Inspiring the extraordinary

Neurotechnology in Healthcare

Submission to the Nuffield Council on Bioethics call for evidence on the ethics of neurotechnologies that intervene in the brain

Miranda Q Wang, Durham Law School, Centre for Ethics and Law in the Life Sciences

Corresponding address: qianyu.wang@durham.ac.uk

16 February 2025

Executive Summary

1. This response examines the ethical, legal, and policy implications of neurotechnological advancements for therapeutic purposes through the framework of neurorights. Since the Council's 2013 report, this area has seen significant academic and regulatory development, positioning neurorights as a cornerstone for future regulatory frameworks governing neurotechnologies.
2. Emphasising two of the four neurorights—cognitive liberty and psychological continuity—this response aligns with the Council's inquiry into the (in)voluntariness of patient treatment choices and the potential impact of neurotechnologies on personal identity.
3. The other two neurorights, mental integrity and mental privacy, are also discussed. Mental integrity underscores the medical ethics principles of beneficence and non-maleficence, while mental privacy emphasises protection against privacy infringements. These considerations resonate with the Council's 2013 report, which highlighted the importance of safe interventions and safeguarding patients and research participants from psychological and social harm in healthcare practices.
4. This response also discusses the ethical implications of neurointerventions within the carceral system, where prisoners may undergo such interventions for therapeutic purposes. The ethical concerns present in traditional therapeutic settings are amplified in this context due to inherent power imbalances.

Table of Contents

Introduction

This response to the Nuffield Council on Bioethics' call for evidence on neurotechnology focuses on the emergence of neurorights – an area of significant academic and regulatory development since the Council's 2013 report.[1] Given the accelerating advancements in neurotechnologies across various fields of applications, the recognition and protection of neurorights have gained substantial traction in ethical and legal discourse.[2]

Structured around the four core principles of neurorights,[3] this response will address each in turn, with a particular emphasis on cognitive liberty and psychological continuity. This focus aligns with the Council's inquiry into the (in)voluntariness of patient choice about treatment and the potential impact of neurotechnologies on personal identity. These issues are of particular importance when considering the use of therapeutic neurointerventions, which could alter an individual's cognitive and psychological states.[4]

Drawing on my research expertise in law, neuroethics, and criminal justice, this response will also examine the ethical implications of neurointerventions within the carceral system. In this setting, prisoners may be subjected to neurointerventions as patients for therapeutic purposes, raising significant concerns regarding consent, autonomy, and voluntariness.[5] The coercive nature inherent to incarceration presents unique ethical challenges, as it could undermine prisoners' ability to make truly free and autonomous choices.[6]

The objective of this response is twofold: first, to contribute recent evidence on the development of neurorights as a legal framework that is informed by and in response to

[1] Marcello Ienca, 'On Neurorights' (2021) 15 Frontiers in Human Neuroscience.
[2] ibid.
[3] Marcello Ienca and Roberto Andorno, 'Towards New Human Rights in the Age of Neuroscience and Neurotechnology' (2017) 13 Life Sciences, Society and Policy.
[4] Oliver Müller and Stefan Rotter, 'Neurotechnology: Current Developments and Ethical Issues' (2017) 11 Frontiers in Systems Neuroscience.
[5] Jesper Ryberg, Neurointerventions, Crime, and Punishment (Oxford University Press 2019).
[6] ibid.

neuroethical concerns; and second, to highlight key issues relating to consent, the principles of beneficence and non-maleficence, and the risks of disruption to personal identity.

1. **Neurorights**

Since the 1990s ‘decade of the brain’, neuroscience has significantly advanced our understanding of human cognition.[7] This development has sparked popular interest not only in scientific inquiry but also in its potential applications across various other domains such as medical, commercial, and criminal justice.[8] This interdisciplinary expansion has led to the emergence of various "neuro" fields,[9] notably neuroethics,[10] a term popularised by William Safire who defined it as "the examination of what is right and wrong, good and bad, about the treatment of, perfection of, or unwelcome invasion and worrisome manipulation of the human brain."[11]

Within neuroethics, a critical area of inquiry addresses ethical challenges through the lens of normative principles – rights and obligations – culminating in the concept of "neurorights."[12] Neurorights aim to enshrine ethical concerns related to neurotechnological advancements into legal frameworks, thereby providing robust safeguards against potential infringements.[13] In 2017, Marcello Ienca and Roberto Andorno proposed a new set of human rights specifically designed to ensure individuals' control over their minds and to protect them from harm in the context of neurotechnology.[14] These proposed rights include cognitive liberty, mental privacy, mental integrity, and psychological continuity.[15]

