies be anticipated by creating governance frameworks that regulate the development and use of neurotechnologies while encouraging innovation in education, well-being and leisure. The question is how to do this. If restrictive regulations are introduced into regulatory instruments, the consequences for progress may be negative, but substantially positive regulation can lead to a transformation of the very essence of the human being and, from a legal point of view, a system of insecurity.

In any case, anticipating fixed legal regulations that provide solutions for all situations (present and future) is not realistic, given that industry and research and "their" risks will continue to evolve. The reality of our time, especially in the scientific and technological field, is characterized by uncertainty and full of risks. Since the law cannot remain outside of it, legal instruments have been developed that allow us to deal with uncertainty and adopt balanced positions without having to sacrifice progress or endanger the safety of people and their rights.[189]The legal system has partially lost its predictability and strictness in favour of principles that, being open clauses, provide greater flexibility and are very useful in changing environments.[190].

5.2.2. The precautionary principle

In the "management" of risks and uncertainty, the precautionary principle is a key tool. In the ethical field, it is an attitude towards the future and risk. In the legal field, it is a rule, applicable to and by public authorities, which inspires and

[189]De Montalvo Jääskelaïnen, F., "Can the law confront disruption with rules?: a reflection on the role of principles in the legal system",*op.cit*, pp. 14-15.
[190]De Montalvo Jääskelaïnen, F.,*Bioconstitutionalism...*,*op. cit.,*p.80.

It structures ordinary and extraordinary law in the face of uncertain risks[191]It can operate as a general inspiring principle or as a decisive element as if it were a rule.

Its purpose is to anticipate risk by carrying out a control prior to the certain existence of the risk, which differentiates it from the prevention principle. The latter, although it also operates prior to the damage, implies certain knowledge of the risk and the causal links. The precautionary principle does not require such evidence; its characteristic feature is that it operates in the presence of uncertain risks with the aim of managing the risk in advance.

The EU has been a pioneer in the incorporation and development of this principle, which has already acquired the status of a legal rule and whose application extends to all social spheres. In its Communication on the use of the precautionary principle, the European Commission points out that when policy makers are aware of a risk, they must obtain a scientific assessment, as complete as possible, in order to select the most appropriate course of action.[192]The application budget of the principle is the prior identification of potentially dangerous effects.

The principle allows for the adoption of exceptional and highly forceful measures[193] and in no case can it justify an arbitrary decision, so its invocation requires proving the uncertainty and the possibility of especially serious, irreversible and uncontrollable damage occurring.[194].

All three branches of government can use this principle in their decisions. From a constitutional point of view, according to Jim Dratwa, it has two important functions. On the one hand, it legitimises regulations that affect human lives, and on the other, it legitimises the institutions of the European Union over those of the Member States.[195].

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[191]Sanchez Barroso, B.,*The precautionary principle in Spain: clarifications on the role of public authorities in the face of risk in a constitutional state*, Congress of Deputies, Monographs No. 106, (online version available athttps://app.congreso.es/est_ppio_precaucion/).
[192]European Commission, Communication on the use of the precautionary principle (COM/2000/0001 final), *European Commission*, 2000.
[193]Esteve Pardo, J.,*Principles of Regulatory Law*, Marcial Pons, Madrid, 2021, p. 195.
[194]De Montalvo Jääskelaïnen, F.,*Bioconstitutionalism... op. cit.*,, p. 63.
[195]Dratwa, J., "Representing Europe with the precautionary principle", 2011, cited in De Montalvo Jääskelaïnen, F.,*ibid*,p.62.

Ienca has called for the regulation of neurotechnologies in light of the precautionary principle while there is still time. In its words, "we have a moral obligation to be proactive and channel the development of these technologies based on democratically agreed ethical and social principles" in a "systematic, empirically based and non-speculative" manner.[196].

5.2.3. The role of judges

In this context, judges take on special relevance, not only in the interpretation and weighing of fundamental rights, but also as interpreters of principles. Principles, which have an autonomous reason for being, perfect the legal system and provide criteria for taking a position in specific situations that*a priori*They seem indeterminate[197]This provides greater flexibility to the legal system and facilitates the adaptation of the rules to each case in a way that the rules do not allow; contrary to the opinion of Ienca and Andorno and Yuste and their colleagues, greater rigidity and specificity of the rule does not necessarily mean greater effectiveness and protection. The balance of the values at stake in each circumstance cannot be foreseen in a rule. Judicial interpretation is therefore essential in order to resolve each situation in the most equitable manner, based on the principles of the legal system itself and its rules.

Federico de Montalvo proposes a reorganization of the powers of the State that gives the courts a greater role and gives rise to a renewed model in which argumentation and principles are fundamental and on which judges can rely. — as is already the case — in the knowledge of other bodies — such as ethics committees —[198]. Borbón y Borbón, in their criticism of neuro-rights, defend the need for "*prepare justice operators to adequately interpret constitutional rights considering the challenges presented by neurotechnologies*"[199].

