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THE REGULATION OF NEURO-RIGHTS IN THE LIGHT OF TRANSHUMANISM. THE RIGHT TO FAIR ACCESS TO COGNITIVE ENHANCEMENT IN LATIN AMERICA.

Master's Thesis

Law and Technology

Supervisor: Maria Claudia Solarte Vasquez

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ABSTRACT

Since 2017, two groups of neuroscientists have been advocating for the introduction of neurorights as a new category of human rights. These rights are aimed to protect the human brain from the risks that the advances of neurotechnologies might imply: erasing and rewriting of human emotions, desires, memories and behaviors, as well as, cognitive enhancement. Experts from different disciplines have warned about the theoretical and practical limitations to legislating neurorights. The issues encompass difficulties from extrapolating neuroscientific concepts to the legal realm and limiting their scope, to the contradictions between each neuroright to others, specially the right to fair access to cognitive enhancement against each of the rest of the rights, notwithstanding, their lobbying and legislation is rapidly advancing, specially in Latin America having Chile as the first country to approve the integration of neurorights in their Constitution in October 2021. Aside from Spain, Mexico, Brazil and Argentina are the only countries in the world with a neuroprotection agenda so far. Although specialists have quickly addressed several aspects from neurorights, still little attention has been drawn to the right to neuroenhancement, which is the basis of the dominant initiative in the region, as a premise built upon Transhumanism, therefore, likely to be afflicted by the same preconceptions towards the notions of cognition, mind, negative emotions, the deification of rationality and its non-existent distinction between brain and mind. This work compares the regulatory approaches of neurorights in Latin America, more specifically the right to fair access to cognitive enhancement and its different scopes in the jurisdictions from the region. On the other hand, it uncovers the transhumanist biases towards the right to neuroenhancement, and the reasons to remove it from the current Latin America's neuroprotection agendas.

Keywords: Neurorights, Cognitive Enhancement, Transhumanism, Cognition

INTRODUCTION

"*No, I repeat, there can never be such a thing as a writ of habeas mentem. But there can be preventive legislation—an outlawing of the psychological slave trade, a statute for the protection of minds against the unscrupulous purveyors of poisonous propaganda, modeled on the statutes for the protection of bodies against the unscrupulous purveyors of adulterated food and dangerous drugs.*"[1]

On the one hand, Ienca and Andorno[2], and on the other, the Morningside Group[3] proposed in 2017 the incorporation of a new category of human rights that protects individuals against the unprecedented possibilities of neurotechnology to access, collect and share brain information as well as manipulate its mechanisms, thus, the human emotions, desires, intentions and behaviors. These new rights are known as Neuro-Rights and they cover the rights to cognitive liberty, mental privacy and consent, psychological continuity, personal identity, free will, protection from algorithm bias and equal access to cognitive augmentation.

However, experts from different disciplines warned about the theoretical and practical limitations to legislating on neurorights.[4] The NeuroRigths Initiatives' raise concern on the lack of delimitation of key concepts, such as mind and brain[5], which makes legal definitions difficult to set. Moreover, non-therapeutic applications, like entertainment, lead to problematic scenarios when talking about criminal or civil liability[6], while possible clinic applications supported by many years of research might be at risk to get banned[7]. Furthermore, neurorights seem to be contradictory to each other.[8] For example, a person who enhances their cognitive capabilities might sacrifice their psychological continuity, thus, the right of protection to their personal identity. The same person might want to use tools that enhance social skills and can detect emotions with the help of others' brain data, hence, they might be violating their right to mental privacy.

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[1] Huxley, A. (2000). Brave New World. New York: RosettaBooks LLC, 85.
[2] Ienca, M. and Andorno, R. (2017). Towards new human rights in the age of neuroscience and neurotechnology. *Life Sciences, Society and Policy*, 13 (5), 1-27.
[3] Yuste, R. *et al.* (2017). Four ethical priorities for neurotechnologies and AI. *Nature* 551, 159-163.
[4] Zúñiga-Fajuri, A. *et al.* (2021). Neurorights in Chile: Between neuroscience and legal science. *Developments in Neuroethics and Bioethics,* 4, 170-172.
[5] Ibid, 171.
[6] Ienca and Andorno (2017), *supra*, 21.
[7] Ruiz, S. *et al*. (2021). Negative effects of the patients' rights law and neuro-rights bill in Chile. *Revista Médica de Chile*, 149, 445.
[8] Siqueiros Fernández, E. *et al.* (2022). Neuro-Rights and Ethical Ecosystem: The Chilean Legislation Attempt. In: In: López-Silva, P. and Valera, L. (eds.) *Protecting the Mind. Challenges in Law, Neuroprotection and Neurorights.* Cham: Springer, 136.

The discussion on neurorights is far from being exhausted[9], notwithstanding, regulations and lobbying[10] on the matter seem to be imminent, mostly in Latin America as the amendments and bills coming up in the region show. Chile became the first country that integrated a protection to Neurorights in their Constitution in October 2021[11]. A bill that follows the Morningside Group's initiative and proposed rights is in a second round of discussion in the Chilean Senate. Similar bills that amend criminal law and personal data protection law have been submitted this year in Argentina and Brazil, respectively. Lastly, a Commission dependent on the Data Protection Authority in Mexico issued soft law on digital rights including neurorights.

Aside from neurorights' conceptualization and harmonization issues, what they intend to guarantee and the risks that they are meant to protect from, are ambiguous and some of them will probably never exist (e.g. mind reading)[12]. This is true especially for the right to equal access to cognitive augmentation. The equalitarian access to Brain-Internet interfaces, brain implants that suppress fear or pain, or technology that boost the decision-making and judgment processes of inmates are not only trending topics in science fiction but actual possibilities according to the transhumanist paradigm[13], which includes the advocacy for such a right[14] [15].

Having said this, researching examples of regulations on neurorights is a chance to examine their scope in the applicable jurisdictions and contribute to the academic discussion on the topic. This work will compare the Latin American approaches to regulation of Neurorights with special emphasis on the right to equal access to cognitive augmentation. Whereas, this study will demonstrate that such an engagement for lawmakers is prone to fail, if it is gripped to transhumanist ideals that entail biased conceptions on the mind, cognition and neurotechnologies.

The first section sets the background for Neurorights and cognitive augmentation. These concepts are needed to understand the foundations for the creation and defense of each

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[9] Bublitz, J. (2022), Novel Neurorights: From Nonsense to Substance. *Neuroethics,* 15 (7), 12.
[10] Ibid, 1.
[11] McCay, A. (2022). Neurorights: the Chilean constitutional change. *AI & Society*, 2022,1.
[12] Zúñiga-Fajuri *et al.* (2021), *supra nota*, 5, 171.
[13] Diéguez, A. (2017). *Transhumanismo. La búsqueda tecnológica del mejoramiento humano.* Barcelona: Herder, 57.
[14] Ienca and Andorno (2017), *supra nota*, 5, 5.
[15] Yuste, R., Columbia University Professor and Gil, D., IBM Research Director. Tener un sensor en la cabeza será de rigor en 10 años, igual que ahora todo el mundo tiene un teléfono inteligente. El País. 5 January 2022. Author's interview. Retrieved from: https://elpais.com/ciencia/2022-01-05/tener-un-sensor-en-la-cabeza-sera-de-rigor-en-10-anos-igual-que-ahora-todo-el-mundo-tiene-un-telefono-inteligente.html, 15 October 2022.

neuroright. The second section will briefly describe the development of each neuroright and the key concepts on them. Neurorights are interrelated and their definitions are important to discern the reasons to either regulate or not the right that is treated in this work. The third section compares the integration of the Neurorights Initiative in Chilean, Brazilian, Mexican and Argentinian law. Aside from Spain, these countries are the only ones in the world that have integrated neurorights in their regulatory agenda so far. The last section discusses the influence of the transhumanist account in the legal concepts of cognition, mind and neuroenhancement and demonstrates that the inherent biases in them would make it rather problematic to keep lobbying and integrating this right as a rule in the treated Latin American jurisdictions at least.

Whether or not most of the novel neurorights pass the minimum criteria to create new rights[16], or that they already covered by human rights law and/or privacy law[17], they are already part of the agenda in several countries and international institutions[18]. Before getting ready to remote access to all world's regulations via brain-computer interfaces for tomorrow's legal world[19], first, it is compulsory to address from an interdisciplinary perspective what actually is being regulated.

[16] Bublitz (2022), *supra nota*, 6, 7.
[17] Zúñiga-Fajuri *et al.* (2021), *supra nota*, 5, 171.
[18] Yuste, R., *et al*. (2021). It's time for Neuro-Rights. New Human Rights for the Age of Neurotechnology. *Horizons Journal of International Relations and Sustainable Development*, 160.
[19] Susskind, R. (2017). *Tomorrow's Lawyers. An Introduction to Your Future.* (2nd ed.) Oxford: Oxford University Press, 192.

1. LAW AND NEUROTECHNOLOGY

Neurorights antecedents can be traced back to the development of the philosophical and political-legal concepts of thought, conscience, privacy, mental integrity and personal identity[20]. Such a conceptual development is the consequence to a great extent of the intersections between neurosciences, ergo, neurotechnology and law[21]. Neurotechnology and law have more to do each other than it is usually thought, "while neuroscience [and neurotechnology] studies the brain processes that underlie human behavior, legal systems are quintessentially concerned with the regulation of human behavior"[22]. Laws prohibit, enforce or allow certain human actions through norms, while neurosciences helps to understand what lies behind our apparent free and self-conscious decisions[23].

Although studies that scrutinized the relations between conduct and brain appeared rather late[24] - excluding the "digressions of phrenology"[25] - Phineas Gage's case and other similar cases where brain damage was involved and that happened to be studied back[26] in the second half of the 19th century, exposed not only the foundational importance of the human brain in language, perception and motricity[27] but also that there are systems dedicated specifically to reasoning and that they impact the person in their individual and social spheres[28].

This chapter intends to give an overview of law and neurotechnology by describing the object of study of the relatively new field called neurolaw, the state of the art in neurotechnology and the main aspects of the transhumanist account on neuroenhancement.

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[20] Ienca and Andorno (2017), *supra nota*, 5, 3.
[21] Sommaggio, P. (2022). Neuroscience, Neurolaw, and Neurorights. In: López-Silva, P. and Valera, L. (eds.) *Protecting the Mind. Challenges in Law, Neuroprotection and Neurorights.* Cham: Springer 73.
[22] Ienca and Andorno (2017), *supra*, 5.
[23] D'Aloia, A.(2020) Law Challenged. Reasoning About Neuroscience and Law. In: D'Aloia, A. And Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 18.
[24] Damasio, A. (1994). *Descartes' Error. Emotion, Reason, and the human brain.* United States of America: Penguin Books, 12.
[25] D'Aloia (2021), *supra*, 7.
[26] Damasio (1994), *supra*, 10.
[27] Ibid.
[28] Ibid.

1.1 The state of the art in Neurotechnology

Neurotechnology comprises a wide variety of technologies developed to observe, measure, control and even improve the neurological system and its functions. In fact, "neurotechnologies" (instead of "neurotechnology"), is the term often used in the reviewed literature. These technologies make use of previous and advanced techniques to approach the challenges that neuroscience, medicine, biomedical engineering and other sciences face to understand the brain. At the same time, neurotechnologies cannot be taken independently from their field of application since they are being developed within them and most of the time by the specialists of those fields. Keeping track of all these advances is not possible since their applications are very bast and they vary from methods that help medical specialists in their monitoring or decision-making to the development of drugs for mental disorders to devices that support specific neurological treatments.[29]

Non-invasive techniques help to record and/or stimulate the brain from the outside without the need of any clinical intervention, while the invasive techniques do require the physical intervention through surgery in order to implant electrodes that record and/or stimulate the neurological system. Among the techniques to record the brain activity can be found the electroencephalogram (EEG) which is the oldest non-invasive one, the functional Magnetic Resonance Imaging (fMRI) that measures the blood flow of the brain, the functional near-infrared spectroscopy (fNIRS) and implantation of microneedles which is an invasive procedure where small electrodes are inserted in the cerebral cortex. On the other hand, the transcranial electrical stimulation (tES), transcranial magnetic stimulation (TMS) and Focused Ultrasound (FUS) are non-invasive techniques that use electrical, magnetic and infrared light pulses respectively to stimulate the brain through either the scalp, eyes or nose and they are used to improve perception, learning and memory. Whereas, deep brain stimulation (DBS) is the famous invasive procedure that consists in implanting electrodes that substitute neurostimulators and it is used in the treatment of Parkinson's disease or epilepsy, for example.[30]

Psychoactive drugs used to treat neurological disorders belong to the brain stimulators category as well. Methylphenidate, modafinil, donepezil, fluoxetine and amphetamines are common drugs

[29] De Albuquerque, V., Athanasiou, A. and Ribeiro, S. (2020). *Neurotechnology. Methods, Advances and Applications.* Stevanage: Institution of Engineering and Technology, 1-2.
[30] Iberdrola (2020). *Neurotechnology. How to reveal the secrets of the brain?* Retrieved from https://www.iberdrola.com/innovation/neurotechnology , 15 March 2022.

used to treat mental disorders such as Alzheimer, dementia and depression, Attention Deficit Disorder (ADD) and narcolepsy. They assist in mood enhancement, memory loss, concentration, wakefulness, assertiveness and sociability. However, they represent a risk for undesired secondary effects that convey behavioral alterations, changes in the self-perception and personal autonomy.[31]

On the other hand, some of the most recent applications of neurotechnologies can be found in neuronal biofeedback that employs EEG or fMRI in real time to manipulate central nervous system's functions such as heartbreak, neuropharmacology which helps to observe how certain substances interact with the neurological system, neuroprostheses, brain-computer interfaces (BCI) and optogenetic implants that enable the manipulation of neural tissues with focused light and which projection is aimed for neuroenhancement, memory stimulation and manipulation of memories by 2040.[32]

As of today, invasive BCIs have supported many people with their treatments. For instance, they have assisted patients of Parkinson's diseases in regaining mobility and people with damaged or missing limbs, to feel heat or cold. They have helped a patient with Amyotrophic lateral sclerosis to write, send emails and use search engines. In Brazil's 2018 Soccer World Cup, a tetraplegic person gave the opening kick with the support of a robotic exoskeleton[33]. A Swedish team led by a Mexican neuroscientist achieved to connect a robotic arm to the bone and its peripheral neurons which facilitates a more independent movement and sensation than the traditional prostheses[34]. Whereas, transcranial magnetic stimulation (TMS), approved by the FDA, has been used to treat tremor, Parkinson's disease, dystonia and obsessive-compulsive disorder.[35]

Current neurotechnologies' applications are not limited to clinical use such as the treatment of Alzheimer, schizophrenia, stroke, post-traumatic stress disorder, depression, addiction or other mental illnesses and neurological diseases only[36]. The extra-medical applications in the judiciary, military and consumer industry sectors have called public and academic interest in the last 20 years[37]. Specific uses of neurotechnologies include pattern recognition, computational

[31] Sommaggio, P. and Mazzocca, M. (2020). Cognitive Liberty and Human Rights. In: D'Aloia, A. And Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 98-99.
[32] Ibid, 98.
[33] Yuste (2021), *supra nota*, 7, 156.
[34] Diéguez (2017), *supra nota*, 5, 54.
[35] Ienca and Andorno (2017), *supra nota*, 5, 5.
[36] Yuste *et al.* (2021), *supra*, 155.
[37] Ienca, M. (2021). On Neurorights. *Frontiers in Human Neuroscience,*15, 2.

intelligence, industrial engineering and robotics.[38] Moreover, companies and governments are developing devices and methods with the potential to allow people to communicate by thinking or deciphering other's thoughts with brain data. For example, mice's amnesia and their amigdala's functions have been researched and treated with optogenetics[39], while invasive BCIs have been used to control mice's and other animals' actions.[40]

Possibilities with BCIs are plenty, "what can be done with mice today could be done with humans tomorrow"[41]. For instance, scientists have been able to share images and words between two people located in different rooms using non-invasive BCIs. In 2018 the MIT Media Lab transcribed human thoughts into typed messaged and Neuralink has announced the development of a wireless implant that will link human minds to computer in order for enhancement purpose with the use of Artificial Intelligence[42]. Other projects led by public institutions and big tech companies have been or are focused on neuroenhancement as well, such as the Blue Brain Project, DARPA, Jülich research Center and Google Brain project[43].

