
| RESEARCH ARTICLE

The Regulation of Neurorights in National Legislation: What Should be Kept in Mind?

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| ABSTRACT

The rapid development of neurotechnologies and achievements in their practical application, as well as the increasing use of methods based on the application of artificial intelligence, represent a great reason for satisfaction, but also for concern about possible cases of their abuse. For this reason, the importance of the existence of rules, so called neurorights, that should guarantee adequate protection and preservation of the human brain and mind, is emphasized in the literature. Those rules are not only constructed at the theoretical level, but gradually become part of the normative framework of various countries and are increasingly discussed at the international level. Although there are numerous studies on neurorights, especially from the perspective of the debate on whether there is a need to regulate them as new human rights, the question of how this could be done by national legislation has not yet entered the narrower focus of research attention. To this end, by using the relevant literature, as well as the existing normative framework of various countries that regulate neurorights, the author of this article tries to contribute to discussions related to neurorights and to stimulate scientific interest in further reflection and research on the topic.

| KEYWORDS

Neurorights, human rights, national legislation, neurotechnology, neuroscience

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1. Introduction

When the US Congress adopted Joint Resolution 174 of July 25, 1989, in order to raise public awareness of the benefits of brain research, designating the decade that began on January 1, 1990 as the Decade of the Brain, it stood out the fact that in the past 25 years 15 neuroscientists received the Nobel Prize, which was an exceptional achievement that underscores the "excitement and productivity of the study of the brain and central nervous system and its potential for contributing to the health of humanity" (US Congress, 1989). On that occasion, former US President George Bush issued a proclamation on July 17, 1990, in which, among other things, he called on all public officials and citizens to mark the decade with appropriate activities and stated that there is a compelling need for continuous brain research and that mapping the brain's biochemical circuitry "may help produce more effective drugs for alleviating the suffering of those who have Alzheimer's or Parkinson's disease" (President of the USA, 1990).

More than two decades later, another former US president, Barack Obama, announced on April 2, 2013, the goals of an ambitious plan to research the human brain through the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative, and reflected on how new technologies offer the hope that this will speed up the discovery of some new ways of treatment and prevention of brain disorders and further clarify, among other things, the neural bases of memory and learning. Furthermore, he pointed out the possibility of raising some of the questions, especially about privacy and moral responsibility, stigmatization and discrimination "based on neurological measures of intelligence or other traits", but also the appropriate use of neuroscience, for example, in criminal-justice system (President of the USA, 2013).

In the last decade, from 2013 to 2022, the number of inventors of patents related to neurotechnology is continuously growing, and the largest number of them comes from the USA (53,794), Germany (4,200) and Canada (3,710), while in terms of the scope of public investments in neurotechnology in the same period, the USA is convincingly the first with as much as 3.3 billion dollars, the European Union with 1.08 billion dollars and Australia with 350 million dollars (Information Commissioner's Office, 2023). Also, neurotechnology is projected to become a market with the potential to generate significant economic benefits, estimated at \$17.1 billion globally by 2026 (Regulatory Horizons Council, 2022). The results of these investments are already visible today. As the Secretary General of the United Nations António Guterres pointed out, on the occasion of the International Conference on the Ethics of Neurotechnology held on July 13, 2023, neurotechnology is progressing at warp speed, representing a reason for celebration, but also caution, given the need to preserve ethical standards and ensure full protection of human rights, which "means robust standards for mental integrity, mental privacy, and mental freedom", as well as "stronger and clearer guidelines governing the application of neurotechnology" (United Nations, 2023).

Bearing in mind the rapid development of neurotechnology and, in particular, the increasing application of methods based on artificial intelligence, part of the scientific and professional public expressed concern about possible cases of its abuse, stressing the importance of the existence of rules that should guarantee adequate protection and preservation of the human brain and mind. These are rules that in philosophical, legal, ethical and other discussions on this topic are usually referred to as neurorights (Yuste, Goering, Arcas et al., 2017; Farinella & Gulyaeva, 2022). Although there are numerous studies on neurorights, especially from the perspective of the debate on whether there is a need to regulate them as new human rights (e.g. Ienca & Andorno, 2017; Carbonell, 2021; Hertz, 2023, etc.), the question of how this could be done by national legislation has not yet entered the narrower focus of research attention. To this end, by using the relevant literature, as well as the existing normative framework of various countries that regulate neurorights, the author of this article tries to contribute to discussions related to neurorights and to stimulate scientific interest in further reflection and research on the topic.