[196]Ienca, M., "Neurorights: why should we act before it is too late?",*CIDOB, International Yearbook*, 2021, p. 42.
[197]Zagrebelsky, G.,*The ductile law: Law, rights, justice*, pp. 172, 182 and 185.
[198]De Montalvo Jääskelaïnen, F., "Can the law confront disruption with rules?: a reflection on the role of principles in the legal system",*op. cit.,*pp. 29-30; and
[199]Bourbon D., and Bourbon, L.,*op. cit.,*p. 3.

5.2.4. Mention of a paradigmatic case in this area: the Judgment of the Supreme Court of Chile of August 9, 2023.

The Sentence[200]resolves the first constitutional action brought for the protection of brain data in relation to the use of commercial neurodevices.

The Court recognizes the violation ofphysical, mental and emotional integritythe right to privacy; obliges the company to delete all information that may have been stored as a result of the use of the device by the appellant, and; subjects its use and marketing to the precautionary principle[201], decreeing the need for them to be evaluated by the health and customs authorities, who will have to make the appropriate legal arrangements.

5.3. Brief final notes on alternative proposals to neuro-rights

Among the proposals for greater protection against neurotechnologies, in addition to neurorights, there are revisions to the GDPR, to establish a unanimous opinion on the nature of neurodata and the scope of its protection, and to reconsider the approach to consent. There has been talk of regulations, limitations and prohibitions, of obligations and sanctions, and self-regulation. There has also been talk of raising awareness in society as a whole, of the urgency of debates and cooperation and the creation of a global governance framework in the face of a global challenge such as neurotechnological advances.

It is worth remembering the lack of protection for users of neurodevices, as they are generally subject to little regulation, and citing the cases of the human genome and artificial intelligence as analogous subjects that can inspire political and legal decisions relating to neurotechnologies. Specifically, in relation to AI, it is worth highlighting, beyond the measures of*Soft law*, its regulation in the EU. The Regulation[202]

[200]The text of the judgment can be consulted at the following link:https://www.diarioconstitucional.cl/wpcontent/uploads/2023/08/GIRARDICONEMOTIVSUPREMA.pdf105.065-2023.pdf .
[201]Payán Ellacuria, E., "The neuro-rights debate reaches the courts: two pioneering rulings in Chile and Spain",*The conversation*, September 18, 2023, (available at: https://theconversation.com/el-debate-de-los-neuroderechos-llega-a-los-tribunales-dos-sentenciaspioneras-en-chile-y-espana-213405).
[202]Proposal for a Regulation of the European Parliament and of the Council establishing harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts (COM(2021) 206 final 2021/0106(COD)).

It establishes a minimum, flexible, risk-based regulation that establishes obligations, protections and sanctions and prohibits systems of unacceptable risk. All of this with fundamental (or human) rights at the centre.

IV. CONCLUSIONS

FIRSTNeurotechnological advances entail unprecedented risks for fundamental rights and the very essence of the person. Among such advances are the hybridization of the brain with machines and devices, the techniques that allow the reading and recording of brain activity with increasing precision - generating a vast body of brain data, which are of great value and sensitivity - and the techniques that alter and modulate brain activity. Beyond the possible therapeutic purposes whose benefits are unquestionable in the medical field, neurotechnologies can be used in other areas, including the military. Of particular concern are the non-invasive neurodevices that are proliferating in the consumer market and that are subject to lower guarantees. On the other hand, the possibility of manipulating the central organ of personality, as well as knowing the most intimate data of people - even unknown to them - makes neurotechnologies attractive for their illegitimate use by*hackers*.

Faced with neurotechnological advances and the new scenarios they create, the Law must respond by adopting formulas that combine scientific and technological progress with the protection of people, their rights and their dignity. The scientific and academic community and various organizations and States are already acting in response to this new panorama.

SECOND. One of the measures proposed to protect rights and freedoms from these new risks consists of the proclamation of new rights: neuro-rights. The authors who have proposed a catalogue of neuro-rights justify their need in the absence of explicit references to neuroscience and neurotechnologies in positive law as well as in the configuration and interpretation of the content of rights made by the courts and the UN Human Rights Committee to date. Some of them have claimed to be against the use of general concepts because they are open to interpretation, and they consider that the protection of the values at stake will be more effective, secure and uniform if specific neuro-rights are protected in legal texts.

THIRD. Greater rigidity and specificity of the norm does not necessarily translate into greater effectiveness and protection. The open formulation of fundamental rights in our legal systems is precisely what allows their adaptation to new scenarios and their weighting in each case. All rights have an irreducible essential core that can be expanded in new interpretations. In addition, under certain requirements, the TC can deduce new rights from existing ones. Following the doctrine of the*Living Constitution* Our constitutional text is dynamic and must be interpreted in light of new circumstances.