On the other hand, there are today several ambitious projects whose scope goes beyond the medical spectrum. Some of them are the Connectome Project and the BRAIN initiative in the U.S., and the Human Brain Project in Europe. The former project was launched in 2009 and it's lasted 5 years, its objective was to fully identify and map the connection nets in the brain and their relation with genes, mental processes and behavior with the help of fMRI, Diffusion tensor magnetic resonance imaging (DTMRI) and Magnetoencephalography (MEG). The Brain Research through Advancing Innovative Neurotechnologies Initiative (BRAIN or BRAINI), whose one of its initiator was Rafael Yuste[44], was presented by Barack Obama in 2013 and it shares the European Brain Project goal, which is to decipher the brain structure in order to understand perception, attention, learning, memory, language, thinking and emotions.[45]

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[38] De Albuquerque, Athanasiou and Ribeiro (2020), *supra nota*, 4, 3.
[39] Cáceres Nieto, E., Diez García, J. and García García, E. (2021). Neuroethics and Neurorights. *Revista del Posgrado en Derecho de la UNAM*, 15, 49.
[40] Yuste *et al.* (2021), *supra nota*, 7, 157.
[41] Ibid.
[42] Ibid.
[43] Vita-More, N. (2019). History of Transhumanism. In: Lee, N. (Ed.), *The Transhumanism Handbook.* Los Angeles: Springer, 58.
[44] Yuste, R. (2017). *The Origins of the BRAIN Initiative: A Personal Journey.* Retrieved from: https://www.cell.com/cell/pdf/S0092-8674(17)31248-5.pdf, 732.
[45] Cáceres Nieto, E., Diez García, J. and García García, E. (2021). Neuroethics and Neurorights. *Revista del Posgrado en Derecho de la UNAM*, 15, 40-45.

Lastly, there are also neurotechnological projects that are focused to be used in the day-to-day devices and softwares and are funded by private big tech companies. The Facebook's "Brain to text" project started in 2017 and aims to build a non-invasive BCI that decodes human thoughts into words on a screen, the company is also developing a wristband that translates neural activity into intentions, gestures and motions in computers or robotic avatars. The "KernelFlow" device created in 2020 by the startup Kernel is a helmet that can map the brain activity with the accuracy and resolution that other devices in the market are not able to[46]. The Apple's XWave headset can read the customers' brainwaves, while Samsung and other companies are testing tabs and other wearable devices that control brain activity via EEG-based BCI[47]. To put it another way, the current applications of neurotechnologies are vast and have different levels of results. Their expansion beyond medicine into education, gaming, entertainment, transportation and the military are already overlapping with ethical concerns such as data security, transparency, fairness and well-being.[48]

On the contrary, future neurotechnological applications in medical and non-medical areas seem to be far from now but promising still and definitely a challenge in terms of equality, justice and law which is the reason behind the aims to protect mental privacy, integrity, identity and the guarantee to access the cognitive advances that they promise.

1.2 Neurolaw

The concerns that neuro-technological developments have raised in the clinical field, judicial system, and the military and entertainment industries have given place to new disciplines, such as neuroethics and neurolaw[49]. The intersections between neuroscience and law have impacted to a great extent the development of the ethical concerns that today are known as Neurorights[50]. A general overview of the evolution of these intersections and neurolaw's theses[51] and limits[52] can shed light on the understanding of what Neurorights attempt to protect.

[46] Yuste *et al.* (2021), *supra nota*, 10, 158.
[47] Ienca, and Andorno (2017), *supra nota*, 5, 4.
[48] Yuste *et al.* (2021), *supra nota*, 7, 159.
[49] Ienca (2021), *supra nota*, 10, 2.
[50] Ienca and Andorno (2017), *supra nota*, 5, 5-6.
[51] Ibid.
[52] Petoft, A. and Abassi, M. (2020). Current limits of neurolaw: A brief overview. *Médicine & Droit, 2020*, 34.

The contribution of neuropsychologists in criminal law is acknowledged to exist since 1990[53] and the term "neurolaw" was coined in 1991 and "born as part of biolaw and bioethical discourse"[54]. The collaboration between neuroscience and law has become more solid in the last 15 years[55]. However, it has to pass more than a century from the first serious discussions on the intersections between jurisprudence and brain science till what is know today as Neurolaw[56]. Four precedents can be summarized.

Firstly, the medico-legal dialogues held in the US at the end of the 19th century and the beginning of the 20th century were already focused on the discussion of the legal aspects of drug use for mental health treatment, brain damage, trauma effects, lie detection, the relation between criminal responsibility and psychic diseases and the difficulties to differentiate pathological from normal minds of criminals[57].

Secondly, what can be considered as the very first encounter between neurotechnology and law occurred with the influence of electroencephalography (EEG) in legal affairs since the middle of the 20th century, when brain electrical activity was finally feasible to measure on living humans[58]. For instance, some positive changes in legislation for epileptic patients were made, and EEG evidence helped in labor and civil disputes to determine brain injuries compensations and disability benefits[59].

Thirdly, the debates on modern psychosurgery as treatment for mental disorders and even as criminal treatment in several countries in the mid-twentieth century, when the "violent brain" was in vogue[60]. The most known example of this is the so-called prefrontal lobotomy which consisted in the removal of the connections of the frontal lobe that were supposedly linked to mental disorders. Although those practices have been diminishing with the increase of pharmacological treatments, they are still in use and under a legal debate that has not been fully resolved[61]. For example, by the sentence of the Italian Constitutional Court 281/2002 different psycho-chirurgical treatments (including the prefrontal lobotomy) were suspended until these are proven to be effective and that do not cause any damage in patient health.

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[53] Goodenough, O. and Tucker, M. (2010). Law and cognitive neuroscience. *Annual Review of Social Science*, 6, 62.
[54] D'Aloia (2020), *supra nota*, 3, 6.
[55] Goodenough and Tucker (2010), *supra*, 6.
[56] D'Aloia (2020), *supra nota*, 8, 6-7.
[57] Shen, F. (2016). The Overlooked History of Neurolaw. *Fordham Law Review*, 673-675.
[58] Ibid, 675.
[59] Ibid, 677.
[60] Ibid, 681.
[61] D'Aloia (2020), *supra nota*, 8, 7.

The gradual introduction of forensic neuropsychology in civil litigations in the 80s and 90s[62] is considered the fourth and direct precedent of neurolaw in literature because of the relevance of testimonies from neuropsychologists in trials including the use of neuroimaging technologies[63]. In *The People of the State of New York v. Herbert Weinstein*[64] in 1992, one of the first cases that demonstrates the impact of brain images in a mental state construction[65], the defendant was accused of strangling his wife and making it to look like a suicide since he threw the body from a 12th floor afterwards. The defense offered a PET scan and an MRI that exposed a cyst in a meninge that hampered brain metabolism in areas associated with executive functions[66]. The evidence was accepted by the court for the analysis of the defendant's insanity[67].

In the following two decades the weight of Neurolaw in the academy would become noticeable, as well as, in courtrooms, specially in capital cases[68]. In 2009, in *Stankewitz v. Wong*[69], a death sentence was reduced to a life sentence without possibility of parole with the help of expert testimonies that presented two EEGs, one was conducted on defendant's at the age of 12. Along with the clinical history, it could be demonstrated child abuse and different disorders from childhood[70]. One year later, in *United States v. McCluskey*[71], offender's death penalty was rejected by the judge apparently persuaded by brain scans that showed considerable damage in frontal lobe and that diminished for the judge the level of culpability and mental skills to plan the crimes[72]. Lastly in the same year, after the admission of a QEEG as evidence in *City of MIami v. Nelson*[73], the sentenced to death was vacated since the scans indicated brain injury and impairment[74].

Years later a dramatic increase on the use of neuroscientific and neurotechnological data in criminal trials would left its mark in Neurolaw's constitution until today along with its

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[62] Shen (2016), *supra nota*, 13, 685.
[63] Ibid, 686-687.
[64] People v Weinstein (1992) 591 NYS 2d 715
[65] Desmoulin-Canselier, S. (2020). Another Perspective on "Neurolaw": The Use of Brain Imaging in Civil Litigation Regarding Mental Competence. In: D'Aloia, A. and Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 531.
[66] Rushing, S. (2014). The Admissibility of Brain Scans in Criminal Trials: The Case of Positron Emission Tomography. *Court Review*, 50, 62-63.
[67] Ibid, 63.
[68] Denno, D. (2015). The Myth of the Double-edged Sword: An Empirical Study of Neuroscientific Evidence in Criminal Cases. *Boston College Law Review*, 56 (2), 544.
[69] Stankewitz v. Wong, 698 F.3d 1163.
[70] Denno (2015), *supra*, 523.
[71] U.S. v. McCluskey, 954 F. Supp. 2d 1224.
[72] Denno (2015), *supra* 494.
[73] City of Miami v. Nelson, 186 So. 2d 535.
[74] Denno (2015), *supra,* 494.

institutionalization as academic field in the US[75], Europe and Latin America[76]. In an empirical study -considered the first systematic investigation on this topic[77]- it was studied how courts used neurotechnological and non-image neuroscientific tests as evidence in 800 criminal trials between 1992 and 2012 in the US[78]. The neurotechnological data was used in 541 cases[79]. Such an evidence included tomographic scans (CAT, PET and SPECT), Magnetic Resonance Imaging (MRI) and EEG[80] that were mostly provided on behalf of defendants ascribed with personality, behavioral and mental disorders[81]. In many cases, these ascriptions were not diagnosed but evidence was presented along with expert testimony to try to demonstrate such mental or behavioral disorder mostly caused by brain damage as a result of substance abuse, accidents and/or violence[82]. The results showed that the purpose of presenting evidence was mostly (60%) to prove brain damage or head injury, followed by low IQ (15%) and others. Whereas, almost 30% involved with diagnosis substance abuse, 15% lobe(s) dysfunction and 10% depression. Lastly, the analysis of the study concluded that a) courts urged the defense to investigate their clients' mental health thoroughly and present relevant evidence in case of any sign mental illness, b) in failure to do this, attorneys were penalized because of lack of fulfilling the minimum defense standards, c) in very few cases dangerousness was assessed with the provided evidence, rather, d) it can be assumed that imaging and non-imaging evidence help to reduce sentence[83].

Today, the rapid development of neurotechnology can collect and quantify in a rather sophisticated way what lawyers and brain scientists were discussing more than a century ago[84]. Neuro-imaging and other tools have the potential to be used as evidence in criminal cases to support responsibility assessments, application of punishment, rehabilitation and/or the evaluation of risks of recidivism, as well as, assessing the subject's capacity to contract or defensor's pain in order to calculate compensations better [85]. However, Neurolaw is still young

[75] Ienca (2021), *supra nota*, 10, 2.
[76] García-López, E., *et al.*. (2019) Neurolaw in Latin America: Current Status and Challenge. International Journal of Forensic Mental Health, 18 (3), 2.
[77] Denno (2015), *supra nota*, 14, 503.
[78] Ibid, 498.
[79] Ibid, 548.
[80] Ibid, 548.
[81] Ibid, 504.
[82] Ibid.
[83] Ibid, 542-544.
[84] D'Aloia (2020), *supra nota*, 8, 8.
[85] Ienca and Andorno (2017), *supra nota*, 5, 5.

and it does have its technical limitations in legal practice and due to similar limitations that experimental neurosciences have[86].

In a more critical analysis of empirical studies on neuroscientific evidence offered in trials in North America and Europe between 2000 and 2012[87] points out that courts are not ready yet to be able to really assess the utility of specific neuroscientific data, specially because they fail, as well as it happens with reductionist assessments, that the correlation that a brain image could provide is not the causation of the hypothetical or presumed motive behind certain criminal act[88]. Furthermore, the analysis showed that imaging evidence was less important than classical behavioral evidence provided by psychiatric and psychological tests[89] and that neuro-evidence in trials is currently doing "nothing more in most cases than to provide a rationalization for a result the judge wishes to reach on other grounds or to avoid responsibility for having to make the hard decision directly by relying on the expert"[90]. Nonetheless, the investigation concludes that neuro-evidence in courtrooms has the potential to improve mental state categorization, administration of justice and legal determination of offenders' competencies[91]. In regards of last notion, a study of civil law cases where mental incompetence has been claimed between 2007 and 2016 in France and the US[92] stated that the assumption that judges are 'fascinated' by neuro-imaging evidence is not totally true since more experienced jurors are still independent when making the final decision[93].

Whereas the reviewed literature indicates that most of the developed countries in the west have mechanisms to process or reject neuroscientific evidence, Chile - the only jurisdiction that has integrated Neurorights in their legislation[94] - and the rest of Latin American still have a long way ahead. A first study on this matter in the region found out that Neurolaw academic discussion started just in the mid-2000s[95] in spite of its urgent need due to the crescent violence rates[96]. On the other hand, the use of neurotechnological evidence in courts occurred a bit before in the 90s. EEG, MRI, SPECT and structural computed Tomographies (CT) were offered in a few trials in

[86] Petoft and Abassi (2020), *supra nota*, 10, 34.
[87] Morse, S. J. (2020). Neuroscience and Law: Conceptual and Practical Issues. In: D'Aloia, A. and Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 431-435.
[88] Ibid, 429.
[89] Ibid, 433.
[90] Ibid, 434.
[91] Ibid, 435.
[92] Desmoulin-Canselier (2020), *supra nota*, 14, 533.
[93] Ibid, 542.
[94] Yuste *et al.* (2021), *supra nota*, 7, 161.
[95] García-López *et al.* (2019), *supra nota*, 15, 261.
[96] Ibid, 262.