In view of the above, after the first, introductory part of the paper, the second part uses the relevant literature to consider the conceptual definition of neurorights and their types, while the third part presents the most common arguments that stand out in the literature for and against their special regulation. Based on an insight into the relevant regulations, the fourth part of the paper presents normative solutions from comparative public law, while in the fifth, final part of the article, concluding remarks are stated.

2. Conceptualization of Neurorights

Between law and psychology there is a long and rich history (Frank, 1949), the sources and early outlines of which are connected with Hammurabi's code (2nd century BC), Justinian's collection of legal Roman law *Digesta seu Pandectae* (533), and later, the *Constitutio Criminalis Carolina*, the code of criminal law and procedure of the German emperor Charles V (1532) (García-López, Mercurio, Nijdam-Jones et al., 2019). However, the essential connection between law and neuroscience began with the first use of electroencephalography (EEG) in courts in the middle of the 20th century, further use of psychosurgery for the prevention of violence in the sixties and seventies (*Ibid.*), while their interpenetration at full capacity began at the end of the last decade of the 20th century (Goodenough & Tucker, 2010), and as a result of this permeation, the term *neurolaw* was coined. This term refers to an interdisciplinary field "which links the brain to law, facilitates the pathway to better understanding of human behavior in order to regulate it accurately through incorporating neuroscience achievements in legal studies" (Petoft, 2015, p. 53), but also that leads "lead to better-designed laws and fairer legal procedures" (Ienca & Andorno, 2017, p. 5).

In addition to the term *neurolaw*, since 2017 the term *neurorights* is often used in the literature, as an umbrella term that is understood to mean "ethical, legal, social, or natural principles of freedom or entitlement related to a person's cerebral and mental domain; that is, the fundamental normative rules for the protection and preservation of the human brain and mind" (Ienca, 2021, p. 44). The term *neurorights* was coined by Marcello Ienca and Roberto Andorno (2017) proposing the standardization of four new human rights – the right to mental privacy, the right to mental integrity, the right to psychological continuity and the right to cognitive liberty. These are rights that partially follow the four ethical priorities, also identified as "four areas of concern that call for immediate action" (Yuste, Goering, Arcas et al., 2017, p. 161) in the context of neurotechnology, but also artificial intelligence, as necessary prerequisites that call for respect: privacy and consent, agency and identity, augmentation and bias. The first priority starts from the threat that neural devices connected to the Internet enable the monitoring or manipulation of the mental experience of the subjects, so for all neural data the possibility of turning off their sharing should be the default choice and carefully protected, and the subjects should explicitly decide to share them. In the explanation of the second priority, it is pointed out that some patients who received deep brain stimulation reported that they had a feeling of changed sense of agency and identity, while the meaning of the third priority is contained in the understanding that the pressure of adopting advanced neurotechnologies, such as those that enable a "radically expand their endurance or sensory or mental capacities, is likely to change societal norms, raise issues of equitable access and generate new forms of discrimination". The fourth priority seeks to ensure that technologies do not privilege certain groups and do not harm people (Yuste, Goering, Arcas et al., 2017, p. 161-162).

lenca and Andorno (2017, p. 24) propose the (neuro)right to mental privacy, the goal of which consists of the protection of “private or sensitive information in a person’s mind from unauthorized collection, storage, use, or even deletion - in digital form or otherwise”. With regard to such content, it is a right that could be generally subsumed under the existing right to privacy, which at the international level is contained, for example, in Article 12 of the Universal Declaration of Human Rights of 1948, on the basis of which no one “shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honor and reputation. Everyone has the right to the protection of the law against such interference or attacks.” (United Nations, 1948). In addition to the mentioned international dimension, the same right is also reflected in national legislation, at the constitutional and/or (sub)legal level, among the provisions that refer to respect for patient privacy. However, in contrast to the regulation of the existing right to privacy, the regulation of the (neuro)right to mental privacy seeks to include information that has not (yet) been expressed (written or verbal), as well as the source of this information, which could effectively protect the “protects a person’s mental dimension as the ultimate domain of information privacy in the digital ecosystem” (lenca & Andorno, 2017, p. 24).