QUARTER. Any rule with a principle structure provides greater flexibility and the possibility of adaptation to each case than rigid rules. In a changing and uncertain context, such as that of technological advances, principles are more useful and realistic solutions to address challenges from the law. Specifically, in uncertain scenarios where there are potential risks, the precautionary principle takes on special importance, allowing for the adoption of exceptional measures for precautionary purposes.

FIFTH. Judges, through their work of interpretation and argumentation, have a fundamental role in determining the essential content of rights and in their adaptation and weighing in each case - especially in 'difficult cases' - as well as in the resolution of cases in application of principles, since this requires greater interpretation than if it were the interpretation of closed rules.

SIXTH. Given that the content of the rights currently recognized can evolve and that the highest interpreter of the Constitution can even “create” rights, it is worth considering whether we really need new rights, or whether, on the contrary, they are unnecessary because those legal assets whose safeguarding is intended with the recognition of neuro-rights are already protected.*A priori*, it seems that the rights and values that are intended to be guaranteed are already protected, with the exception of the right to cognitive freedom understood in a positive way. The right to mental self-determination and to improve one's own abilities is neither recognized nor does it seem to fit into our legal system, since it is a proposal with the aim of overcoming human nature.

In other cases, recognizing neuro-rights is meaningless. The Constitution already recognizes the dignity of the person as the foundation of political order and social peace,

the free development of personality and inviolable rights, including privacy, physical and moral integrity, freedom of thought and data protection. The fact that there are no express references to mental privacy, for example, or to neurotechnology, does not mean that their protection cannot be extended to new cases through the interpretation of the rights in each case, or that new rights cannot be deduced from those already existing.

There is certainly an urgent need to ensure the effective protection of rights and freedoms and to take global measures against the risks posed by neurotechnological advances, but neurorights are not the solution. Needs should not be confused with rights, especially considering the inflationary phenomenon of rights that we are witnessing.

SEVENTH. As various organisations and academics have already pointed out, neurotechnological development must be carried out in an ethical manner and the measures adopted by law must focus on human nature and dignity while encouraging innovation. Beyond increasing the role of judges, it is necessary to have debates, to raise awareness in society and for companies and governments to foresee and address the challenges. Political and legal operators will have to decide how to respond to neurotechnologies. For their regulation, the AI Regulation or the limitations already foreseen in the biomedical field can serve as inspiration.

V. LITERATURE

1. LEGISLATION

Spanish Constitution of 1978 (No. 311, 12/29/1978).

Organic Law 2/1979, of October 3, of the Constitutional Court (No. 239, of 05/10/1979).

Organic Law 10/1995, of November 23, of the Penal Code (BOE No. 281, of 24/11/1995).

Charter of Fundamental Rights of the European Union (2010/C 83/02).

Proposal for a Regulation of the European Parliament and of the Council establishing harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts (COM(2021) 206 final 2021/0106(COD)).

Instrument of Ratification of the Convention for the Protection of Human Rights and Fundamental Freedoms, done at Rome on 4 November 1950, and amended by Additional Protocols Nos. 3 and 5 of 6 May 1963 and 20 January 1966, respectively (BOE 10 October 1979).

Instrument of Ratification of the Convention for the Protection of Human Rights and the dignity of the human being with respect to the applications of Biology and Medicine (Convention on Human Rights and Biomedicine), done in Oviedo on April 4, 1997 (BOE October 20, 1999).

Constitutional Reform Act No. 21,383, which modifies the fundamental charter Chilean to establish scientific and technological development at the service of people, 2022, (available at: https://www.bcn.cl/leychile/navegar?idNorma=1166983).

2. JURISPRUDENCE

Constitutional Court Decision 382/1996, of December 18, 1996, (FJ 3rd).

Judgment of the Constitutional Court (Plenary) 117/1981, of April 8, 1981.

Judgment of the Constitutional Court (First Chamber) 2/1982, of January 29, 1982.

Constitutional Court ruling 231/1988, of December 2, 1988

Judgment of the Constitutional Court 247/2007, of December 12, 2007, (ECLI:ES:TC:2007:247).

Judgment of the Constitutional Court STC 254/1993, of June 20, 1993, (ECLI:ES:TC:1993:254).

Judgment of the Supreme Court of Chile of August 9, 2023 (Third Chamber), Case No. 105.065-2023, (available at:https://www.diarioconstitucional.cl/wpcontent/uploads/2023/08/GIRARDICONEMOTIVSUPREMA.pdf105.065-2023.pdf).

3. DOCTRINAL WORKS

Alegre Martinez, M.A.,*The dignity of the person as the foundation of the legal system Spanish constitutional*, University of León, 1996.

Alonso García, R., "The Strasbourg doctrine on equivalent protection after the Luxembourg's veto of EU accession to the ECHR (regarding Avotins v. Latvia)",*Institute for European Law and Regional Integration (IDEIR)*, No. 32, 2017, (available at:https://www.ucm.es/data/cont/docs/595-2017-05-03-RAG%20Postbosphorus.pdf).

Álvarez Vélez, M., "Constitutional guarantees" in Álvarez Vélez, M. (coord.), *Lessons in Constitutional Law*, 6th ed., Tirant lo Blanch, Valencia, 2018, pp. 511-528.