Colombia, Argentina, Mexico and Chile such as in the Pinochet's case where the former president was processed for human rights violations[97]. SPECT, CT and testimony were provided by his defense to claim dementia, however, he was deemed competent for trial[98]. The study analyzed the only 61 publications that were identified on the topic between 2004 and 2017, most of them from Argentina, Colombia and Mexico only. The paper concludes drawing attention to increase the number of experts that can analyze neuroscientific evidence and to focus in the creation of investigations ad-hoc to the region[99].

As it can be appreciated in the explanation above, there is not an specific focus from Neurolaw on what today could be considered rights of the brain or mind[100]. Nonetheless, it is feasible to deduct in the reviewed literature an indirect or direct involvement of the rights that the Morningside Group's and Ienca/Andorno's initiatives advocate for. For instance, some sort of psychological continuity and cognitive liberty can be identified behind the offender's competence and capacity surmise. Whereas, their protection against biases might be at risk when neuroscientific evidence and testimonies are improperly weighed up in the sentencing process.

As a matter of fact, Neurolaw, and specifically, the use of neurotechnology in law has been drawing attention from the ethical perspective since its beginnings. A first concern is the issue of "consent and coercion"[101]. Let's imagine that the invasive and/or non-invasive neurotechnology is used not only for evidence purposes in trials but as a way to determine recidivism and even openly to the public to predict criminality, it should be up to the subject to provide or not this kind of biometric information instead as a measure of monitoring either convicted or civil population. This issue also touches the principle of privacy[102] over personal information, if we consider the scenario where such scans and other neuro-data is used for purposes beyond trial evidence, e.g. for former or future employers of the released person.

Furthermore, the so-called "Brain Overclaim Syndrome" or the overestimation of neuro-evidence biased by the folk growing believe that the brain is the only cause of individual's behavior and actions[103] turns to be more critical than it seems when taking into account that brain

[97] García-López,*et al.* (2019), *supra nota*, 16, 270.
[98] Ibid.
[99] Ibid, 274-275.
[100] Ibid.
[101] Tortora, L. *et al.* (2020). Neuroprediction and A.I. in Forensic Psychiatry and Criminal Justice: A Neurolaw Perspective. *Frontiers in Psychology*, 11 (220), 10.
[102] Ibid, 8.
[103] Desmoulin-Canselier (2020), *supra nota*, 14, 530.

imaging technologies are never 100% accurate[104], they depend of expertise interpretation, and many of them are still in experimental phases and used as auxiliary for determining certain neurological conditions[105], rather than being served as legal evidence per se. Now, if decisions have to be taken with brain data at public scale and without 'curing' such a syndrome, biases are immanent[106]. It is relevant to add that aside from the ethical awareness given on the implications of free will (e.g. competence), and permissibility of neuroscientific evidence, the academic discussion on Neurolaw in its first decades focused on pharmaco-cognitive enhancement too and on the implications of neuroimaging in mind reading, pain and lie detection.[107]

1.3 Transhumanism and Bioenhancement

In a short story of the series Black Mirror, an ER doctor agrees to use a prototype brain implant provided by a private company. The device, which works along with a hairnet that is placed on patients' heads, allows him to access their symptoms, so he could deliver quicker and more accurate diagnoses. Although this is science fiction today, the head of the Morningside Group and one of the founders of the BRAIN initiative, Rafael Yuste, stated at the begining of this year[108] that given the accelerated advances in neurotechnology, brain sensors will become compulsory for the public in 10 years. They (neuroscientists) will make it possible to connect our brains to the internet, do what we do today with smartphones and get others' neural data access. Essentially, "we will become hybrids"[109]. The same discourse is present in most of Yuste's interviews, talks, academic presentations and debates available in the internet along with the urgence to protect our brains against the abusive uses of neurotechnologies.

A semi-hybrid human stage has already started if we think about some of the Morningside Group's theses on neurotechnologies, the million times average we touch our smartphones[110] along with the kind of input this information provides to the data processor, the $1.9 million a

[104] Tortora, *et al.* (2020), *supra nota*, 17, 11.
[105] Morse (2020), *supra nota*, 16, 438.
[106] Tortora, *et al.* (2020), *supra nota*, 17, 7.
[107] Ienca (2021), *supra nota,* 10, 2.
[108] Yuste, R., Columbia University Professor and Gil, D., IBM Research Director. Tener un sensor en la cabeza será de rigor en 10 años, igual que ahora todo el mundo tiene un teléfono inteligente. El País. 5 January 2022. Retrieved from: https://elpais.com/ciencia/2022-01-05/tener-un-sensor-en-la-cabeza-sera-de-rigor-en-10-anos-igual-que-ahora-todo-el-mundo-tiene-un-telefono-inteligente.html, 15 October 2022.
[109] Ibid.
[110] Yuste (2017), *supra nota*, 5, 3.

year spent in neurotechnology apps[111], the technological capacity to observe processes of brain image codification[112], and the huge public and private investments[113] put into research of fields that go beyond the therapeutic sector (see chapter 1.1). A next stage of hybridism is the imminent expansion of neurotechnologies to other human spheres[114] and the full integration between the brain and technology[115]. Such a perspective that supports NeuroRights initiative, is nothing else than transhumanism, which is the movement that, according to the last review of their "Transhumanist Declaration" "envisions the possibility of broadening human potential by overcoming aging, cognitive shortcomings, involuntary suffering, and our confinement to the planet Earth"[116]. In fact, BRAINI and the initiatives listed in previous sections aim to achieve all or several of these human potentials with applications that go beyond the therapeutic sphere. Neurosciences and neurotechnologies promise to solve the social issues that traditional humanities cannot, through direct and indirect modifying interventions[117]. These promises are:

a) Mind reading,
b) mood and personality alteration,
c) behavioral aspects changing,
d) memory modification and
e) cognitive enhancing.[118]

Transhumanism itself is a non-uniform conglomerate of philosophies, scientific and non-scientific postures[119] which aim is to serve as guide to the posthuman condition[120]. The techno-scientific stream of Transhumanism, which is the one taken for this work, is mostly based on two pillars: one is compounded by research and speculative theories in robotics, cybernetics, and IA; while the other consists of applications from biology, medicine, pharmacology and

[111] Sharp Brains (2019). *Trend: Consumers spent significantly more on digital brain health and neurotechnology apps*. Retrieved from: https://sharpbrains.com/blog/2019/05/24/trend-consumers-spend-significantly-more-on-digital-brain-health-and-neurotechnology-apps, 15 October 2022.
[112] Yuste *et al.* (2021), *supra nota*, 7, 159.
[113] Yuste *et al.* (2021), *supra nota*, *7*, 160.
[114] Ibid, 159.
[115] Yuste, R. (Lecturer). (2021). *The Brain Activity Map and Future Neurotechnology* [Video]. Retrieved from: https://www.youtube.com/watch?v=1gLBv9kgTt4, 15 October 2022.
[116] Cordeiro, J. (2019). The Boundaries of the Human: From Humanism to Transhumanism. In: Lee, N. (Ed.), *The Transhumanism Handbook.* Los Angeles: Springer, 77.
[117] Sommaggio, P. (2022). Neuroscience, Neurolaw, and Neurorights. In: López-Silva, P. and Valera, L. (eds.) *Protecting the Mind. Challenges in Law, Neuroprotection and Neurorights.* Cham: Springer, 81.
[118] Ibid, 73.
[119] Diéguez (2017), *supra nota*, 6, 21.
[120] Ibid, 18.

genetics[121]. Techno-scientific Transhumanism is a growing worldview which aims to generate debate, visionary foresight and awareness of the ethical and political issues related to the posthuman condition.[122] Moreover, human enhancement is one of the cores of transhumanist thought.[123] It encompasses improvements on cognitive and physical aspects with the help of artificial support, such as the capacity to avoid sickness or aging, improve perception, physical force or speed.

The Crispr method is a good example of biological enhancement and depiction from the transhumanist point of view.[124] This genetic method allows editing some parts of the DNA by replacing them with other segments[125], certainly, despite its experimental phase, it offers promising solutions to a wide variety of congenital and genetic disorders[126] with a non-expensive procedure and easily manipulated with trained specialists[127]. However, the experimentation with monkeys has returned only 20% of expected results[128]. Therefore, this and other genetic methods still keep raising concerns related to human genetic design, secondary effects, hereditary effects and public health.[129]

Conversely to such a scenario of uncertainty, transhumanist theorists defend the human experimentation of enhancing technologies and their potential application in sick and non-sick humans. Firstly, according to transhumanism, enhancement is a moral duty since not making use of it when available, would be unfair for potential receptors since they could live a more satisfactory and productive life. Secondly, since we have exploited resources to improve our cognitive and physical attributes (from caffeine to computers) through human history, using technological enhancers is the next expected step with no social resistance against it. Thirdly, bioenhancers will increase social equality between sick and non-sick people and eventually among everyone since the access to that technology would be as it was with TV or smartphones: sooner or later everyone will have access to them. Human enhancement will be eventually needed to balance machines' attributes as well. Fourthly, autonomous human improvement is better than waiting for the "genetic lottery" to decide. Lastly, from the transhumanist perspective

[121] Ibid, 25.
[122] Vita-More (2019), *supra nota*, 6, 52-58.
[123] Ibid, 58.
[124] Borbón Rodríguez, D. and Borbón Rodríguez, L (2021). NeuroRight to Equal Access to Mental Augmentation: Analysis from Posthumanism, Law and Bioethics. *Revista Iberoamericana de Bioética*, 7.
[125] Ibid.
[126] Diéguez (2017), *supra nota*, 6, 70.
[127] Ibid, 71.
[128] Ibid, 70.
[129] Borbón Rodríguez and Borbón Rodríguez (2021), *supra,* 8.

on human biology, since there is not such a thing as "human nature", therefore, there is no human dignity to protect.[130]

Talking about neuroenhancement or cognitive enhancement in particular, this refers to the modification of the normal functions of the mind in order to improve them through different procedures.[131] Cognitive enhancers can be drugs or devices that improve mental processes[132], such as memory, perception, attention or the alertness state. For instance, the Black Mirror doctor's story. Currently, drugs, invasive and non-invasive devices are mostly used for therapeutic purposes and others are being tested for commercial or other uses.[133] For instance, Adderall, the drug used to treat ADHD (see section 1.1), has been used in the school context with subjects without diagnoses as auxiliary to improve attention, thus, academic performance.[134] Whereas, implanted neural interfaces used only for medical conditions, such as depression, can have other potential commercial uses in healthy people.[135] Following brain projections and transhumanist ideals, such an implant can be used by the consumers to increase or decide when to experience happiness, or at least trigger the relevant neurotransmitters to generate that feeling. The hypothetical situation might be unfair for people (without depression) that cannot have a boost of happiness because they cannot afford it. The same technology might increase happiness but decrease other cognitive or emotional aspects, or even cause addiction, as research has shown[136].

On the other hand, the NeuroRights initiative follows the transhumanist trend by standing up for hybridization and equal access to cognitive augmentation[137]. This guarantee has been considered in literature the "door to the posthuman condition"[138]. However, it can even be argued that the full initiative, including the rest of the proposed rights (i.e. mental identity, agency, mental privacy and protection against biases), is marked by the transhumanist scope since rights are

[130] Diéguez (2017), *supra nota*, 6, 71-73.
[131] Palazzani, L. (2015). *Il potenziamento umano. Tecnoscienza, etica e diritto.* Italy: Giappichelli Editore, ix referenced in Fattibene (Fattibene, R. (2020). Self-Determination, Health and Equality: The Constitutional Protections for Cognitive Enhancement. In: D'Aloia, A. And Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 215).
[132] Tran, J. and Tran, D. (2015) (De)Regulating Neuroenhancement, *University Of La Verne Law Review* 37 (1), 181.
[133] Borbón Rodríguez and Borbón Rodríguez (2021), *supra nota*, 15, 7.
[134] Tran and Tran (2015), *supra nota*, 16, 191-193.
[135] Errigo, M. (2020). Neuroenhancement and Law. In: D'Aloia, A. and Errigo, M. C. *Neuroscience and Law. Complicated Crossings and New Perspectives*. Cham: Springer, 193.
[136] Tran and Tran (2015), *supra nota*, 16, 195.
[137] Borbón Rodríguez and Borbón Rodríguez (2021), *supra nota*, 15, 7-8.
[138] Ibid, 8.

technically executable only in a semi-hybrid or posthuman brain stage when emotions, behaviors and memory can be manipulated, the mind can be read and the brain is enhanced.

Last but not least, neuroenhancement encompasses boosting more than cognitive capacities. Aside from perception, attention or memory; judgment and decision-making are mostly related to the moral aspect of the mind. The latter form of enhancement focuses on the improvement of human morality by biotechnological means.[139] Theorists have stated that moral bioenhancement must be a duty if we thrive to face the challenges of the future (e.g. war) and there should not be any restriction for these kinds of applications since societies have always implore for such an aim.[140] In the realm of Neurolaw, it has been argued that moral bioenhancement should be compulsory for subjects that committed certain type of crimes[141] and a as a measure against crime recidivism[142]. The moral boost can be obtained from the management of negative emotions[143], particularly, aggressiveness[144].

Whether or not transhumanism arguments are refutable or if neurotechnologies can actually achieve such goals, it can be foreseen that neuroenhancement would generate a wide variety of new challenges mostly related to safety, coercion and fairness.[145] It can potentially generate inequality instead, over-demand, it would challenge the meritocracy idiosyncratic, generate loss of diversity[146] and along with it, be a threat to democracy[147].

[139] Salardi, S. (2020). When the 'Age of Science and technology' Meets the 'Age of Rights'. 'Moral' Bioenhancement as a Case Study. In: D'Aloia, A. and Errigo, M. C. *Neuroscience and Law*. *Complicated Crossings and New Perspectives*. Cham: Springer, 243.
[140] Ibid, 243-244.
[141] Ienca and Andorno (2017), *supra nota*, 5, 19.
[142] Levin, S. (2021). *Posthuman Bliss? The failed Promise of Transhumanism.* New York: Oxford University Press, 22.
[143] Ibid, 23.
[144] Ibid.
[145] Tran and Tran (2015), *supra nota*, 16, 186.
[146] Borbón Rodríguez and Borbón Rodríguez (2021), *supra nota*, 20, 9.
[147] Levin (2021), *supra*, 8.