In addition to the (neuro)right to mental privacy, lenca and Andorno (2017) also state the (neuro)right to mental integrity, which guarantees the protection of that integrity from mental illness or traumatic injuries, as well as from all unauthorized encroachments on a person's mental wellbeing through the use of neurotechnology, especially when the intrusive action results in impairment physical and mental health of a person (*Ibid.*). With regard to such content, it is a right that could be generally subsumed under the concept of the existing right to physical and mental integrity, which is already regulated at the international level, for example, by Article 3 paragraph 1 of the Charter of Fundamental Rights of the European Union (European Union, 2016) based on which everyone has “the right to respect for his or her physical and mental integrity”. Furthermore, on the same existing right, there is also the practice of the European Court of Human Rights, for example, in the *Sentges v. The Netherlands* case, in which the Court expressed the opinion that “private life includes a person’s physical and psychological integrity; the guarantee afforded by Article 8 of the Convention is primarily intended to ensure the development, without outside interference, of the personality of each individual in his relations with other human beings” (European Court of Human Rights, 2003). In addition to the international dimension, the same right is also reflected in national legislation, at the constitutional and/or (sub)legal level, among the provisions that refer to the respect of the patient's right to physical and mental integrity. On the other hand, lenca and Andorno (2017, p. 18) point to the fact that mental integrity is not just a “pendant” of the right to physical integrity, and that the existing (i.e. positive) law does not explicitly mention neurotechnology, the application of which could damage a person's physical and mental health.

The (neuro)right to psychological continuity constitutes next proposed neuroright, which seeks to “protect the mental substrates of personal identity from unconscious and unconsented alteration by third parties through the use of invasive or non-invasive neurotechnology” (*Ibid.*, p. 24). This would guarantee protection against various manipulations such as unconscious neural advertising through neuromarketing and the use of subliminal techniques that cannot be consciously registered, thus protecting the psychological continuity of a person in his usual thoughts, preferences and choices (*Ibid.*, p. 21-22). Given such a description, one can get the impression that it is a right that could be generally subsumed under the concept of the existing right to personality that is already regulated at the international level. For example, in Article 22 of the Universal Declaration of Human Rights, it is prescribed that everyone is “entitled to realization, through national effort and international co-operation and in accordance with the organization and resources of each State, of the economic, social and cultural rights indispensable for his dignity and the free development of his personality” (United Nations, 1948). In general, the concept of personality is based on the understanding that there are a number of differences between people that are manifested by their “characteristic individual patterns of behavior” (Bačić, 2002, p. 84); in other words, by “special and different ways in which someone lives, fulfills his obligations, expresses his needs” (*Ibid.*). The right to personality includes numerous values such as the right to life, physical and mental health, privacy, etc., and the reflections of these rights are contained in national legislation at the constitutional and/or (sub)legal level. On the other hand, in relation to existing rights, lenca and Andorno (2017, p. 21-22) believe that the (neuro)right to psychological continuity is directed towards protection at a level that precedes the expression of personality, and the fundamental difference in relation to the (neuro)right to mental integrity consists in the fact that the latter right requires that there must be an intervention that causes injury or trauma, while in the case of the right to psychological continuity they are not directly required (*Ibid.*).

Finally, lenca and Andorno (2017) also propose a (neuro)right to cognitive liberty, which aims to ensure that each person can freely make decisions related to her or him, that is, to guarantee the right to refuse the forced use of neurotechnology. It is an expression of freedom, that is, the right to one's own consciousness and thought processes, which is why it is considered that cognitive liberty is a prerequisite for all other freedoms because it constitutes their “neurocognitive substrate” (*Ibid.*, p. 10). In this sense, an analogy could be drawn with the concept of freedom of thought, from which comes a whole series of other rights, such as freedom of speech and public performance, etc. Freedom of thought is regulated at the international level, for example, by the Article 18 of the Universal Declaration of Human Rights (“Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief, and freedom, either alone or in community with others and in public or private, to manifest his religion or belief in teaching, practice, worship and observance”) and the elaboration of this freedom, especially of

the expression of opinion, can be seen in national legislation, at the constitutional and/or (sub)legal level. On the other hand, it is considered (Ienca, 2021, p. 47-48) that the existing regulations on freedom of opinion to a greater extent adequately protect only the *locus externus* (behaviour, statements, text, etc.), and to a lesser extent the *locus internus* (unspoken information, hidden intentions, etc.).