Andorno, M., "Why human rights are crucial in responding to the challenges posed by neurotechnologies", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, pp. 29-31, https://doi.org/10.54678/POGS7778 ;

Andorno, R., and Ienca, M., "Towards new human rights in the age of neuroscience and "neurotechnology",*Life Sciences, Society and Policy*, 13, (5), 2017, p. 5.

Banacloche Palao, J., "The development of Fundamental Rights by the Power Legislative, the Judiciary and the Constitutional Court",*Deusto Studies*, vol. 66, no. 2, 2018, p. 17-46,https://doi.org/10.18543/ed-66(2)-2018 .

Bandini, S., “Regulating AI? The EU's first steps and future BCI-based scenarios”, in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.), *The risks and challenges of Neurotechnologies for Human Rights,* Paris: UNESCO, 2023, p. 23-25. https://doi.org/10.54678/POGS7778 .

Bastidas Cid, YV, “Neurotechnology: Brain-computer interface and data protection brain or neurodata in the context of the processing of personal data in the European Union”, *AEPD*, 2020, p. 12, (available at: https://www.aepd.es/documento/premio-emilio-aced-2020-yasna-vanessabastidas.pdf).

Borbón D., and Borbón, L., “A Critical Perspective on Neurorights: Comments Regarding Ethics and Law”, *Frontiers in Human Neuroscience*, vol. 15, 2021, https://doi.org/10.3389/fnhum.2021.703121 .

Borbón Rodríguez, DA, et al., “Critical Analysis of Human Neurorights in the Free free will and equitable access to enhancement technologies,” *Ius et Scientia*, vol. 6, no. 2, pp. 135–161, https://doi.org/10.12795/IETSCIENTIA.2020.i02.10 .

Bublitz, C, et al., “Forensic Brain-Reading and Mental Privacy in European Human Rights Law: Foundations and Challenges”, *Neuroethics*, n. 14, 2021, pp. 191-203.

Bublitz, C. et al., “On the Verge of the Hybrid Mind”, *Morals and Machines*, vol. 1, n. 1. pp. 30-43, https://doi.org/10.5771/2747-5174-2021-1-30 .

Bublitz, C., “Bublitz, C., “My mind is mine!? Cognitive Liberty as a Legal Concept”, in Franke, A.G., and Hildt, E., (eds.), *Cognitive Enhancement*, Springer, Dordrecht, 2013, pp.2344-264 (text available at: https://www.researchgate.net/publication/259912348_My_Mind_Is_Mine_Cognitive_Liberty_as_a_Legal_Concept).

Bublitz, C., “Cognitive Liberty or the International Human Right to Freedom of Thought”, in Clausen, J., Levy, N. (eds), *Handbook of Neuroethics*, Springer, Dordrecht, pp. 1309-1333, https://doi.org/10.1007/978-94-007-4707-4_166 .

Bublitz, C., and Merkel, R., “Crimes Against Minds: On Mental Manipulations, Harms and a Human Right to Mental Self-Determination”, *Criminal Law, Philosophy*, vol. 8, 2014, pp. 51-77, doi: 10.1007/s11572-012-9172-y.

Bublitz, J.C., "Novel Neurorights: From Nonsense to Substance,"*Neuroethics*, vol. 15, n.7, 2022,https://doi.org/10.1007/s12152-022-09481-3 .

Chang, CC, et al., "National technology foresight research: a literature review from 1984 to 2005",*International Journal of Foresight and Innovation Policy*, vol. 6, no. 1, 2010, pp. 5 -35.

Dato, A., "Brain Computer Interface: a Data Protection Perspective", Tilburg University [LL.M. Thesis], 2018, (available at: http://arno.uvt.nl/show.cgi?fid=146398).

From Assisi, R.,*"On the proposal for neuro-rights", Rights and freedoms,*n. 47, pp. 51-70,https://doi.org/10.20318/dyl.2022.6873 .

De Lora, P.,*Rights in jest*, Deusto, Madrid, 2023, pp. 107-151.

De Montalvo Jääskelaïnen, F., "Can the law confront disruption with rules?: A reflection on the role of principles in the legal system"*Legal News Uria Menendez*, n. 54, 2020, pp. 1-30.

De Montalvo Jääskelaïnen, F., "Individual rights and freedoms (I)", in Álvarez Vélez, M. (coord.),*Lessons in Constitutional Law*, 6th ed., Tirant lo Blanch, Valencia, 2018, p. 57-388.

De Montalvo Jääskelaïnen, F.,*Bioconstitutionalism: a reflection on the edition Genomics from (and for) the theory of Constitutional Law*, Thomson Reuters Aranzadi, Pamplona, 2020.

Diez-Picazo, LM,*Fundamental rights systems*, 4th ed., Thomson Reuters Civitas, Pamplona, 2013.