2. INTRODUCTION TO NEURORIGHTS

Although ethical concerns on neurotechnologies exist since the 50's[148] of the previous century - probably even since the creation of electroencephalography more than 100 years ago[149] - focused attention to rights as branch of human rights or aligned with them has less than 20 years when the notion of cognitive liberty was promoted and developed as consequence of the debates on neuroimaging, cognitive enhancements and mind reading[150]. In the last decade, the cognitive liberty or self-determination passed from being considered a philosophical aspiration to a fundamental freedom and the basis of any other kind of freedom since it guarantees one's "sovereignty over their own mind"[151].

Despite the notions of freedom of thought, conscience, privacy, mental integrity and personal identity have been theorized for centuries[152], it can be considered that the right to cognitive liberty evolved in the fields of neurosciences and neurotechnology set up the path to the discussion and construction of other neurorights[153].

It was until 2017 that the term Neuro-Rights was introduced by the expert in emerging technologies, Marcello Ienca and the jurist specialized in bioethics, Roberto Andorno. In their proposal *new human rights in the age of neuroscience and neurotechnologies*[154] they analyzed on the one hand, the feasibility of new human rights applicable to the the protection of the human brain and mind content in the light of the advances in neurotechnology and, on the other hand, to what extent their concerns are covered by the UN's Universal Declaration of Human Rights (1948), the EU's Charter of Fundamental Rights (2000) and the UNESCO's Universal Declaration on Bioethics and Human Rights (2005). Ienca and Andorno identified four neurorights: right to cognitive liberty, mental privacy, mental integrity and psychological continuity[155], whereas Ienca defined neurorights "as the ethical, legal, social, or natural principles of freedom or entitlement related to a person's cerebral and mental domain; that is, the

[148] Schleim, S. (2021) Neurorights in History: A Contemporary Review of José M. R. Delgado's "Physical Control of the Mind" (1969) and Elliot S. Valenstein's "Brain Control" (1973). *Frontiers in Human Neuroscience* 15, 2.
[149] Ibid.
[150] Ienca, (2021), *supra nota*, 10, 2.
[151] Ibid.
[152] Ibid, 3-6.
[153] Ibid, 3.
[154] Ienca and Andorno (2017), *supra nota*, 5, 1-27.
[155] Ienca (2021), *supra nota*, 10, 3.

fundamental normative rules for the protection and preservation of the human brain and mind"[156].

In the same year, the Morningside Group set up a second initiative and the most known as of today due to their lobbying of neurorights across the globe. The group comprised by neuroscientists, neurology technicians, physicians, ethicists and machine-intelligence engineers[157], moved from a ethical-legal analysis (present in Ienca's and Andorno's initiative) to policy advocacy[158] by raising ethical concern about four areas that involve neurotechnology, proposing protection clauses for them and calling international institutions for attention on the matter.[159] The ethical areas they consider fundamental are: a) privacy and consent, b) agency and identity, c) Augmentation and d) Bias[160]. It is until a more recent development of their ideas exposed in an article from 2021 that they formally proposed five neurorights: right to identity, agency, mental privacy, fair access to mental augmentation and protection from algorithmic bias.[161]

As it can be seen both of the initiatives propose a different set of neurorights. What is more, there is no international consensus on what neurorights are or which one should be considered as such[162] since their legal constructs have evolved differently. However, it is possible to track them back to generic rights to understand their interrelations. In the diagram below it can be appreciated how similar or different are the rights proposed by both initiatives and to understand where they come from.

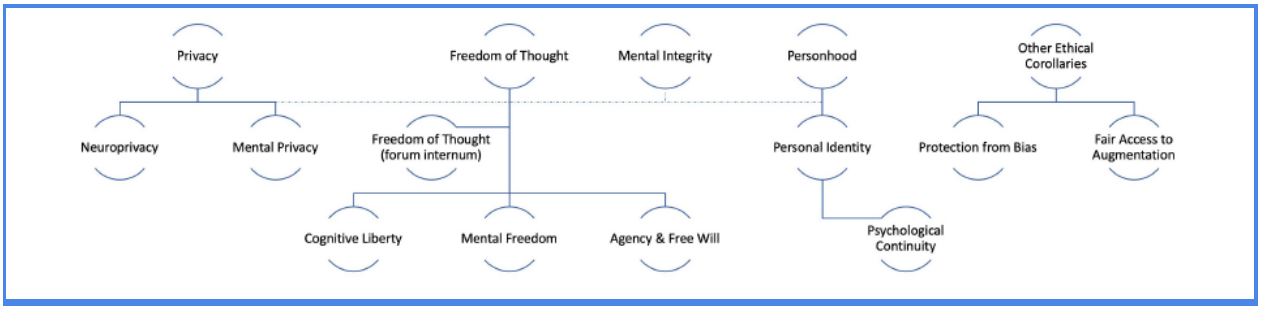

Figure 1. A taxonomy of Neurorights.

Source: Ienca (2021, 6).

[156] Ienca (2021), *supra nota*, 10, 2.
[157] Yuste *et al.* (2017), *supra nota*, 5, 159.
[158] Ienca (2021), *supra nota*, 10, 2.
[159] Yuste *et al.* (2017), *supra nota*, 5, 161.
[160] Ibid, 161-163.
[161] Yuste *et al.* (2021), *supra nota*, 7, 160.
[162] Ibid, 161.

So far, Chile is the only country that has integrated neurorights in their regulatory system with an amendment to their constitution, approved in September 2021, and a "Neurorights bill of law" which is still in debate. Although the Spanish Charter of Digital Rights is not treated in this work, it is relevant to mention that it is an important precedent, it was approved in July 2021 and it contemplates a list of digital rights in its chapter 24th that protect individuals in the context of neurotechnologies. On the other hand, Mexico, Brazil and Argentina introduced the neuroprotection in their agendas in spring and summer 2022. The Chilean amendment and approval were advised and impulsed by Rafael Yuste's team whose consider it a world achievement[163]. It is ignored if the neuroscientist is directly involved in the rest of Latin American projects but the influence of their neurorights initiative is clear as analyzed in chapter 3.

The following sections are dedicated to the description of each neuroright from both initiatives taking into account authors' concerns in the specific techniques of neurotechnology and their ethical and/or legal justifications.

2.1 Cognitive liberty

Considered as the fundamental neuroright in Ienca's and Andorno's initiative, cognitive liberty or mental self-determination comprises 2 principles: 1) the right to use novel neurotechnologies and 2) the protection against coercive and/or unconsented use of them. Having control over our own "consciousness and electrochemical thought processes" is key and a condition when building other rights such as the freedom of thought is the basis for the freedom of speech, press or religion.[164] In fact, the right to cognitive liberty is a ramification of the freedom of thought as per the ontology of neurorights.[165]

Cognitive liberty involves positive and negative liberties as well. On the one hand, it holds up the negative liberties to choose to whether or not use neurotechnologies to change one's mind and cognitive domains in absence of external obstacles, prohibitions or violations and on the other hand, it supports the positive liberty to make use of them to control one's mental life.[166]

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[163] López-Silva, P. and Madrid, R. (2021) On the convenience of including neurorights in the Constitution or in the law. *Revista Chilena de Derecho y Tecnología*, 10 (1), 60.
[164] Ienca and Andorno (2017), *supra nota*, 5, 10.
[165] Ienca (2021), *supra nota*, 10, 7.
[166] Ibid, 11.

The Morningside Group raises concern on the evidence that "neurotechnologies could clearly disrupt people's sense of identity and agency"[167] and lead the individual to behave in ways they don't consider their own actions or personality such as people who reported an alteration in the personality and behavior due to deep-brain stimulation (DBS) to treat their depression[168]. Therefore, they propose a similar but broader definition of cognitive liberty that encompasses the "right to agency, or the "freedom of thought and free will to choose" which entails protection on action, cognition and decision making. However, a normative description of these abilities or dispositions is still unclear.[169]

2.2 Mental privacy

Neural information will not be exempt from the pros and cons that other personal information is exposed to. The exponents of both initiatives on neurorights agree that neurotechnology applications will facilitate the access and control to brain activity which at the same time might imply risks due to third parties intervention or data security[170] as it happens today with biometric or other personal information.

According to Ienca and Andorno, there is a lack of consensus in the legal construct *privacy*, therefore, it cannot be considered that it necessarily covers and protects the information that is produced by and contained in our minds. Moreover, the particularity of brain data is that the information to be protected is distinguishable from the source that produces such data (i.e. the brain). Therefore, in order to protect the recorded information and the source in the approaching neurotechnological feature, the *neural activity* should be protected and be a precedent guide for mental privacy.[171]

That neurotechnological future is possible today only in science fiction, like in that Black Mirror's chapter where a passenger is inspected in customs with a device that can read everything that he "stored" in his memory. However, neural data should be taken with concern today since it does allow to distinguish, recognize and verify persons as other biometric data (e.g. iris, face pattern or fingerprints patterns)[172]. For example, signals from recorded

[167] Yuste *et al.* (2017), *supra nota*, 5, 161.
[168] Ibid.
[169] Ienca (2021), *supra nota,* 10, 7.
[170] Ienca and Andorno (2017), *supra nota*, 5, 11.
[171] Ibid, 12-14.
[172] Ibid.

electroencephalograms (EGG) can be used as biometric identifiers as fingerprints or DNA, and since almost 15 years ago EGG for individual recognition purposes have been developed[173].

Therefore, the right to mental privacy should guarantee the protection of brainwaves as data and data generators or sources of information. Secondly, it should cover conscious brain data and also data that might be exposed under involuntary or unconscious state, including the situations where access to brain information is possible without the intervention of the subject such as EGG records. Lastly, the right should protect against illegitimate access to brain information and the prevention of its leakage.[174]

On the other hand, mental privacy along with consent is a topic of concern for the Morningside Group due to the correlations of neural activity with states of attention analyzed through devices that are connected to the internet. For instance, it has been already researched that motor behavior analysis through typing patterns on personal devices could be used to diagnose Parkinson's disease or that mobility measures via smartphones suggested the possibility to diagnose Alzheimer. This group defines mental privacy as "the ability to keep thoughts protected against disclosure"[175] and they advocate for treating neural data as other organs or tissues are treated in terms of medical treatment consent, that the commercialization and use of neural data is strictly regulated and that proper technologies to safeguard it are being used, such as blockchain-based techniques.[176]

Lastly, Ienca's initiative calls for attention on whether the right mental privacy should be a relative or an absolute right. On the one hand, it can be considered as a relative right following the legal almost universal conception of privacy as to be protected only when public disorder, crime, health, other rights and public interests are not involved. On the other hand, in criminal law neurotechnologies can be used as a source of proof which might violate the ban on coerced self-incrimination, also widely recognized. Therefore, they call for a public discussion on the matter since in fact, the source of information are the individual's thoughts.[177]

[173] Ienca and Andorno (2017), *supra nota*, 5, 14.
[174] Ibid, 15.
[175] Yuste *et al.*(2021), *Supra nota*, 7, 160.
[176] Ibid, 161.
[177] Ienca and Andorno (2017), *supra nota*, 5, 17-18.

2.3 Mental Integrity

Unauthorized brain intrusions would not only harm the subject's mental privacy but it can impact on their neural computation. Influencing people's neurological computing is feasible with Brain Computing Interface (BCI) technology used for medical purposes but that could harm the subject's mental integrity, if this technology is used for commercial purposes. This practice is known as *malicious brain-hacking* and it has been identified that an attack can occur at the BCI stage of measurement, decoding and feedback[178]. A threat to mental integrity has to include: i) a direct access to and manipulation of neural signaling, ii) be unauthorized, and iii) result in physical or psychological harm[179]. However, threats to mental integrity are not limited to brain-hacking but it is also possible to happen with the use of BCI in the military sector, specifically in warfighting enhancement or prisoner processing. since such applications intervene the subject's brain activity by suppressing or enhancing different neurological functions[180]. What is more, memory engineering has not reached human experimentation yet but it might pose a challenge for the protection of mental integrity in the near future since the strengthens or weakens of synaptic connections through these technologies can erase or restore memories selectively of individuals, and even be used for surveillance and manipulation of memories of masses[181].

In this regard, Ienca and Andorno define the right to mental integrity "as the right of individuals to be protected from illicit and harmful manipulations of their mental activity"[182] and their perspective emphasizes that a right to mental integrity should not only guarantee the protection to people with medical conditions but to everyone and neurotechnologies should be considered within the protection frame as it has been done with the attention given to genetic treatments. Nonetheless, these authors consider that the right to mental integrity might be considered to be a relative right for the purpose of moral enhancement for certain criminal cases.[183]

On the other hand, the neuroright to agency was proposed by the Morningside Group due to the same concerns regarding neurological treatments that influence people's sense of identity and

[178] Ienca, M. and Haselager, P. (2016) Hacking the brain: brain-computer interfacing technology and the ethics of neurosecurity. *Ethics and Information Technology,* 18 (2), 20-25.
[179] Ienca and Andorno (2017), *supra nota*, 5, 16.
[180] Ibid, 19.
[181] Ibid.
[182] Ienca, M. (2021), *supra nota*, 10, 8.
[183] Ienca and Andorno (2017), *supra nota*, 5, 16.

agency[184]. They define the right to agency as "the freedom of thought and free will to choose one's own actions"[185] which partially considers the scope of Ienca's mental integrity and psychological continuity rights.