Although the mentioned neurorights proposed by Ienca and Andorno (2017) are often cited in the literature, some authors have other proposals as well. For example, Lavazza (2018, p. 4) suggests that only one neuroright should be regulated, namely mental integrity, which means "individual's mastery of his mental states and his brain data so that, without his consent, no one can read, spread, or alter such states and data in order to condition the individual in any way". Such a definition expands the one offered by Ienca and Andorno (2017), encompassing both the issue of privacy and the issue of cognitive liberty. On the other hand, some authors propose other solutions, e.g. Lighthart, Ienca, Meynen et. al. (2023) in addition to mental integrity suggest the norming of mental privacy and cognitive liberty; Baselga-Garriga, Rodriguez, and Yuste (2022) suggest five neurorights, namely: mental privacy, personal identity, free-will, protection from algorithmic bias, and equal access to mental augmentation; etc. Therefore, there are certain differences in the conceptual-normative frameworks of neurorights in the literature, as well as in the terminology used, which is why it is not possible to give a single division of neurorights, nor to give their unison definitions.

3. Positions on Regulation

In the debates about the need for legal regulation of neurorights, two main positions stand out - legal conservatism, on the one hand, and legal innovation, i.e. legal reformation, on the other - although certain authors propose some pragmatic, compromise solutions as well.

The first position starts from the assertion that the positive normative framework can provide needed answers to the questions of protection and preservation of the human brain and mind. In this sense, there is criticism that the "juridification (...) of ethical norms leads to the inflation of fundamental rights" (Kellmeyer, 2022, p. 422), while conceptual specifications of individual rights, transdisciplinary cooperation and concrete proposals for the responsible governance of neurotechnologies are missing (*Ibid.*, pp. 422-424). In other words, it is about understanding that the normative state remains as it is.

The second position starts from the fact that it is a matter of the qualitative specificity and innovation of neurotechnology interventions in the mental domain of a person, which is why it is necessary to establish rules that will regulate the protection and preservation of the human brain and mind by introducing new rights (i.e. legal innovation) or changing existing rights (i.e. legal reformation) (*Ibid.*). At the same time, this would contribute to the clarification of unclear and limitedly applicable norms of positive law and harmonize them with the requirements dictated by the dynamic pace of neurotechnological evolution (Ienca, 2021).

Finally, some authors suggest a third, pragmatic approach that tries to reconcile the previous two positions, by accepting the argument that the existing rights do indeed constitute sufficient foundations, but also respecting the argument about the need to find certain answers in relation to neurorights at the national and supranational level through "context-sensitive and adaptive regulatory, legal, and political solutions" (Kellmeyer, 2022, p. 425), such as ethical self-regulation. The advantage of such pragmatism lies in the greater space for discussion, which allows decision-makers to still manage to find a common thread in shaping the appropriate solution.

4. Examples from Comparative Law

In comparative law, there are different normative solutions for the regulation of neurorights. In the Republic of Chile, on October 14, 2021, a constitutional change was adopted, which stipulates: "Scientific and technological development will be at the service of people and will be carried out with respect for life and physical and mental integrity. The law will regulate the requirements, conditions and restrictions for its use in people, and must especially protect brain activity, as well as the information from it." (Article 19 paragraph 1) (Congreso Nacional de Chile, 2021). In addition, the Chilean Senate approved the accompanying draft bill on the regulation of neurorights, and from the content of that draft, which is still in the adoption phase (Senado de la República de Chile, 2021), it follows that it aims, *inter alia*, to: protect mental integrity of citizens (Article 1); guarantee that the state will ensure the development of neuroscience and neurotechnology and access to their progress without arbitrary discrimination (Article 2); enable the free use of any type of permitted neurotechnology and bind interventions only with free, prior, explicit and informed consent (Article 4); restrict or prohibit the use of neurotechnology due to violation of fundamental rights, influence on a person's behavior without their consent, exploitation of the vulnerability of certain groups, and extraction of data without authorization, i.e. prior consent of the owner or negative impact on neuroplasticity of the brain (Article 8); enable the collection, storage, processing and transfer of data only for legitimate and informed purposes and with the person's consent (Article 11); to prescribe sanctions in case of actions contrary to the law (Article 10).

In the same year, the procedure of the Chamber of Deputies of the Parliament of the Federal Republic of Brazil included a draft bill on amendments to the General Law on the Protection of Personal Data (Câmara dos Deputados do Brasil, 2021). It provides for the processing of neural data only with the explicit consent of the owner or legal guardian and prohibits the use of any brain-computer interface or method that could harm someone's identity, autonomy or psychological continuity, as well as communication between data controllers or their joint use of neural data aimed at obtaining economic benefit. Moreover, the draft law foresees that neural data constitutes a special category of sensitive health data that requires greater protection and that the state takes the necessary measures in order to have equal access to progress in neurotechnology (Article 3).