Dratwa, J., "Representing Europe with the precautionary principle", in Jasanoff, (ed.), *Reframing Rights: Bioconstitutionalism in the Genetic Age,*MIT Press Scholarship On-line, 2011, https://doi.org/10.7551/mitpress/9780262015950.003.0135 .

Dura-Bernal, S., "Introduction to part I: State of the art and challenges of neurotechnology" at UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, pp. 10-14, https://doi.org/10.54678/POGS7778 .

Eagleman, D., *The brain. Our history*, trans. D. Alou, Anagrama, Barcelona, 2017.

Elger, B.S., et al. "From Healthcare to Warfare and Reverse: how should we regulate dual-use neurotechnology?", *Neuroview*, vol. 97, no. 2, 2018, pp. 269-174. https://doi.org/10.1016/j.neuron.2017.12.017 .

Esteve Pardo, J., *Principles of Regulatory Law*, Marcial Pons, Madrid, 2021, p. 195.

Farahany, NA, *The Battle for Your Brain: Defending the Right to Think Freely in the Age of Neurotechnology*, St. Martin's Press, New York, 2023.

Fernández Jover, E., "Intervening in the brain: challenges and future prospects", in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.), *The risks and challenges of Neurotechnologies for Human Rights,* Paris: UNESCO, 2023, pp. 17-19, https://doi.org/10.54678/POGS7778 .

Ferry, L., *The transhumanist revolution*, trans. Martorell, A., Alianza Editorial, Madrid, 2018.

García Figueroa, A., "Fundamental principles and rights", in Betegón, J., et al. (coords.), *Constitution and fundamental rights*, Center for Political and Constitutional Studies, Madrid, 2004, p. 235-268

García, L. and D. Winickoff, "Brain-computer interfaces and the governance system: Upstream approaches", *OECD Science, Technology and Industry Working Papers*, n. 1, 2022, https://doi.org/10.1787/18d86753-en .

Garrett, BL, Helfer, LR, and Huckerby, JC, "Closing International Law's Innocence Gap", *Southern California Law Review*, vol. 95, n. 2, 2021, pp. 311-364 (available in: https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6816&context=faculty_scholarship)

Genser, J., et al., "It's time for neuro-rights", *Horizons*, vol. Winter, no. 18, pp.154-164, (available in: https://www.cirsd.org/files/000/000/008/47/7dc9d3b6165ee497761b0abe69612108833b5cff.pdf).

Haselager, P., and Ienca, M., “Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity”,*Ethics and Information Technology*, vol. 18, 2016, pp. 117-129,https://doi.org/10.1007/s10676-016-9398-9 .

Hierro, L., “Human rights or human needs? Problems of a concept. S*ystem,*46 ,1982 pp. 45-61.

Ienca, M., “Neurorights: why should we act before it is too late?”, *CIDOB, International Yearbook*, 2021, pp. 42-43, (available at: https://www.cidob.org/articulos/anuario_internacional_cidob/2021/neuroderecho_why_we_must_act_before_it_is_too_late).

Ienca, M., “Neuroprivacy, neurosecurity and brain-hacking: Emerging issues in neural engineering”,*Bioethics Forum*, vol. 8, no. 2, 2015, pp. 51-53, doi: 10.24894/BF.2015.08015.

Ienca, M., “On neurorights”,*Frontiers in Human Neuroscience*, vol. 15, 2021, https://doi.org/10.3389/fnhum.2021.701258 .

Ienca, M.,*Common human rights challenges raised by different applications of neurotechnologies in the biomedical field*, Council of Europe, 2021, (available at: https://rm.coe.int/report-final-en/1680a429f3).

Kellmeyer, P., “Neurotechnology and fundamental rights: conceptual and ethical foundations”, in UNESCO, Milan-Biocca, State University of New York Downstate Health Sciences University (eds.),*The risks and challenges of Neurotechnologies for Human Rights,*Paris: UNESCO, 2023, pp. 39-44, https://doi.org/10.54678/POGS7778 .

Laporta, F., “On the concept of human rights”,*Doxa. Notebooks of Philosophy of the Right*, no. 4, 1987, pp. 23-46.

Lavazza, A., “Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis”,*Frontiers in Neuroscience*, vol. 12, n. 82, 2018, https://doi.org/10.3389/fnins.2018.00082 .

Macías Jara, M., and De Montalvo Jääskelaïnen, F., “General theory of human rights “fundamentals” in Alvarez Velez, M. (coord.),*Lessons in Constitutional Law*, 7th edition, Tirant lo Blanch, Valencia, 2020, pp. 333-366.

Morente Parra, V., "Hybrid intelligence: towards the recognition and guarantee of the neuro rights?" in Llano Alonso, FH and Garrido Martín, J. (coords.), *Artificial Intelligence and Law. The jurist facing the challenges of the era*digital, Thomson Reuters Aranzadi, Pamplona, p. 259-277.

Nunez Party, JP, *The mind: the final frontier,* 2nd ed., Madrid: Pontifical University Comillas, 2020.