2.4 Psychological Continuity

Aside from damages against mental integrity and mental privacy, the inadequate use of neurotechnologies can put at risk the individuals' perception of their identity as well. In the medical context it has been reported that DBS and other treatments with neurotechnological approach are related to the increase of aggressiveness, impulsivity, changes in sexual behavior and the feeling of strangeness and unfamiliarity. Moreover, memory engineering can influence self-recognition by manipulating individual memories. Furthermore, psychological continuity of individuals is more likely to be compromised outside the clinical context as it has been reported in the intelligence and military areas related to experimentation that involves brain electrodes, LDS, hypnosis, Manchurian candidates creation, implantation of false memories and induction of amnesia. Lastly, brain implants are feasible to be intervened by third parties (brainjacking) in unauthorized manners having as consequence not only the violation of mental integrity and privacy but also the subject's psychological continuity by altering their impulses, emotions and reward system.[186] Lastly, it is possible that psychological continuity is violated by new forms of brain-washing that involve transcranial magnetic stimulation (TMS) and modulate the regions related to religious, political and socio-cultural postures. Such techniques could be used by extremist leaders, in authoritarian regimes or even simply to modulate consumers' buying decisions.[187]

A right to psychological continuity can guarantee protection of personal identity and behavioral coherence against unconsented manipulation by third parties according to Ienca and Andorno. On the other hand, it might be thought that this right is already covered by the right to mental integrity, however, the condition to violate the latter should be physical or mental harm while the harm condition does not necessarily apply to psychological continuity. This is true when neurological interventions are not invasive like in neuromarketing where there is evidence of

[184] Yuste *et al.* (2017), *supra nota*, 5, 162.
[185] Yuste *et al*. (2021), *supra nota*, 7, 160.
[186] Ibid.
[187] Ienca (2021), *supra nota*, 10, 22.

subliminal techniques used with the purpose of manipulating responses that the consumer cannot register consciously.[188]

Furthermore, Ienca's and Andorno's perspective advocates for a discussion regarding whether or not the right to psychological continuity should be a relative right since it some circumstances of persistent crimes it could be a social benefit to treat serial rapists, killers or pedophiles without their consent or authorization and preventing them to spend long periods of time in prison.[189]

This right to psychological continuity was formulated by Ienca and Andorno in a way that is focused on the individual's cognitive liberty and as a derivative (but not necessarily covered by) of the freedom of thought.[190] Whereas, the Morningside Group defend the idea that the abstract right to identity is the ability to control both one's physical and mental integrity[191].

2.5 Protection from algorithms bias

Another ethical corollary that protects those rights focused on the mental domain and formulated by the Morningside Group is the protection against biases caused by algorithms and artificial intelligence as a whole. They called attention to this area since there have been reported applications of technology into masses where results segregate the population. For instance, Google's jobs with less payment advertised to women than men or US law-enforcement agencies' algorithms wrongly predicting reoffending of black people compared to white people are some applications where mathematical models are not properly taken care of and which practice using neural data might be a prejudice rather than supporting social improvements.[192] Yuste and colleagues defines the right to protection from algorithmic bias as the "ability to ensure that technologies do not insert prejudices"[193] and advocate for countermeasures that fight bias as the norm for machine learning and that neurotechnologies' user groups, including marginalized ones, participate in the design of such algorithms and devices.[194]

[188] Ienca (2021), *supra nota*, 10, 22.
[189] Ibid, 23.
[190] Ienca (2021), *supra nota*, 10, 8.
[191] Yuste *et al.* (2021), *supra nota*, 7, 160.
[192] Yuste *et al.* (2017), *supra nota*, 5, 164.
[193] Yuste *et al.* (2021), *supra nota*, 7, 161.
[194] Yuste *et al.* (2017), *supra nota*, 5, 164.

2.6 Equal access to mental augmentation

Equal access to mental augmentation is another right that was proposed only by the Morningside Group. As it has been said in chapter 1, neuroenhancers are not at hand today and it is difficult to guess what their equal access should protect. Ienca and Andorno did not take this as a right in their initiative and they consider that this is a normative ethical corollary not aimed to protect the mental domain but which aims is to promote the proper socio-technical requirements[195] and a prerequisite to cognitive liberty in the sense that the subject should be free to drive their own mind as they please[196].

Nonetheless, the initiative's leads defined it as "the ability to ensure that the benefits of improvements to sensory and mental capacity through neurotechnology are distributed justly in the population"[197]. This encompasses the chance to correct or ameliorate the patient's mental condition and enhance the mental capacities of the non-sick. According to Yuste, the proposal is relevant for the latter group since most healthy people will experience intellectual disability at some point in life, the massification of brain-computer interfaces will make many tasks easier and these technologies will eventually be powerful enough and merchandised in the public sooner or later.[198] Moreover, such a right is needed since the pressure to adopt neurological enhancements outside the medical context would generate discrimination if access to enhancing neurotechnologies are not properly regulated.[199]

On the other hand, cognitive augmentation research projects have been conducted in the military sector for creating "super-intelligent agents to decipher combat streams"[200], improve alertness, suppress sleep and pain[201] to mention some of them. Therefore, according to the Morningside Group, proper ethical approach and regulation of the use of neurotechnology for augmentation purposes in the military sector should be discussed as it has been done with nuclear, chemical and biological technologies. Out of the military sector this ethical concern should be taken seriously for medical or industrial purposes as it has been done with gene editing in humans.

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[195] Ienca (2021), *supra nota*, 10, 8.
[196] Ibid.
[197] Yuste *et al.* (2017), *supra nota*, 5, 160-161.
[198] Yuste, R. (2022). Neuroderechos. DERTECNIA UC3M. Author's interview. Retrieved from: https://www.youtube.com/watch?v=uAcwW6UQItQ 10 October 2022.
[199] Yuste *et al.* (2017), *supra nota*, 5, 163.
[200] Ibid.
[201] Errigo (2020), *supra nota*, 21, 207.

Lastly, banning these applications should be taken carefully since it is possible that the development of neurotechnology with useful and sometimes needed purposes is shrinked.[202]

[202] Errigo (2020), *supra nota*, 21, 207.

3. REGULATIONS ON NEURORIGHTS

"Genetics may yet threaten privacy, kill autonomy, make society homogeneous and gut the concept of human nature. But neuroscience could do all of these things first." [203]

Excluding Spain, Chile, Mexico, Argentina and Brazil are the only countries in the world that have integrated neurorights in their legislation or agenda as of today. The latter countries' bills, which are still in discussion, have Chile's neuroprotection perspective as their starting point, thus, the Morningside Group's proposal is their main influence. However, there are 3 different approaches that jurisdictions in Latin America would be taking so far. A first approach, taken by Chile, is to integrate neuroprotection into constitutional guarantees and primary legislation. A second approach is to integrate neurorights into Data Protection Law as in Brazil. Lastly, a third approach, which can be a Neurolaw approach, is to enable the use of neurotechnologies in Criminal Law as scientific evidence and as part of the rehabilitation treatment of inmates, as it is intended in Argentina. Mexican legislators are taking a mixed approach between Chile and Brazil. This chapter will highlight the main characteristics of each approach and discuss the scope of the right to equal access to cognitive augmentation that was taken into consideration to different degrees in all of the law projects.

3.1 Constitutional amendment and the Bill of Law establishing Neuroprotection. Chile.

Chile became the first country to legislate on neurorights in October 2021[204] upon approval of amending the article 19, section 1° of the Chilean Constitution. The article covers the constitutional protection of the person's life and psychical, and psychic integrity, while section 1° establishes a) the protection to the life of the unborn child, b) observations on capital punishment and c) the prohibition of maltreatments. The fragment added after as new paragraph in section one reads:

[203] The Economist (2002) *The ethics of brain science. Open your mind.* Retrieved from: https://www.economist.com/science-and-technology/2002/05/23/open-your-mind. 15 October 2022.
[204] McCay (2022), *supra nota*, 3, 1.

"The scientific and technological development will be at the service of people and will be carried out with respect for life, physical and mental integrity. The law will regulate the requirements, conditions and restrictions for its use in people, and must especially protect brain activity, as well as its information."[205].

As it can be appreciated in the amendment, the Chilean lawmaker established at least two points. Firstly, that the Constitution orders that science and technology developments respect the person's life, physical and psychic integrity. Secondly, specific regulations will be put in place to protect human brain activity and its data. It is relevant to add that Chile is going through a painful process of changing the Constitution amid social discontent and institutional instability in recent years.[206]

Along with the constitutional bill, the Chilean Commission of Future Challenges, Science, Technology and Innovation, the same group in the Senate that proposed the constitutional reform, submitted the Bill of Law Establishing Neuroprotection (Published in bulletin 13828-19)[207]. This bill's aim is to guarantee the protection of the person's life, physical and psychic integrity against neurosciences, neurotechnologies and their medical applications as per its first article. As of the time this work is written, the bill is still in review. A last draft with changes was approved by the Review Chamber in December 2021 and the last discussion (which content was not published in the Senate's web page) was held in March 2022.

There are drastic differences between the first and last drafts in terms of extension and content. The first draft dedicates 10 articles to the four ethical priorities raised by the Morningside Group[208], while the last draft[209] consists of 11 articles that are dedicated to the regulation of

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[205] Original text: *El desarrollo científico y tecnológico estará al servicio de las personas y se llevará a cabo con respeto a la vida y a la integridad física y psíquica. La ley regulará los requisitos, condiciones y restricciones para su utilización en las personas, debiendo resguardar especialmente la actividad cerebral, así como la información proveniente de ella;*
Ley 21383. Modifica la Carta Fundamental, para establecer el Desarrollo Científico y Tecnológico al Servicio de las Personas. Retrieved from: https://www.bcn.cl/leychile/navegar?idNorma=1166983&tipoVersion=0 18 October 2022.

[206] Bublitz (2022), *supra nota*, 6, 2.

[207] Girardi *et al.* (2020a) *Bill of Law Establishing Neuroprotection*. Retrieved from: https://www.diarioconstitucional.cl/wp-content/uploads/2020/12/boletin-13828-19-nuroderechos.pdf, 30 October 2022

[208] Yuste *et al.* (2017), *supra nota*, 5, 14.

[209] N°578/SEC/21. Retrieved from: https://www.senado.cl/appsenado/templates/tramitacion/index.php?boletin_ini=13828-19&fbclid=IwAR20C81udV7yKzRCnKetunR6g_0dy7-zU67kfivOEJxs5DQ-OxhrejxiW0I, 30 October 2022.

neurotechnologies and 4 articles that amend other related regulations. Moreover, it defines in a more granular way certain aspects of the use of neurorights such as the concept of consent and it stipulates restrictions and penalties against unlawful uses of neurotechnologies that go from 2 months till 20 years. Lastly, attention was given to changes that should be made to the Chilean electoral, privacy, health and genetic research acts, where neurorights might be indirectly or directly involved.

Whereas, the first draft bill is more similar to the Morningside Group's publication in Nature and it turns into law their ethical concerns and concepts, the last draft erases the notion of brain data as organ (article 7) and it removes the definition of brain-computer interface (BCI) and neurorights in its 2° article. Instead, the definition of "neurotechnologies" partially incorporates BCI's definition and it gets extended as "group of devices and instruments that enables connection to the central nervous system to read, register or modify the brain activity and the information originated from it"[210]. It is relevant to mention that "non-pharmacological methods" are removed from the concept of neurotechnologies and the terms "invasive" and "non-invasive" were erased from the full document as well. This point is important in the context of augmentation since drugs could be considered neurotechnologies too.

3.2 Charter of Digital Rights. Mexico.

At the end of October 2022, a commission dependent on the personal data protection authority in Mexico City, got approved a soft law instrument that lists guidelines for private and public institutions on the protection of persons in digital contexts[211]. In eight chapters, the guide covers an extensive variety of rules from access to information to child protection and non-discrimination. Its structure and division of the digital rights resembles the Spanish Charter of Digital Rights (see 3.5) with some differences. In fact, the Commission took the Spanish

[210] Original text: "Neurotecnologías: conjunto de dispositivos o instrumentos que permiten una conexión con el sistema nervioso central, para la lectura, el registro o la modificación de la actividad cerebral y la información proveniente de ella".
N°578/SEC/21. Retrieved from: https://www.senado.cl/appsenado/templates/tramitacion/index.php?boletin_ini=13828-19&fbclid=IwAR20C81udV7yKzRCnKetunR6g_0dy7-zU67kfivOEJxs5DQ-OxhrejxiW0I 30 October 2022.

[211] Comisión de Protección de Datos Personales. (2022) *Carta de Derechos de la Persona Digital. Código de Buenas Prácticas.* Retrieved from: https://www.infocdmx.org.mx/doctos/2022/Carta_DDigitales.pdf, 1 November 2022, 26.

Charter as structural model[212] and the principles in the Chilean first draft of their bill of law for neurorights protection.

Neurorights are defined by the Commission as "human rights which fundamental aim is protecting the brain and its functions"[213]. Two first structural problems can be identified by this definition. On the one hand, defining neurorights as human rights would mean that they are in balance with the rest of the human rights contained in the Mexican Constitution. As of today, none of the neurorights are contained in the relevant section of the Magna Carta. Should the instrument is approved as primary law, as it is intended as per the Commission Head's words[214], we will be talking about a similar approach to Chile's. On the other hand, considering the protection of "brain and its functions" under neurorights definition might be excluding the notion of "mind", which is actually what Yuste's and Ienca's initiatives mean to protect in the first place. Excluding the definition of neurorights might be the current proper approach to dodge failing and having to define the concept "brain/mind", as the rest of the countries have done with their law projects so far.

The soft law's section dedicated to neurorights enlists the right to a) "neural data privacy", b) "personal identity preservation", c) "no interference to freedom of decision" and e) "equity towards the enhancement of brain activity". The Mornings Group's proposal on their four ethical priorities and rights can be identified across the chapter with the exception of the protection against bias. Nevertheless, some definitions are consistently different to those provided by the experts and other law projects. For instance, the preservation of the personal identity establishes that the proceedings should have a low degree of intrusion and that they do not affect the subject's own recognition, personality, thoughts and emotions. Such an approach to mental identity would make it difficult to determine what "low degree of intrusion" means and if it is actually possible today to measure with accuracy the neurotechnology effects on some aspects of the subject's mind, especially on their thoughts.

On the other hand, the notion of neural data in the document encompasses the subject's consent protection as the rest of initiatives analyzed in this work. However, the Data Protection

[212] Comisión de Protección de Datos Personales. (2022) *supra nota*, 35, 8.
[213] Ibid, 4.
[214] Senado de la República de Chile (2022). *Congreso Internacional Inteligencia Artificial, Neuroderechos, Plataformas Digitales y Metaverso*. Retrieved from: https://www.youtube.com/watch?v=P1ZnfQNLHRg 3 November 2022.

Commission considers measurement and analysis as the only two possible procedures despite the actual problem of neurotechnologies and the main reason from neuroscientists to bring Neurorights to legal scrutiny, is the fact that these technologies do influence brain activity and its processes. This issue is likely to be structural for the neuroprotection of privacy, identity and agency. If the Commission's aim would simply be to protect the brain information, extra legislation would not be needed since this can be taken as biometric data that is already protected under federal personal data protection law.

3.3 Amendment to criminal law. Argentina.

The Argentinian perspective on neuroprotection is quite different compared to Chile and Mexico and its approach is closer to Neurolaw's view of neurotechnology application in criminal law. Their law project, submitted in March 2022, rather than introducing a new legal text of neurorights, entails the modification of criminal law, particularly, the Federal Penal Code of Procedures and the Imprisonment Act[215]. The amend on the former document allows to use neurotechnologies as judicial evidence on the ground that "brain imaging techniques and any other kind of neurotechnologies, from the information related to the brain structure and/or functions, permit to infer the mental activity in all its aspects"[216]. Judicial evidence can only be used under judicial order and subject's consent[217]. Furthermore, the proposed change to the article 1° in the Imprisonment Act establishes the use of brain imaging techniques and neurotechnologies as a form of treatment with the same conditions as in the Code but with the obligation to prevent any cognitive or algorithmic discriminatory bias[218].