Also in 2021, in the Republic of France, a law related to bioethics was passed, which, among other things, supplemented the Public Health Act with a provision on the basis of which actions, processes, techniques, methods and equipment that lead to the modification of cerebral activity and represent a serious danger or suspicion of a serious danger to human health may be prohibited by decree, after notification of the competent authority, and any decision to cancel the prohibition must be in the same form (Article 19) (Assemblée nationale Française, 2021). In addition, the following year, the French Ministry of Higher Education and Science adopted the Charter for the Responsible Development of Neurotechnologies, which aims to promote the responsible development and use of neurotechnologies, both for medical and for non-medical purposes, by strengthening trust, and by protecting "patients and consumers against potentially abusive and malicious uses leading to loss of cognitive freedom or a breach of confidentiality of the personal brain-data collected".

In the Republic of Argentina, in 2022, a draft bill was presented to amend Article 134 of the Federal Criminal Procedure Code. According to the draft, any means that include brain imaging techniques and any other types of neurotechnologies that, based on data related to the structure and/or function of the brain, in some way allow inferences about mental activity, in all its aspects, can serve as evidence and can only be used by order of the court and with the explicit consent of the person, who must be previously informed of their purpose and scope (Honorable Cámara de Diputados de la Nación Argentina, 2022). The same formulation was also used in relation to the execution of the prison sentence, with the addition that in all cases "discriminatory prejudices, both cognitive and algorithmic, must be omitted" (*Ibid.*).

In the Republic of Ecuador, in 2023, a draft bill on neuroprotection and ethical application of neurotechnologies was presented (Asamblea Nacional del Ecuador, 2023). It aims to guarantee the protection of rights against the abuse of neurotechnologies, with the aim of preserving human dignity from the development of new invasive or non-invasive technologies, among other things, through: the protection of physical and mental integrity; the protection of the privacy of neural data; the right to free decision and autonomy; the right to non-discriminatory access to neurotechnologies aimed at increasing psychic abilities; a guarantee that users of neurotechnologies will be informed about possible negative consequences and side effects; the right to voluntary control over the operation of any device connected to their brain (Article 3). The draft law *explicite* provides for the guarantee and protection of, among other things, the right to: preserve personality; non-interference with freedom of decision; neural data privacy; equality in the improvement of brain or cognitive abilities; protection against algorithmic bias; cognitive liberty; mental integrity; psychological continuity; information about new technologies and ethical implications; and other rights arising from human dignity, which are subject to abuse of neurotechnology, artificial intelligence, etc. (Article 6). Also, it is worth noting that the draft law provides mechanisms (instruments) for public participation. Namely, the authority responsible for health management in coordination with the authority responsible for management in higher education, science and technology must promote participation, as well as cooperation with civil society and contribute to the formation of citizens' committees to monitor compliance with the law as a mechanism of transparency, citizen participation and social control (Article 19).

In contrast to the aforementioned constitutional and legal provisions, and draft laws, in comparative law there are also examples of the regulation of neurorights only through non-binding documents, such as the Charter of Digital Rights, a document adopted by the Government of the Kingdom of Spain in 2021, which Article XXVI deals with digital rights in the use of neurotechnologies (Gobierno de España, 2021). The Charter stipulates that the conditions, limits and guarantees of use of neurotechnologies may be regulated by law to guarantee the individual, among other things: control over his own identity; self-determination, sovereignty and freedom of decision; confidentiality and security of data related to his cerebral processes and full control and disposal of (neuro)data; assurance that decisions and processes based on neurotechnologies are not conditioned by incomplete, unwanted, unknown or biased data and programs. Moreover, the law can also regulate those cases and conditions of use of neurotechnology that seek to perform mental augmentation outside of therapeutic application or stimulate or improve one's abilities, with the condition of respecting the dignity of the person, equality and prohibition of discrimination.

Similarly, it is worth highlighting the Charter of the Rights of the Person in the Digital Environment: Code of Good Practice, a document presented by the National System of Transparency, Access to Information of Public Importance and Protection of Personal Data in the United Mexican States, (Sistema Nacional de Transparencia, Acceso a la Información Pública y Protección de Datos Personales, 2022), which also refers to neurorights. It states, among other things, that procedures in which neuroscience and neurotechnology are used must preserve personal identity, and the right to protection from the forced and non-consensual use

of such technologies. It is stipulated that everyone has the right to the protection of neurodata and to give consent to the measurement, analysis and modification of brain activity, whereby all decisions will be made freely, with full autonomy and with a sense of responsibility. Also, it states that neurotechnology cannot be used to change person's will, and that the right to improve a person's brain activity and abilities must be available to everyone, without any differences.