Paun, AMC, "Brain Computer Interface manufacturers under the data protection lens", Tilburg University [LL.M. Thesis], 2022, (available at: http://arno.uvt.nl/show.cgi?fid=160486).

Perez Luño, A.E., *Human rights, rule of law and constitution*, 9th edition, Tecnos, Madrid 2005.

Perez Luño, A.E., *Fundamental rights*, 9th edition, Tecnos, Madrid 2007.

Prieto Sanchís, L., *The constitutionalism of rights*, Trotta, Madrid, 2013.

Reche Tello, N., *Mens iura fundamentalia: neurotechnology before the Constitution,* Colex, [ebook], 2024.

Ruiz Miguel, C., "The third generation of fundamental rights", *Journal of Studies Politicians*, n. 72, 1991, pp. 301-312, (available at: https://www.cepc.gob.es/sites/default/files/2021-12/16657repne072302.pdf).

Sanchez Barroso, B., *The precautionary principle in Spain: clarifications on paper of public powers in the face of risk in a constitutional State*, Congress of Deputies, Monographs No. 106, (online version available at https://app.congreso.es/est_ppio_precaucion/).

Sandel, M., "The case against perfection", *The Atlantic monthly,* vol. 293, n. 3, 2004, pp.50-62,(available at: https://cyber.harvard.edu/cyberlaw2005/sites/cyberlaw2005/images/Case_Again st_Perfection.pdf) .

Sententia, W., "Neuroethical Considerations. Cognitive Liberty and Converging Technologies for Improving Human Cognition", *Annals of the New York Academy of Sciences*, vol. 1013, no. 1, pp. 221-228.https://doi.org/10.1196/annals.1305.014 .

Sieira Mucientes, S., "The free development of personality as a fundamental right General freedom (self-determination): euthanasia and abortion in the Constitutional Court rulings 19/2023 and 44/2023",*Journal of the Cortes Generales*, n. 116, 2023, pp. 261-314, (available at:https://orcid.org/0000-0002-0595-6832)

Villarino Marzo, J., "Fourth generation of rights: reflections on the freedom of expression on the internet",*Journal of the Cortes Generales*, no. 100-101-102, 2017, p. 47-99.

Zagrebelsky, G.,*The ductile law: Law, rights, justice*, pp. 172, 182 and 185.

Zuñiga-Fajuri, A., et al.., "Neurorights in Chile: Between neuroscience and legal science", Developments in Neuroethics and Bioethics, vol. 4, 2021 pp. 165-179, https://doi.org/10.1016/bs.dnb.2021.06.001 .

INTERNET RESOURCES

Ienca, M., and Vayena, E., "Cambridge Analytica and Online Manipulation",*Scientific American*, vol. 30, New York, (available at: https://www.scientificamerican.com/blog/observations/cambridge-analytica-andonline-manipulation/).

Bostrom, N.,*Human Reproductive Cloning from the Perspective of the Future*, 2002, (available in:https://nickbostrom.com/views/cloning).

Díaz Dorronsoro, J., "How far are we, scientifically, from reading the thoughts",*The Conversation*, February 18, 2024, (available at: https://theconversation.com/a-que-distancia-estamos-cientificamente-de-leerlos-pensamientos-22282).

Farahany, N., "Nita Farahany on the neurotechnology already being used to convict criminals and manipulate workers", interview by Rodriguez, L., The *80,000 Hours Podcast*, December 7, 2023, (available at https://80000hours.org/podcast/episodes/nita-farahanyneurotechnology/#top (Last accessed May 29, 2024).

Zúñiga-Fajuri, A., et. al., "Neurorights? Reasons for not legislating",*Ciper,*11 of December 2020, (available at:

https://www.ciperchile.cl/2020/12/11/neuroderechos-razones-para-nolegislar/#_ednref3 .; last accessed 6 April 2024).

Ignatieff, M., "Human Rights: The Midlife Crisis", *Foreign Policy*, n. 70, 1999, (available at:https://www.politicaexterior.com/articulo/derechoshumanos-la-crisis-de-los-cincuenta/).

Ignatieff, M., "Human Rights as Politics", *The tanner lectures on human values* [delivered at Princeton University April 4-7 2000] p. 300, (available at: https://tannerlectures.utah.edu/_resources/documents/a-to-z/i/Ignatieff_01.pdf).

Barrio, M., "The Digital Bill of Rights of Spain", Public Writing, n. 135, 2022, (available in https://escriturapublica.es/la-carta-de-derechos-digitales-deespana-por-moises-barrio-andres/ ; last consulted on 12/02/2024).

Neurorights Foundation, mission, [page web] https://neurorightsfoundation.org/mission .

Neurorights Foundation [website],https://neurorightsfoundation.org/ .

Presno Linera, MA, "Minimal notes on the general theory of human rights" fundamental rights in the Spanish Constitution. The horizontal effectiveness of fundamental rights", *The right and the wrong side*[[blog entry], March 15, 2021, (available at: https://presnolinera.wordpress.com/2021/03/15/apuntesminimos-sobre-teoria-general-de-los-derechos-fundamentales-en-laconstitucion-espanola-18-la-eficacia-horizontal-de-los-derechos-fundamentals/).