A first aspect to observe is that only two neurorights present in the Argentinian bill are those considered in the Morningside Group initiative but not by Ienca and Andorno: protection against bias and equal access to mental augmentation. The latter at least in a very limited way and only applicable in the criminal law sector as treatment for inmates. The same observation turns problematic when interpreting the protection against bias and mental augmentation without the other rights or concepts that both neurorights initiatives advocate for. For instance, the concept

[215] Ley 24.660 de Ejecución de la Pena Privativa de la Libertad.
[216] Gutiérrez, R. *et al.* (2022) *Proyecto de Ley 0339-D-2022*. Retrieved from: https://www4.hcdn.gob.ar/dependencias/dsecretaria/Periodo2022/PDF2022/TP2022/0339-D-2022.pdf, 25 October 2022.
[217] Ibid.
[218] Ibid.

of “mental integrity" is not explicitly present in the project. The notion can be inferred from the obligation that the application of neurotechnologies for treatment or as a way of judicial evidence must be enabled under subject’s consent. However, the precept would not guarantee that the subject's mental computing (see 2.3) would not be affected by the sort of neurotechnologies that work in that way (see 1.1). Due to the same issue, the subject’s cognitive liberty might be compromised and, if invasive procedures are to be used as treatment or to provide evidence at trial, even the physical integrity would be put at risk as well. Moreover, the notion of neural data is not explicit and neither biometric data nor personal data can’t be inferred to be prevented from being at risk in the scenario that the intervention from a third party is needed and/or that the subject’s brain information is feasible to get commercialized.

Although the rest of the neurorights are not part of the amendment proposals in any legal precepts, the deputies that authored the document do draw the attention on the relevance of protecting neural data, the rest of the rights that the Morningside Group proposes and the risks of the use of neurotechnologies in the commercial sector due to their potentials in memory mining, cognitive enhancement and brain data management.

3.4 Amendment to the Personal Data Protection Act. Brazil.

The neuroprotection agenda in Brazil starts with the proposal to integrate some notions of neurorights into the Brazilian Personal Data Protection Act and special rules for the treatment of neural data. The project law was also submitted in March 2022. The bill aims to amend the personal data protection law by adding “neural data” and “Brain-Computer Interface” and “Neurotechnology” in the article of definitions, and the MG’s neurorights in section II dedicated to the “treatment of sensitive data”. Besides making neural data a class of sensitive personal data, the proposal would make it equivalent to genetic and biometric data. Whereas, neural data is defined in the bill as any information about the central nervous system that is accessed by brain-computer interfaces or any other invasive or non-invasive technology. Lastly, neurotechnology would be integrated into personal data protection law as any device or non-pharmaceutical instrument that enables the connection to the nervous system.[219] It is worth

[219] Gaguim, C. (2022). *Projeto de Lei N°522, de 2022. Modifica a Lei n° 13.709, de 14 de agosto de 2018 (Lei Geral de Proteção de Dados Pessoais), a fim de conceituar dado neural e regulamentar a sua proteção*. Retrieved from:https://www2.camara.gov.br/legin/fed/lei/2018/lei-13709-14-agosto-2018-787077-norma-pl.html, 3, 1 November 2022, 1-4.

to note that non-pharmaceutical methods are excluded from the definition of neurotechnology while this encompasses the whole nervous system including the peripheral section which enables the connection between the central nervous system and the rest of the body.

Regarding data processing by health authorities, the bill proposes that neural data should be processed under subject's or representative's consent or without consent only for a) investigation purposes by relevant authority, b) subject's life protection or protection of third parties physical integrity or c) medical care. Moreover, the data subject should be informed about the possible physical, cognitive and emotional secondary effects before processing their neural data, as well as, the security measures taken to process it. BCIs and other methods that can cause damage to the subject's mental agency, personal identity and psychological integrity are prohibited, as well as, sharing neural data with monetary purposes. The last paragraph of the proposed article states that "The State will take measures to ensure equal access to the advances of neurotechnology"[220].

As it can be seen, the protection of neurorights in Brazil would be covered within personal data protection law as per this project so far. The author's concerns, as referred in the bill's recitals, are similar to those presented in the Argentinian and Chilean bills as well: the rapid development of neurotechnologies, its applications beyond the medical specter and the use of AI and the privacy risks. Aside from the right to mental privacy, the other Morningside Group's 4 neurorights are mentioned in the recitals and treated as basic rules to guarantee the protection of neural data, including the equal access to cognitive augmentation[221]. Although the law project would make neural data processors and controllers accountable for mental privacy protection and making the data subject aware of possible secondary effects of neurotechnologies, the project cannot ascertain that it would cover the protection to rights other than mental privacy. This is true to the extent that the proven risks related to the use of certain neurotechnologies can threaten not only the subject's privacy but also their mental, physical health, and probably expose them to algorithmic biases in the health and/or goods and services sectors. Having a similar approach to Chile's by amending other related legal precepts and involving other actors would sort out some protection for the rest of the rights, at least to a certain extent.

[220] Original text: *"O Estado tomará medidas para assegurar o acesso equitativo aos avanços da neurotecnologia"*. Ibid, 4.
[221] Ibid, 7.

3.5 Scope of the right to fair access to cognitive enhancement in Latin America

Although all law projects in Latin America are based on the Morningside Group's neuroprotection initiative, their ambit of action is different as discussed in the previous chapters. Likewise, the scope of the right to fair access to cognitive augmentation differs depending on the field focus from its legislators. This could be within personal data protection law as in Brazil and Mexico, criminal law like in Argentina or meant to become a constitutional guarantee as in Chile and Mexico. The sections below will discern and compare the field of action of the access to neuroenhancement in each jurisdiction.

3.6 Chile

The Chilean neuroprotection bill's preamble and its article 10[222] stipulates that the "State will ensure the promotion and equitable access to the advances in neurotechnologies". Whereas, the article 1° reads that the Act aims to protect "the fair access, without arbitrary discriminations, to those neurotechnologies that enhance mental capabilities". Both sentences could be understood simply as one right to fair access to enhancing neurotechnologies. However, In the last draft approved by the Senate[223], both fragments were reworded having as a result two different principles. On the one hand, instead of the subject's right to access to the advances in neurotechnologies, the article 2° of the last draft reads that the "State will ensure the development of neurosciences and neurotechnologies that prone the human wellbeing and the access without arbitrary discriminations to its advances". On the other hand, the non-discriminatory access to neuroenhancing technologies was substituted by the "freedom to use any kind of allowed neurotechnology" under due, written and revocable consent in article 4. The section is followed by the consent rules applicable within medic and research purposes. For the former the consent rules are the same as in the first section of the bill, while a new consent should be requested any time the research terms or conditions change (Genetic Research Act, art. 9[224]).

What first calls the attention in both drafts is that the access to neuroenhancement would be protected "without arbitrary discriminations". First, it does not make any distinction from

[222] Girardi *et al.* (2020a)*, supra nota*, 32.
[223] N°578/SEC/21, *supra nota*, 33.
[224] Ley N° 20.120 Sobre la Investigación Científica en el Ser Humano, su Genoma, y prohíbe la Clonación Humana.

"non-arbitrary" discriminations, and second, in case there exist exceptions to the equal access, it is not possible to determine those scenarios neither in any law project nor in the approved constitutional amendment.[225] The Antidiscrimination Act[226] defines arbitrary discrimination in its article 2 as any distinction, exclusion or restriction without reasonable justification made by individuals or the State that threatens or violates the exercise of fundamental rights. The same article establishes that such "distinctions, exclusions or restrictions to exercise a fundamental right are reasonable when they are justified by another legitimate fundamental right" and it refers to a list of principles found in the Constitution. Following these principles under the legal projects, subjects can be denied access to neuroenhancers, or simply, to the advances and use of neurotechnologies, if democracy, good administration, nationality, effective remedy and/or suffrage are being threatened. The exceptions made by the projectists are relevant to the extent that neurotechnologies might impact in different degrees such constitutional principles.

For instance, the Cambridge Analytica scandal showed that voters' decision-making was easily manipulated through social media.[227] The possibilities to do so at a greater scale and with more accurate inputs are immense for an enhanced candidate with a BCI connected to a social media cloud that controls its users' brain data. This candidate would have accurate and live information on voters' political inclinations, feelings towards their leadership, social fears and decision-making processes. In fact, the last draft also amends in its article 15 the Electoral Act by sanctioning individual(s) that influences votation with the use of neurotechnologies. Conversely, the same "non-arbitrary discrimination" exception, applied for instance for reasons of political ideology or ethnicity, makes totally unclear how the equal access to enhancement or to the advances of neurotechnologies can be exercised.

Secondly, not having rules on the non-arbitrary restrictions to access neurotechnologies can generate more problems than solutions. Those with more purchasing power will get more benefits from the neurotechnology merchandising than those who will not be able to afford the same neurological "upgrades". Since a new right would become a new demand, the wrong delimitation if it can cause the abuse of neuroenhancement from the consumer point of view as it

[225] Barcia Lehmann, R. *et al.* (2021). ¿Cómo avanzar en los nuevos neuroderechos y en su regulación? Comentarios al proyecto de reforma constitucional (Boletín N° 13827-19) y al proyecto de ley (Boletín N° 13828-19). *Instituto de Investigación en Derecho*, 5, 15-17.
[226] Ley N° 20.609. Establece medidas contra la Discriminación.
[227] Time (2018). *Facebook's New Controversy Shows How Easily Online Political Ads Can Manipulate You.* Retrieved from: https://time.com/5197255/facebook-cambridge-analytica-donald-trump-ads-data/, 01 December 2022.

is known from other areas such as plastic surgery and sports. The right to neuroenhancement might even cause discrimination either to improved or not improved people. Scenarios for the latter group are difficult to draw, especially for those that do not want to get enhanced due to security uncertainty towards new intrusive and not intrusive brain technology, because they might not consider enhancement in their ethical principles, or because of any other personal reason. Should a right against enhancement be protected by the state?[228] The current draft does not address these highly possible scenarios and they will be issues that either this law or its implementation and observation by the Health and Science Ministries have to address.

Thirdly, one of the cores of equal access to enhancement and other neurorights is subject's consent as per both initiatives. Legit consent plays as a cohesion factor in neurorights initiatives since the use of any neurotechnology is allowed only under the clear and free consent. The written subject's consent in the first Chilean bill of law was the main restriction of harmonization with other rights in the bill and mostly for therapeutic purposes since it would fully prohibit any access to neurotechnologies to patients that are not able to consent in circumstances where their decision-making capacities are partially or totally diminished due to the conditions that actually neurotechnologies were thought for (e.g. schizophrenia, Alzheimer's disease, lateral sclerosis) and others.[229] The last bill draft made the relevant changes in a way that its normativity was more flexible and the intervention for other important actors less restrictive. Firstly, it included the subject's representative in the consent, as it is logically expected in mental health contexts. Lastly, the last bill refers to the Health Code and Genetic Research Act which would establish specific consent rules for therapeutic and experimental neurotechnology purposes.

However, this change does not cover yet the situations where the principle of progressive autonomy of the child is involved[230]. The Child Protection Act (Art.11)[231], recently approved this year, recognizes that children are free to exercise their rights according to their mental mental evolution, age, maturity and manifested development. Would a 17-year-old be able to decide to get an implant that allows them to boost their concentration or that depends on their parents? Would a 4-year-old diagnosed with intellectual giftedness have the same chance to make use of enhancers as the 17-year-old or an adult? Not less important, it remains the question whether or

[228] Borbón Rodríguez and Borbón Rodríguez (2021), *supra nota*, 20, 8-10.
[229] Ruiz, S. *et al*. (2021), *supra nota*, 2, 444-445.
[230] Barcia Lehmann *et al.* (2021), *supra nota*, 41, 11.
[231] Ley N° 21.430 Sobre Garantías y Protección Integral de los Derechos de la Niñez y Adolescencia.

not the access to decrease mental/brain abilities can be consented.[232] Although the term used for enhancement in the Latin American bill drafts analyzed in this work literally means "improvement", the hypothetical child with intellectual giftedness diagnosis might also understand (due to their advanced socio-emotional development) that decreasing their brain capabilities is equal to the improvement of their relationships with the peer-group.

Thirdly, the last bill of law's draft establishes penalties for the misuse of neurotechnologies and they can hypothetically apply in the context of cognitive augmentation as well. As per bill's article 10, a penalty of 2 months and around 1.5 years of imprisonment can apply in cases where consent is not given and the neurotechnology alters one or more individuals' will. If the doctor, researcher or individual that employs the technology induces the subject to commit a crime or causes their death, the penalty can be imposed from 15 to 20 years. It is relevant to remind that the second draft got rid of the terms "continuity", "psychology", "decision-making" and "autonomy". In consequence, it would be difficult to determine at this point of the bill's development, how the will can be understood as altered without all the variables the first draft considered. Lastly, the preventive regulation would consider specific individuals liable for the misuse of neurotechnologies with enhancing and nonenhancing purposes and it binds the technology's producer, provider and seller of material and moral liability. Nevertheless, the bill still fails to bind penalties to companies which are the main actors of concern, as pointed out as main concern from initiatives' perspectives.

Last but not least, the notion of fair access to neurotechnological advances is wider in the second draft and senators added basic guidelines for the exercise of this right in medical and research context. If the aim of the new phrasing is to exclude the use of neurotechnologies by healthy individuals (e.g. entertainment), then a clearer line of distinction against the medical and research purposes should be drawn. The BCIs' applications referred to in section 1.1 can clearly fall into medical and/or research scenarios since disorders are diagnosed by the relevant medical professional, in specific institutional contexts, and with a specific treatment which may convey more than the use of BCIs. Nonetheless, the possible future application and commercialization of non-intrusive BCIs might not depend on any diagnosis to improve memory. attention or perception but they still can fall in the offenses sanctioned by the Chilean law project. Moreover, as shown in section 1.2, determining a "brain condition" can be very subjective and the outcome

[232] Barcia Lehmann *et al.* (2021), *supra nota*, 41, 11.

can depend on its institutional context. Therefore, people without proper diagnoses might be excluded from the right of access to the advances in neurotechnologies for medical or research purposes.

All in all, the protection to fair access to cognitive augmentation in the current progress of the Bill of Law establishing Neuroprotection is not totally clear but it can be interpreted under the freedom to use any kind of neurotechnology and the State's guarantee to the equitable access to the advances of neurotechnologies. The latter principle has been already added in the constitution after its last amendment. The amendment and the addition of the limits and penalties of the use of neurotechnologies (including enhancers) in the bill, provide more visibility of the scope of the right to neuroenhancement to certain extent compared with the first draft. However, the distinction between the access to the advances of neurotechnologies for enhancing purposes should be clearly made from those with therapeutic aims.