The development of neurorights represents a significant advancement in the ethical and legal governance of neurotechnologies. Given that fundamental human rights standards must be upheld in every aspect of social functioning,[16] neurorights are emerging as a cornerstone for the regulatory frameworks governing neurotechnologies. While the United Kingdom has not yet incorporated neurorights into its legal system, international momentum is growing. Chile

---

[7] EG Jones, ‘Assessing the Decade of the Brain’ (1999) 284 Science 739.
[8] OD Jones and others, ‘Law and Neuroscience’ (2013) 33 Journal of Neuroscience 17624.
[9] Steven Rose, ‘The art of medicine: 50 years of neuroscience’ (2015) 385 The Lancet 598.
[10] Jon Leefmann, Clement Levallois and Elisabeth Hildt, ‘Neuroethics 1995–2012. A Bibliometric Analysis of the Guiding Themes of an Emerging Research Field’ (2016) 10 Frontiers in Human Neuroscience.
[11] Safire, W. (2002). “Visions for a new field of neuroethics,” in Neuroethics: Mapping the Field, Conference Proceedings, May 13-14, 2002, (San Francisco: The Dana Press) 5.
[12] Ienca (n 1).
[13] ibid
[14] Ienca and Andorno (n 3).
[15] ibid
[16] Jack Donnelly, *Universal Human Rights in Theory and Practice* (Cornell University Press 2013).

pioneered this movement by amending Article 19 of its Constitution to enshrine protections for psychological integrity and brain activity.[17] Following Chile's lead, several other countries, including Mexico, Brazil, Argentina, and Colombia, are actively considering legislative bills aimed at recognising neurorights.[18] In the United States, individual states such as Colorado and California have introduced legislation addressing the regulation of neurotechnologies.[19] Additionally, the European Union and the United Nations are actively engaged in discussions on developing a supranational and international legal framework for these emerging rights.[20]

The unprecedented invasiveness and expansive applications of neurotechnology – particularly when integrated with artificial intelligence – pose novel challenges to traditional understandings of individual mental states and cognitive processes.[21] Consequently, the recognition of neurorights as a distinct set of legal and human rights is imperative, whether immediately or in the near future. Even in the absence of dedicated legislation, courts may adopt expansive interpretations of existing human rights or reconceptualise them to ensure the continued protection of fundamental freedoms in the face of advancing neurotechnologies.[22] However, a piecemeal, reactive approach to regulation is insufficient and risks leaving significant gaps in legal protections.

In light of these developments, the core principles of neurorights should be regarded as essential when addressing the ethical and legal dimensions of neurotechnology's future. The following sections will examine these principles, with particular attention to ethical

---

[17] Diego Borbón, 'What a NeuroRights Legislation Should Not Look Like: The Case of the Latin American Parliament' (2025) 18 Frontiers in Neuroscience.
[18] Diego Borbón and Jorge Alberto Ramírez-Gómez, 'Between Politics and Scholarship: The (Un)Settled Debate over Neurorights' (2024) 6 Frontiers in political science.
[19] Brad Brooks, 'First Law Protecting Consumers' Brainwaves Signed by Colorado Governor' (*Reuters* 18 April 2024) <https://www.reuters.com/technology/first-law-protecting-consumers-brainwaves-signed-by-colorado-governor-2024-04-18/>; Jessica Hamzelou, 'A New Law in California Protects Consumers' Brain Data. Some Think It Doesn't Go Far Enough.' (*MIT Technology Review* 4 October 2024) <https://www.technologyreview.com/2024/10/04/1104972/law-california-protects-brain-data-doesnt-go-far-enough/>.
[20] 'Neurotechnology and Neurorights - Privacy's Last Frontier | Past Events | Events | Think Tank | European Parliament' (*Europa.eu* 2023) <https://www.europarl.europa.eu/thinktank/en/events/details/neurotechnology-and-neurorights-privacy-/20231019WKS05721>; 'Towards an International Instrument' (*Unesco.org* 2024) <https://www.unesco.org/en/ethics-neurotech/recommendation>.
[21] Sara Berger and Francesca Rossi, 'AI and Neurotechnology: Learning from AI Ethics to Address an Expanded Ethics Landscape' (2023) 66 Communications of the ACM 58; Zhiyi Chen and Ali Yadollahpour, 'A New Era in Cognitive Neuroscience: The Tidal Wave of Artificial Intelligence (AI)' (2024) 25 BMC neuroscience.
[22] Christoph Bublitz, 'Neurotechnologies and human rights: restating and reaffirming the multi-layered protection of the person' (2014) The International Journal of Human Rights.

challenges arising in both conventional therapeutic settings and the carceral context, where prisoners may become patients subject to neurointervention.