*Wi*sear [web page], (available at:https://www.wisear.io/ , last accessed on May 27 (from 2024).

AEPD "Neurodata and neurotechnology: privacy and protection of personal data", *AEPD*,(available at:https://www.aepd.es/prensa-y-communication/blog/neurodata-and-neurotechnology-privacy-and-protection-of-personal-data , last accessed May 27, 2024).

Payán Ellacuria, E., "The neuro-rights debate reaches the courts: two rulings pioneers in Chile and Spain", *The conversation*, September 18, 2023, (available at:https://theconversation.com/el-debate-de-los-neuroderechosllega-a-los-tribunales-dos-sentencias-pioneras-en-chile-y-espana-213405).

Tasioulas, J. The inflation of concepts,*Aeon*, January 29, 2021, (available at: https://aeon.co/essays/conceptual-overreach-threatens-the-quality-of-publicreason).

Livelly, S.B., "Market Analysis: Neurotechnology,"*The Neurorights Foundation*, 2023, (available in https://www.canva.com/design/DAFKWDyTHH0/h5RgsTiQ35zWCh2IiiebSA/view?utm_content=DAFKWDyTHH0&utm_campaign=designshare&utm_medium=link&utm_source=publishsharelink#1 ; last accessed May 28, 2024).

Rodrigues, R., "Principles and approaches in ethics assessment: dual use in research", *Stakeholders Acting Together on the Ethical Impact Assessment of Research and Innovation - SATORI*, 2015, (available inhttps://satoriproject.eu/media/1.g-Dual-use-in-research.pdf).

STATEMENTS, REPORTS AND DOCUMENTS FROM INTERNATIONAL ORGANIZATIONS

Universal Declaration of Human Rights.

Universal Declaration on Bioethics and Human Rights.

European Commission, Communication on the use of the precautionary principle (COM/2000/0001 final),*European Commission*, 2000.

Bioethics Committee of Spain,*Report of the Bioethics Committee of Spain on the Draft Digital Bill of Rights*, 2021, p. 9, (available at: https://comitedebioetica.isciii.es/wp-content/uploads/2023/10/Informe-CBEsobre-el-Borrador-de-Carta-de-Derechos-Digitales.pdf).

UN Human Rights Council,*Resolution of October 6, 2022 of the Human Rights Council*, A/HRC/RES/51/3, (available at: https://undocs.org/Home/Mobile?FinalSymbol=A%2FHRC%2FRES%2F51%2F3&Language=E&DeviceType=Desktop&LangRequested=False ; last accessed May 31, 2024).

Council of the European Union,*The Leon Declaration on European Neurotechnology: a person-centred and human rights-based approach*, October 2023, (available in: https://spanish-

presidency.consilium.europa.eu/media/5azj0e2h/declaraci%C3%B3n-dele%C3%B3n.pdf).

International Bioethics Committee, *Report on the Ethical Issues of Neurotechnology*, UNESCO, Paris, 2022, (available at:https://doi.org/10.54678/QNKB6229).

OECD, *Neurotechnology Toolkit*, 2024, (available in : https://www.oecd.org/health/emerging-tech/neurotech-toolkit.pdf).

OECD, *Recommendation of the Council on Responsible Innovation in Neurotechnology*, of 11 December 2019, OECD/LEGAL/0457, 2022, (available at: https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457).

UNESCO, *Universal Declaration on Bioethics and Human Rights*, 2005.

UNESCO, *Recommendation on the Ethics of Artificial Intelligence*, 2022, p. 37, (available in:https://unesdoc.unesco.org/ark:/48223/pf0000381137_eng)

UNESCO, *Towards a draft text of a recommendation on the ethics of neurotechnology* [working document], 2024, (available at: https://unesdoc.unesco.org/ark:/48223/pf0000389438).

UNESCO, *Unveiling the neurotechnology landscape: scientific advancements innovations and major trends*, 2023,https://doi.org/10.54678/OCBM4164 .

University of Deusto, *Deusto Declaration on Human Rights in Digital Environments*, sf, (available at:https://www.deusto.es/es/inicio/privacidad/declaraciondeusto-derechos-humanos-en-entornos-digitales ; last accessed April 6, 2024).

UN, "Foundations of International Human Rights Standards", *UN*, [page web], (available at:https://www.un.org/es/about-us/udhr/foundation-ofinternational-human-rights-law , last accessed June 5, 2024).

STUDIES, REPORTS AND OTHER SCIENTIFIC RESOURCES[203]

Achiakh, Y., and Sarda Dutilh, L. "Industry News - Apple patents a next-generation AirPods Sensor System", *Wisear*, July 27, 2023, available at

[203]Given the relevance of knowledge of the state of scientific and neurotechnological advances for this work, all scientific studies and reports, as well as Internet resources, on neurotechnologies and the effects and uses they are having are included in a specific section.

https://www.wisear.io/posts/industry-news-apple-patents-a-next-generationairpods-sensor-system , last accessed May 27, 2024).