3.7 Mexico, Brazil and Argentina

As mentioned in the introduction to chapter 3, the Morningside Group's initiative, Chile's constitutional amendment and their first bill proposal comprise the regulatory model in the rest of Latin American jurisdiction with a neuroprotection agenda. However, the impact in the scope of the right to fair access to cognitive augmentation is drastically impacted by the different approaches that senators in Brazil and Argentina and data protection commissioners in Mexico decided to take in their legislative projects.

The Mexican Charter's objective is to serve as a model that establishes obligations for public and private entities for the protection of individuals in digital environments[233]. The Morningside Group's neurorights set (with exception of protection against algorithmic bias) is part of these obligations that constitutes the neuroprotection aspect in the digital environment. In regards of the right to fair access to enhancement, this is a two-folded precept that comprises on the one hand, the equitable access to "possible enhancement of brain activity and human capacities"[234] and, on the other, the obligation from the state to guarantee the limits and contexts to the access to neurotechnology enhancers. The regulation of the cognitive augmentation technologies

[233] Comisión de Protección de Datos Personales. (2022) *supra nota*, 35, 26.
[234] Ibid., 60.

beyond therapeutic uses is also part of the Charter's general "minimal principles that should govern the digital environments"[235].

In Brazil, the neurorights proposers claim that the main reason to regulate the fair access to cognitive augmentation is because it would be impossible to prohibit the access to neuroenhancers in the future when "companies will be able to use algorithms not only to extract brain data but to augment the individual's cognitive competences"[236]. The bill provides for this right in the last subsection of its article 13-A that deals with the treatment of sensitive data and, exactly as in the first draft of the Chilean's bill of law, it reads that "The State will take measures to ensure equal access to the advances of neurotechnology"[237]. However, aside from such a statement, there is no further support on the constitution of the right to cognitive augmentation, contrary to what happens with the Chilean project even after its amendments.

Lastly, the approach taken by the Argentinian bill on neuroenhancement is rather a sui generis approach compared to the regulation of neurorights in other jurisdictions. As mentioned in section 3.3, the bill provides for the right to protection against algorithmic biases and neuroenhancement but only within criminal law and leaving behind the rest of the neurorights initiatives. Equally to legislators in Brazil, the importance to regulate the access to enhancers (and neurorights in general) is not "being tied to the rules of the market and leave it in private hands"[238] as well as ruling against brain hacking, manipulation, "brain kidnapping" and non-authorized enhancements[239]. On the other hand, the bill to amend the Imprisonment Act (Art. 1) states that brain imaging techniques and any type of neurotechnology that allow to infer mental activity can be used for the rehabilitation and social reintegration of the inmate with certain conditions, this should be executed only under court order, subject's consent and without cognitive or algorithmic discriminatory biases.[240]. As treated in chapters 1.3 and 2.3, differently from regular neuroenhancement, moral enhancement has been seen as a "lesser of two evils principle" (and even as a measure to make compulsory) by Neurolaw, bioethics and both neurorights initiatives since it promises the reintegration into society of subjects that have committed certain types of crime, less crime recidivism and in subjects that committed certain

[235] Ibid, 25-29.
[236] Gaguim (2022), *supra nota*, 37, 8.
[237] Ibid, 4.
[238] Gutiérrez (2022), *supra nota*, 37.
[239] Ibid.
[240] Ibid.

type of crimes[241] and as a measure against crime recidivism and the possible management of negative emotions such as aggressiveness.

The scope of the right to fair access to cognitive enhancement is non-existent in Brazil's and Mexico's projects of law. The "access to the advances in neurotechnology" might encompass neuroenhancement technologies in the Brazilian proposal as well but in the best scenario, neuroprotection will only be limited to the integration of neural data as a subcategory of sensitive data since the data protection authority does not have decision power over health or genetic areas that neuroenhancement would impact as it has been reconsidered by the Chilean senators in their last bill of law draft. Then again, it is worth to point out that the Mexican Charter would be protecting access to enhancement in all human aspects (not only the neural one), however, such a protection is limited to the digital environment and not to individuals that might need/be accessing neuroenhancers but not taking part of any digital community or using any ICT as defined by the Charter. Should the latter instrument become a federal law, as DPA commissioners mean to, broader and clearer definitions on the field of action of this right will be necessary. It is relevant to add that aside from the lack of distinction between the fields of health, research and improvement, these projects do not consider possible penalties for the misuse of neurotechnologies outside of personal data protection law.

Conversely, the Argentinian project does specify that the use of neurotechnology is meant to the deduction of the brain's activity and the field of action of neuroenhancement is limited as auxiliary in the inmate's rehabilitation process. The right to access to neuroenhancement, in this case moral enhancement, can be executed by the person who wants to enhance their behavior and be reintegrated with means that otherwise are not possible. However, it also implies that executing this right can end in detriment of other neurorights that the bill does not consider such as the right to cognitive liberty or psychological continuity, still without taking into account other risks that neuroenhancers convey such as brain hacking, data mining and even physical health issues.

[241] Ienca and Andorno (2017), *supra nota*, 5, 19.

4. TRANSHUMANISM AND THE RIGHT TO FAIR ACCESS TO COGNITIVE ENHANCEMENT

It is maybe impossible to find anyone that has not made use of any drug to protect their body against a threat from the environment or a dietary supplement, cure or even coffee to boost their physical or mental performance. Transhumanism envisions that technology will systematize and guarantee equal access to these and more improvements without less or no risks, specially for what is considered the master human organ, the brain. The right to fair access to neuroenhancement is the basis of the Morningside Group's neurorights initiative and the latter establishes the guidelines for its regulation in Chile, Mexico, Brazil and Argentina. This chapter scrutinizes the ideology behind the right to cognitive augmentation and brings to light why it should be removed from the Latin American neuroprotection agendas.

4.1 Transhumanist "cognition" in cognitive enhancement

Hybrid individuals that can have access to the internet 24/7 with an intrusive or non-intrusive device powerful enough to increase the cognitive skills of its users is one of the main justification for the addition of neurorights into national and international law[242] or at least this is how the BRAIN project's ideologist promotes them to their audiences (see chapter 1.3). Aside from neurotechnologies already in use for therapeutic purposes or in experimental phase, a smartphone or a alike connected to the human brain without any corporal mediation (e.g. fingers) as implant or portable device is still today a promising technology (see chapter 1.1). More tempting is the ability to "update" thinking processes, accelerating making-decision mechanisms, increasing information retention and processing, and even downloading minds or removing parts of the brain to add artificial components in order to fit individuals into society.[243] Whether or not all this technology will be available in 10 years[244], 29[245] or definitely never, it is true that the brain is being promoted from the neuroenhancement advocacy's (a.k.a.

[242] Yuste (2021), *supra nota*, 7, 164.
[243] Gare, A. (2022) Ethics and Neuroscience: Protecting Consciousness. In: López-Silva, P. and Valera, L. (eds.) *Protecting the Mind. Challenges in Law, Neuroprotection and Neurorights.* Cham: Springer, 33.
[244] Yuste, R., Columbia University Professor and Gil, D., IBM Research Director. (2022), *supra nota*, 19.
[245] Kurzeil, R. (2012). *How to Create a Mind. The Secret of Human Thought Revealed*. New York: Wiking referenced in Moreu Carbonell, E. (2022). The Regulation of Neuro-Rights. *European Review of Digital Administration & Law - Erdal*, 2 (2), 149.

transhumanism) as an entity that must become something else more similar to a computer than to a imperfect human organ[246] that could process better and more information without errors and even without emotions, at least without negative ones. Today's human mind is envisaged as tomorrow's chimp's and the posthuman in a status way higher compared to today's geniuses.[247] This for the sake of what is defended as a moral duty[248]: the achievement of maximum wellbeing, productivity and overcoming the challenges of the future[249].

Transhumanism, as any other metanarrative[250], proclaims values and concepts projected to the future[251], in this case to a posthumanist condition. However, in regards to neuroenhancement, their structural notions on cognition are biased mostly by the premise of the brain as a purely informational machine. Transhumansm mixes up rationality with cognition[252] when proclaiming the power of neurotechnologies as the releasors of specific neuronal functions that focus on the processing of information such as concentration, perception and memory, and excluding non-rational mental abilities such as creativity, inspiration or emotions. Yuste's iphone-like BCI that enables brain connection to the internet 24/7 is the best example of this premise. For instance, the teenager that today learns a song on the guitar with videos and digital scores found on the internet, tomorrow the very desire will be enough so their brain device connected to the internet would deploy and help to mentally process the expected guitar song. How this would be performed is a very different story since the non-rational operations that would guarantee a proper performance, such as creativity, are secondary or non-important factors through transhumanist lenses. This is because the transhumanist account sees cognitive functions as independent segments in the brain, feasible to upgrade individually despite decades of neuroscientific findings demonstrating something totally different.[253]

Transhumanism's confidence upon the enhancement of rational aspects of cognition and its availability for the public are based on the current use of drugs for the treatment of psychiatric disorders[254]. For instance, as illustrated in sections 1.1 and 1.3, Adderall used in Attention Deficit

[246] Gare (2022), *supra nota*, 47, 32
[247] Levin (2021), *supra nota*, 22, 19.
[248] Diéguez (2017), *supra nota*, 6, 71.
[249] Ibid, 72-73.
[250] Levin (2021), *supra nota*, 22, 11.
[251] Ibid, 13.
[252] Ibid, 10.
[253] Ibid.
[254] Ibid, 32

Disorder with and without hyperactivity helps the patient to increase their attention thresholds. Boons from the administration of psychopharmacological agents in psychiatric patients have been pictured by transhumanism as the definite proof that cognitive enhancement is viable, therefore, advocating for the use of this and other psychiatric drugs in non-therapeutic spheres is necessary.[255] The use of pharmaceuticals in non-sick individuals, along with their avowed secondary negative effects, is justified with a similar practice in the sport environment where people without any physical condition, use them to enhance their force, speed and/or muscular volume beyond the normal levels.[256] However, research conducted with stimulant drugs do not show enough evidence that they actually enhance cognitive functions in healthy individuals, at least under how neuroenhancement is defined by the scientific community as "the improvement of brain and associated functions beyond what is considered normal for the general population"[257]. What is more, the administration of drugs used for the improvement of certain cognitive functions might result in the fall of other rational and non-rational functions. For instance, dopamine (neuro-transmissor associated with working memory) was raised through Adderall and Ritalin in subjects known to have genetic predisposition to retain such a substance, the studies shown that despite working memory improved, the resolution of high-difficulty tasks and efficiency decreased drastically.[258]

On the other hand, secondary negative effects of invasive neurotechnology are well known (described some of them in chapter 1.1), therefore, non-invasive devices have been promoted as low or 0 risk neurotechnology by transhumanists, including the main promoter of the right to enhancement in Latin America. However, several studies oppose these assumptions. Studies on the continued use of magnetic stimulation (see 1.1) show seizures, hearing impairment, eardrum rupture in laboratory subjects even with all safety protocols.[259] Other non-invasive stimulation technologies have shown cognitive tradeoffs, for instance, while the laboratory subjects' posterior parietal cortex imaging show improvement in mathematical learning, performance and automaticity were observed to diminish.[260]

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[255] Levin (2021), *supra nota*, 22, 28-30.
[256] Savulescu *et al.* (2004). Why We Should Allow Performance Enhancing Drugs in Sport. *British Journal of Sports Medicine* 38(6), 666– 70 referenced in Levin (2021), *supra nota*, 22, 31.
[257] Levin (2021), *supra nota*, 21, 31.
[258] Ibid. 31-32.
[259] Dubljević, V. (2015). Neurostimulation Devices for Cognitive Enhancement: Toward a Comprehensive Regulatory Framework. *Neuroethics* 8 (2), 115-122 referenced in Levin (2021), *supra nota*, 22, 32-33.
[260] Kadosh, R. (2013) Using Transcranial Electrical Stimulation to Enhance Cognitive Functions in the Typical and Atypical Brain. *Translational Neuroscience* 4 (1), 20-33 referenced in Levin (2021), *supra nota*, 22, 33.

A fifth point of concern is that the notion of cognition (purely rational) neglects the role of emotions, specially the negative ones[261] for the sake of the aspirational posthuman who should be "funnier, more intelligent, more empathetic and less aggressive"[262] since the nature of mind is designed for happiness[263] and not otherwise as per transhumanism. The idea of annihilating negative emotions includes sadness, anxiety, jealousy and grief in the same sack as anger[264] is rather related to the moral aspect of bioenhancement that transhumanism campaigns. This idealization is a product of an outdated premise in neurology that indicates that there are dedicated parts in the brain for each aspect of the mind and that work independently of each other. Although this misunderstanding was discarded decades ago, the interaction between reason and emotions is far from being exhausted in neurosciences and outlining even the most basic theses exceeds the aims of this work. For instance, research with fMRI show that brain regions associated with emotion are more active when dealing with personal moral dilemmas while higher cognitive function areas are active only when the dilemma is impersonal.[265] Psychological and neurological evidence show that many of the "negative" emotions above are needed not only for survival but they are also correlated to empathy, recognition of the other, assertive communication and socialization and tied to the continuous state of vulnerability that we face as human beings.[266] Posthuman positivity towards everything that surrounds it is appealing if also an idealist peace would govern, however, showing anger towards social injustice or violence would be a more realistic need. Guaranteeing fair access to the extirpation of our "evilness" and ignoring the impact on the rational aspect of cognition, its tradeoffs and the current lack of proven evidence seems more dangerous as in the real world than in the laboratory.

The unfounded principles of transhumanism on neuroenhancement and the equitable access to it as presented by Rafael Yuste and being introduced in different regulatory levels in Chile, Brazil, Mexico and Argentina is an apparent reductionism of cognitive sciences that extrapolates the Cartesian error mind/body into their notion of mind/brain. Such extrapolation has led to understanding the brain as the only relevant entity in the dichotomy as per the scientificist view

[261] Levin (2021), *supra nota*, 22, 22-23.
[262] Savulescu, J., and Kahane, G. (2009). The Moral Obligation to Create Children with the Best Chance of the Best Life. *Bioethics*, 23 (5), 274 referenced in Levin (2021), *supra nota*, 22, 23.
[263] Ibid.
[264] Levin (2021), *supra nota*, 22, 24.
[265] Greene, J. (2016). Beyond Point- and- Shoot Morality: Why Cognitive (Neuro)Science Matters for Ethics. In: *Moral Brains: The Neuroscience of Morality*, 119– 49. Ed. S.M. Liao. New York: Oxford University Press referenced in Levin (2021), *supra nota*, 22, 48-49.
[266] Diéguez (2017), *supra nota*, 6, 17.

of transhumanism. In the best scenario both entities are related in the sense that the brain is the hardware while the mind the software and that the latter do not survive without the former. The "brain produces the mind" (Yuste's constant) is the ultimate failure of this paradigm. In fact, it is impossible to study the mind without neurochemistry or neuroanatomy but also impossible to study the brain without the rest of the organism and its physical and social environment.[267] In this order of ideas, the phrenologist's obsession of trying to understand and solve poverty, social inequality, criminality or school failure[268] would not bring any change by turning such an approach into a fundamental right. From this perspective, it seems that actually what is being lobbied and regulated in Latin America is the intervention of the brain while ignoring the mind and the psychological and social implications of it.