5. Concluding Remarks

From what has been presented so far, it follows that there is no unified position in the literature about which neurorights should be regulated, nor how they should be regulated, nor, moreover, whether they should be regulated at all. On the one hand, it is pointed out that there are no clear conceptual frameworks of the proposed neurorights, and, on the other hand, that the provisions of positive law cannot be assessed as completely clear and unambiguous when it comes to examples of possible applications of neurotechnology and their adaptability in following the dynamic course of neurotechnological evolution. Also, it can be concluded from the literature that, on the one hand, there are objections to the necessity of interpreting general terms and insufficiently clear and precise norms of positive law in connection with the subject of neurorights, while, on the other hand, objections are made that the regulation of neurorights would lead to the inflation of new human rights, as well as new norms.

Given such an incoherent theoretical framework, it was particularly important to analyze examples from comparative law of how neurorights are regulated by national legislation and which issues should be considered in this regard. In comparative law, very different normative solutions for the regulation of neurorights have been established: from the constitutional approach to regulation (in the Republic of Chile), through special laws on neurorights (e.g. draft laws in the Republic of Chile and the Republic of Ecuador) and their regulation within the framework of some other law (such as the draft amendments to the General Law on the Protection of Personal Data in the Federal Republic of Brazil and the draft amendments to the Federal Criminal Procedure Code in the Republic of Argentina or the amendment to the Public Health Law in the Republic of France) and up to the approach of regulation exclusively by non-binding documents such as the charter (e.g. in the Kingdom of Spain and the United Mexican States). In addition, some of these solutions are only of a principled nature (e.g. the constitutional solution from the Republic of Chile, three charters from the Kingdom of Spain, the United Mexican States and the Republic of France), while other normative solutions are more or less concrete, where some of them foresee sanctions (e.g. a draft law in the Republic of Chile), and some explicitly foresee the public participation and the need for supervision (e.g. a draft law in the Republic of Ecuador), etc.

If the position is taken that neurorights should be regulated, the following open questions should be kept in mind: a) whether it will be done through a binding or non-binding regulation; b) whether it will be done by the constitution, which requires the highest possible degree of socio-political consensus, and/or by law and/or by a specific act of lower legal force; c) whether it will be done by a special act that regulates only the issue of neurorights and/or within the framework of another, existing act, i.e. through its amendment; d) whether it will be done by provisions of a principled or concrete nature; e) whether the norms on neurorights will be protected under the threat of sanctions or not; f) whether an existing state body will be entrusted with the implementation of that normative solution or a new independent body will be formed; g) which neuroright will be regulated and with what content and concept.

When answering the mentioned and similar questions, it would be especially useful to keep in mind the existing solutions of positive law and experience from comparative law and practice, as well as guidelines, recommendations and other documents that have already been adopted at the international level, such as the OECD Recommendation on Responsible Innovation in Neurotechnology (OECD, 2022) which, among other things, indicates the necessity of international standards for responsible innovation in neurotechnology. In addition, the process of adopting the constitution, laws and other acts should definitely involve the professional, scientific and other public through the use of some of the legal instruments of public participation in that process (e.g. Struić, 2017; Struić & Bratić, 2017).

Although the normative framework of neurorights would have to be legally constructed in a general way to be able to adapt to the rapid development of neurotechnologies and artificial intelligence, at the same time this framework must ensure concrete and effective protection for citizens and be adapted to the socio-cultural, political, economic and other foundations on which a given state and society rest, as well as to be harmonized with international legal standards, especially considering that, at the national level, the normative solutions are still very diverse.

In any case, it seems that the rapid spread of neurotechnology in its possibilities, applications and implications will broaden, deepen, and accelerate the debate on neurorights not only in an increasing number of countries, but also at the international level, whose legal instruments seem crucial to guide national legislation and practice. At the same time, different fragmented and isolated approaches of national legislations per se cannot be seen as a sufficient key for the establishment of a coordinated and coherent supranational regulatory framework that could serve as a response to the current and upcoming challenges related to the application of neurotechnology and the need to protect human rights.

5.1 Study Limitations and Future Research

Although this topic certainly opens up a number of other directions for discussion, such as considering a closer comparative analysis of the regulations and documents of the aforementioned countries or researching how neurorights should be standardized at the supranational level, such and similar issues should be considered in a separate study.

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