Benchetrit, Y., Banville, HJ, and King, JR, "Towards real-time decoding of images of brain activity",*Goal,*October 18, 2023, (available at https://ai.meta.com/blog/brain-ai-image-decoding-megmagnetoencephalography/).

Cook, M., et al., "How I became myself after merging with a computer: Does human-machine symbiosis raise human rights issues?"*Brain Stimulation*, vol. 16, 2023, pp. 783-789,https://doi.org/10.1016/j.brs.2023.04.016 .

Darby, R., and Pascual-Leone, A., "Moral Enhancement Using Non-invasive Brain "Stimulation",*Frontiers in Human Neuroscience*, vol. 11, n. 77, 2017, https://doi.org/10.3389/fnhum.2017.00077 .

Genser, J., et. al., "Safeguarding Brain Data: Assessing the Privacy Practices of Consumer Neurotechnology Companies"*Neurorights Foundation*, 2024, (available in: https://www.perseus-strategies.com/wpcontent/uploads/2024/04/FINAL_Consumer_Neurotechnology_Report_Neurori ghts_Foundation_April-1.pdf).

Hain, DS, et al.,*Unveiling the Neurotechnology Landscape Scientific Advances Innovations and Major Trends*, UNESCO, Paris, 2023, (available at: https://doi.org/10.54678/OCBM4164).

Inchingolo, R., et al. (eds.)*A closer look at scientific advances March 2023*, Human Brain Project, 2023 (available athttps://sos-ch-dk-2.exo.io/public-websiteproduction-2022/filer_public/6f/70/6f706305-a2e3-45b8-a42b-dfb476222a6a/230413_hpb22_digital.pdf).

Inchingolo, R., Mendes, H., Vincenz-Donnelly, L., Zekert, P., in Vincenz-Donnelly, L., Zekert, P. (eds.),*A closer look at scientific advances March 2023*, Human Brain Project, 2023 (available athttps://sos-ch-dk-2.exo.io/public-websiteproduction-2022/filer_public/6f/70/6f706305-a2e3-45b8-a42b-dfb476222a6a/230413_hpb22_digital.pdf).

Information Commissioner's Office."ICO tech futures: neurotechnology"*Information Commissioner's Office*, 2023 (available in:https://ico.org.uk/about-the-

ico/research-reports-impact-and-evaluation/research-and-reports/technologyand-innovation/ico-tech-futures-neurotechnology/).

Innovate Forge, “Meta's AR wristband”,*Medium*[web article], March 1, 2024, (available in: https://medium.com/@InnovateForge/metas-ar-wristband-12eae52bae13).

Mann, J., “Neuralink's brain-chip implant malfunctioned, and the company reportedly considered removing it from its human patient”,*Business Insider*, May 9, 2024, (available at:https://www.businessinsider.com/neuralink-weighedremoving-patient-brain-chip-implant-after-malfunction-report-2024-5 , last accessed May 28, 2024).

Mendes, H., et al. (eds.),*Human Brain Project: Spotlights on major achievements*, Human Brain Project, 2023, (available at:https://sos-ch-dk-2.exo.io/publicwebsite-production-2022/filer_public/74/94/74948627-6a92-4bed-91e0- 3fab46df511d/hbp_spotlights_achievements_2023.pdf).

Mitchell P., “Assessment of Safety of a Fully Implanted Endovascular Brain-Computer Interface for Severe Paralysis in 4 Patients: The Stentrode With Thought-Controlled Digital Switch (SWITCH) Study”,*JAMA Neurology*and, vol. 80, no. 3, 2023, pp. 270-278, doi:10.1001/jamaneurol.2022.4847.

Neuralink (https://neuralink.com/ , last accessed on May 27, 2024) and De la Prida, L., “Elon Musk’s brain implant is not the first, but it is less invasive and more efficient than others”, interview by Teresa Guerrero,*The World*, January 30, 2024, available athttps://www.elmundo.es/ciencia-ysalud/salud/2024/01/30/65b90966e4d4d8e57c8b45cd.html , last accessed April 1, 2024).

Portillo-Lara, R., et al., “Mind the gap: State-of-the-art technologies and applications for EEG-based brain–computer interfaces”,*APL Bioengineering,*vol. 5, n. 3, 2021, pp. doi:https://doi.org/10.1063/5.0047237 .

Royal Society,*iHuman Blurring lines between mind and machine*, 2019, p. 49, (available in:https://royalsociety.org/-/media/policy/projects/ihuman/reportneural-interfaces.pdf).

Tang, J., et al., “Semantic reconstruction of continuous language from non-invasive brain recordings”, *Nature Neuroscience*, vol. 26, 2023, pp. 858-866 (https://doi.org/10.1038/s41593-023-01304-9).