4.2 Fair access to cognitive enhancement vs. other Neurorights

At the end of the day, the reason for Ienca and Yuste to raise awareness on neurorights is to legitimately protect the individual's thoughts and their identity from present and future neurotechnologies. Cognitive liberty (MG's agency and free will) and mental privacy are the bases of these novel rights.[269] On the other hand, the rights to mental integrity and psychological continuity were thought to protect the mind against intrusion and alteration of the self respectively.[270] The protection against algorithmic biases and to fair access to cognitive augmentation are supporting rights of the rest from the list from Ienca's and Andorno's perspective[271]. Whereas, the latter rights are independent from Yuste's perspective, mostly for the right to neuroenhancement which is advocated as the basic condition for the existence of the rest of neurorights.

Regardless of the level where the right to fair access to cognitive augmentation is located, its nature does not get along with the objectives in both neurorights initiatives and with any other neuroright from the list, with exception of AI which is one of the bases for enhancement as per MG's initiative[272] and what Latin America follows. The only right that is partially safe, would be the right to privacy as stipulated in the Chilean and Argentinian bills. In theory, the right to

[267] Damasio (1995), *supra nota*, 8, 249-252.
[268] Clément, E. *et al.* (2014). Le cerveau ne pense pas tout seul. *Le Monde diplomatique*. Retrieved from: https://gpc-maths.org/data/documents/8.-le-cerveau-ne-pense-pas-tout-seul-monde-diplo.pdf, 20 December 2022
[269] Moreu (2021), *supra nota*, 47, 155.
[270] Ibid.
[271] Ienca (2021), *supra nota*, 10, 8.
[272] Siqueiros Fernández (2022), *supra nota*, 5, 136.

cognitive augmentation would be possible to be exercised by the subject without affecting their privacy when providing neural data under informed, specific, unambiguous and revocable consent. This would be feasible in Chile for medical and research purposes, for other cases, only if the technology is secure enough. Whereas, consent and a judicial order would be necessary in Argentina for inmate's reinsertion treatment only, i.e. moral enhancement purposes.

In practice, this is a very different story when trying to discern what the mind is since it is affected by the same transhumanist epistemology as in their notion of cognition. Although the last draft of the Chilean bill erased the term "psychological", there is still confusion since the terms "psychic", "mental", "mind" and "neurodata" appear to be interchangeable although this is not true as per discussed in the previous chapter. In both bills, what is being protected is only the access without consent to neural data, i.e. brain activity, not how this data is translated in the subjects behavior, self-perception or feelings. This point is paramount when talking about unauthorized moral or cognitive enhancement. In the hypothetical scenario that the company that sells headsets to help the customers to monitor their brain waves decides to try a method to decrease their physical pain threshold by inhibiting C-type neurons firing. Since the person is conscious only of the consequence of the brain activity (pain) and not of these neurons[273], they would not be able to claim a violation of their "mind" privacy, simply because they are not aware of the intrusion in their neural data.

On the other hand, the right to equal access to neuroenhancement is contrary (in practice and theory) to the MG's rights under the cognitive liberty and mental integrity spectrum: identity, agency and free will. What cognitive enhancement promises is actually the improvement of the brain integrity that in consequence would impact the subject's self-perception, identity and likely the degree of autonomy over their actions and behavior. Therefore, they are contradictory. Despite this contradiction had been discussed in different forums, even years before neurorights existed, when analyzing the implications of the right to enhancement on health, physical integrity, personality and medical responsibility,[274] this does not represent any concern for the lobbyists of neuroenhancement[275]. Following MG's initiative, Chile, Mexico and Brazil explicitly state in their neuroprotection projects that neurotechnologies should not violate the subject's psychic and physical integrity while they should still protect the fair access to

[273] López-Silva, Pablo (2022) The Concept of Mind in the Neuroprotection Debate. In: In: López-Silva, P. and Valera, L. (eds.) *Protecting the Mind. Challenges in Law, Neuroprotection and Neurorights.* Cham: Springer, 13.
[274] Fattibene (2020), *supra nota,* 21, 218-222.
[275] Bublitz (2022), *supra nota*, 6, 11.

neuroenhancement in different levels. As per its last bill's draft, Chile would be the jurisdiction with the best framework to protect cognitive liberty in this respect since the scope of neuroenhancement is the most delimited compared to the first draft and other projects, there is a lower margin of exercise it outside the medical and research environments, there are stipulated penalties against damage of physical or psychic integrity with neurotechnologies and the health authority would be in control of neurotechnology applications. A balance towards cognitive liberty and against neuroenhancement is more visible in the current proposal. However, without a clear definition of the mind, psychic and positioning towards neurodata, the proposal put into practice is prone to fail. Again, what is being protected is the interpretation of brain activity from neural data. "Brains are not conscious, brains do not enjoy agency or free will, and certainly, brains do not experience pain or suffering."[276] Taking a hypothetical transhumanist scene as illustration, a metaverse platform offers connecting its users with compatible emotions, the company manipulates without authorization the data and enhances certain emotions to increase compatibility (e.g. increase pleasure when watching cat images), thus, such changes lead to the modification of behavior. There might be a proven violation to privacy but not to the right to agency or identity since there is not an actual harm, in fact, users subscribed to that metaverse for compatible purposes.

Concerns on cognitive liberty are expressed in the Argentinian bill's recitals and with emphasis to the possible biases from AI. However, the moral bioenhancement bill falls into the same mind/brain issue and does not consider the cognitive tradeoffs of enhancers despite proposers raising their concerns on the risks of smart drugs and the interactions between BCIs and AI.[277] This form of enhancement is advocated by both Ienca's and Yuste's neurorights initiatives as well as from different exponents of Neurolaw. The quintessential transhumanist ideal of the isolation and annihilation of the criminal mind seems to play a main role in the so called neuro-essentialist constructions[278]. Likely because the intention as treatment sounds fair balanced against repetitive crimes, recidivism and dangerousness. Nonetheless, the principle is outdated, firstly, due to the impossibility to isolate emotions and feeling from the rational mind as reviewed in the previous chapter, secondly, due to the research in emotions is in its infancy and cognitive sciences do not even agree still in what basic emotions are and how these are related to the non-mental aspects of the human being and its environment[279]. Therefore, the right to moral

[276] López-Silva (2022), *supra nota*, 52, 15.
[277] Gutiérrez (2022), *supra nota*, 37.
[278] Bublitz (2022), *supra nota*, 6, 7.
[279] Levin (2021), *supra nota*, 22, 56-76.

enhancement, or rather the obligation to apply it, should not be included as a form of treatment without having treated the issues exposed above.

4.3 A regulation for the future?

As analyzed in this chapter, the right to fair access to cognitive enhancement is contrary to the neurorights in the spectrum of cognitive liberty and to a great extent to the right to mental privacy as engaged by the Morningside Group and followed by Chile, Mexico, Argentina and Brazil in their regulatory agenda on the protection against neurotechnologies. The posthuman brain ideal behind neuroenhancement is not sustainable in the full extent of what cognition actually embraces and the notion of mind, as a product of neural activity, is reductionist and promotes the human brain as a deficient organ feasible to "upgrade" or fully substitute with the help technology. Such premises rather mimic traditional medical, psychiatric and/or psychological practices that today are either banned or at least under close scrutiny, such as lobotomy to treat mental disorders, shock therapy for depression (by memory "destruction"), chemical remedies for mood modification[280] and conversion therapy to "cure" sexual orientation.

Inducing equal access to cognitive enhancement as compulsory for the state would rather cause more obstacles than solutions. The secondary negative effects of neuroenhancers are known for being a threat to the psychological continuity (self-perception) of psychiatric patients (see section 1.1). An abrupt opening without any sort of investigation or public policy for the masses represents a serious threat to non-sick users as well. As it happened with vaccination, people already enhanced might put pressure on those that do not want the upgrade with the risk of social segregation. Many others would get it because of moral obligation rather than conviction. There might be even some institutional sectors that would coerce their people to get the upgrades against their will. The loss of "cognitive diversity" is also possible, everyone would have the same informational processing "gift" and even the same emotional, behavioral and creative set.[281] The pressure would not be only for not getting any enhancement but also for never getting enough of them as it happens with people obsessed with plastic surgeries[282]. An unequal access to enhancement would create more differentiations within populations in the job market and

[280] Gare (2022), *supra nota*, 47, 33.
[281] Borbón Rodríguez and Borbón Rodríguez (2021), *supra nota*, 20, 12-15.
[282] Sommaggio (2022), *supra nota*, 19, 78.

educational systems[283]. For instance, children whose parents cannot afford portable BCIs or even workers, would likely fail to perform as those that can afford the devices. Lastly and perhaps most importantly, the right is thought to be funded by states, however, research centers, laboratories, producers and distributors currently focus on the brain and neurotechnologies are mostly private dominant corporations[284].

Last but not least, the implementation of the right to equal access to cognitive enhancement seems more complicated in reality than in paper for several reasons. First of all, Neurolaw is practically nonexistent in the region. Despite these four countries being among the few ones in the region with academic interest in Neurolaw, there is no actual research on the matter and its implementation in the judicial system is poor and not continuous (see chapter 1.2). In this regard, great efforts to implement neuroscientific evidence as proof and moral bioenhancement in criminal law will be needed in Argentina. Whereas, the implication of enhancement in personal data protection, civil and even constitutional law in Chile, Mexico and Brazil seem to be colossal.

Instead of regulating for the future, the lack of thoroughness and structural contradictions in the integration of the right to fair access to neuroenhancement in Latin America, and neuroprotection in general, shows rather a legal regression. Echoing a well known critique from half a century ago against legislating practices in the region, enacting laws is still a consequence of political pressure hurriedly conducted without any legal technique on bills without either internal or external regulatory harmony and reconciling contradictory ideologies and questionable precepts.[285] In this order of ideas, the access to neuroenhancement should not be approved to become positive law in Chile and Argentina due to the lack of consistency in its scope, the lack of delimitation in the notion of "cognition", the obvious contradictory nature towards other neurorights and the absence of the implications of its ideological background. Instead, the use of neurotechnologies in medical and research contexts should clearly be limited and stipulated in Chile's bill of law. The section related to the fair access to cognitive augmentation should be erased from Mexico's and Brazil's bills, otherwise, the full neuroprotection regulatory framework should be reconsidered due to their restricted scope to personal data protection law.

[283] Bublitz (2021), *supra nota*, 6 , 5.
[284] Yuste (2017), *supra nota*, 5, 6. This information is also exposed with updates in almost every public presentation from Yuste that can be easily accessed via Youtube and Facebook.
[285] Novoa Monreal, E. (1975). *El Derecho como obstáculo al cambio social.* Mexico: Siglo XXI Editores, 49-54.

CONCLUSION

The Morningside group's neurorights initiative moved from the philosophic-ethical debate to the policy and legislation arena in less than 5 years. This probably happened quicker than the advances in the neurotechnologies that they attempt to regulate to safeguard the human mind, mostly through a controversial universal right to access these technologies to enhance cognitive functions. Notwithstanding the scientific and legal debate on neurorights and neuroenhancement are far from being exhausted, Chile, Mexico, Brazil and Argentina have already either legislated on them or are in the process of it. This work compares the regulatory approaches to neuroprotection in Latin America with emphasis on the right to fair access to cognitive enhancement and it analyzes the main transhumanist assumptions upon which the dominant neurorights initiative is based. The goal of this work is to understand the scope of such a right in the light of the lack of consistency of the ideology behind the neurorights proposal.

Firstly, main highlights on the pillars of neurorights are provided. The current general applications of invasive and non-invasive technologies are described along with a general overview on Neurolaw, as a main point of convergence between neurotechnology and law. The uses of neurotechnology in medical and non-medical spheres have called the attention not only from law but from transhumanism as well due to their promise to read the mind, alter emotions, personality and behaviors, modify memory, and most importantly, to enhance human cognitive functions. The chapter is closed with the transhumanist account on bioenhancement.

Secondly, Ienca/Andorno's and the Morningside group neurorights initiatives are detailed. The chapter is explained with Ienca's taxonomy of neurorights and it comprises the right to cognitive liberty, mental privacy, mental integrity, psychological continuity, protection against biases from algorithms and the equal access to mental enhancement. Specific examples of neurotechnological applications are proved against some subject's mental aspects that can be infringed with their use such as integrity, privacy, self-perception and development. The representatives of neurorights reckon that currently, law cannot protect the human brain against the potentials of these technologies.

In the third chapter, neurorights frameworks in Chile, Mexico, Brazil and Argentina are compared with emphasis on the right to fair access to cognitive enhancement. Chile is the only

country in the world with neuroprotection integrated in their Constitution since October 2021 and primary law is still under discussion. Bills of law are also being discussed in the Senates of Brazil and Argentina since the beginning of 2022. Whereas soft law on digital rights (and some neurorights) was published in Mexico at the end of 2022 with the aim to enact it as primary law. Although these countries' agendas are impacted by the Morningside group's initiative, each country took a different approach, therefore, neurorights would have very different scopes in case bills are approved, including the right to enhancement. So far, moral bioenhancement would be protected under criminal law while the current advances of the Chilean bill indicates that the right to fair access to neuroenhancement would have a scope nearly limited to medical and research purposes.

Lastly, this study scrutinizes the general notions of transhumanism, the ideology behind MG's proposal, on neuroenhancement as a universal right. The fourth chapter lays out why the transhumanist concepts of cognition, negative emotions, human mind and the insistence in its rational aspects are outdated, they do not hold basic findings in cognitive sciences (along with not conclusive evidence), and the lack of distinction between mind and brain makes a regulation on universal neuroenhancement unsuitable in Latin America and contrary to the rest of neurorights. The comparison and analysis uphold that neuroenhancement without research of medical purposes should be discarded from the Latin American projects, either because it would be in contradiction with other neurorights or simply because it lacks any scope of practice.

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