2. **Cognitive Liberty**

The neuroright to cognitive liberty, as defined by Ienca and Andorno, encompasses both the right to modify one's mental states through neurotechnological means and the right to refuse such interventions.[23] This dual aspect underscores self-determination and the principle of autonomy,[24] which is also a cornerstone of medical ethics, asserting that competent individuals have the right to make informed decisions about their medical treatments.[25] In therapeutic settings, it is imperative that the right to cognitive liberty is rigorously upheld, aligning with existing legal mandates that protect patients' bodily integrity and autonomy to consent/refuse the use of neurotechnologies as medical treatment.

2.1 Balancing the Promotion of Cognitive Liberty with Patient Autonomy in Treatment Decisions

Beyond the traditional discourse on consent and refusal in medical ethics, the recognition of cognitive liberty as a distinct neuroright may also impose a positive obligation on states to actively preserve and promote mental liberty.[26] While constitutional provisions vary in the extent of positive duties assigned to states, the inviolability of the freedom of thought and the preservation of core personal identity suggest that states could be required to provide necessary resources to individuals deprived of essential cognitive capacities.[27] This obligation may include allocating more resources for research and treatment of neurodegenerative conditions, such as Alzheimer's disease, and supporting patients in minimally conscious states.[28]

---

[23] Ienca and Andorno (n 3).
[24] Jan-Christoph Bublitz, 'My Mind Is Mine!? Cognitive Liberty as a Legal Concept' in Elisabeth Hildt and Andreas Franke (eds), *Cognitive Enhancement: Trends in Augmentation of Human Performance, vol 1* (Springer, Dordrecht 2013) 233.
[25] GM Stirrat and R Gill, 'Autonomy in Medical Ethics after O'Neill' (2005) 31 Journal of Medical Ethics 127.
[26] Bublitz (n 24).
[27] ibid
[28] ibid

The potential recognition of a positive duty to promote cognitive liberty and mental autonomy introduces complex ethical considerations, particularly concerning the balance between state intervention and individual consent. A critical question arises: Can the state compel individuals to undergo neurointerventions in the name of enhancing cognitive liberty? This issue is especially pertinent within incarcerated populations, where the dynamics of consent and coercion are inherently complex.

There is a compelling argument for applying neurointerventions to prisoners; such interventions could enhance their autonomy and well-being by addressing underlying neurological conditions that contribute to criminal behaviour.[29] For instance, Choy et al. suggest that certain desires driving criminal actions may be experienced as internal coercion, hindering autonomous decision-making.[30] This perspective is particularly relevant for sex offenders, whose biologically driven impulses may conflict with their higher-order desires to abstain from offending behaviours.[31]

Therefore, the state's positive duty to enhance autonomous mental choices could in theory justify the imposition of therapeutic neurointerventions for incarcerated individuals as a means of crime reduction. Scholars such as Douglas, or Ellegaard and Kragh have argued that, if the state is permitted to impose incarceration without an individual's consent, it might similarly justify non-consensual neurointerventions aimed at rehabilitation. [32] This perspective suggests that such interventions could be considered analogous to traditional criminal justice remedies, such as imprisonment, probation, and psychological rehabilitation programs, and thus may not necessitate the prisoner's consent when public safety and welfare are at stake.[33]

Despite arguments in favour of neurointerventions as rehabilitative tools, their fundamental nature distinguishes them from conventional criminal justice remedies. Unlike incarceration or psychological rehabilitation programs, neurointerventions directly modify an individual's motivations and behaviours by altering neurological processes, in some cases bypassing

[29] Ryberg (n 5).
[30] Olivia Choy, Farah Focquaert and Adrian Raine, 'Benign Biological Interventions to Reduce Offending' (2018) 13 Neuroethics.
[31] Gregg D Caruso, *Neurolaw* (Cambridge University Press 2024).
[32] Thomas Douglas, 'Criminal Rehabilitation through Medical Intervention: Moral Liability and the Right to Bodily Integrity' (2014) 18 The Journal of Ethics 101; M Ellegaard and K Kragh K, 'Moral Enhancement and Persistent Violent Offenders' (2015) Philosophy and Science Studies, cited in Ienca and Andorno (n 3).
[33] ibid.

conscious deliberation.[34] This invasive character raises significant ethical and legal concerns, particularly regarding an individual's right to bodily and mental integrity.

Given that the mind is constitutive of personal identity and agency, any external intervention targeting neural processes may be perceived as a fundamental threat to autonomy.[35] Without stringent safeguards and the assurance of consent, such interventions risk becoming profound violations of personal dignity and self-determination.[36] This concern is not limited to the criminal justice context but extends to standard medical settings, where the potential for neurotechnological procedures to alter mental faculties underscores the necessity of upholding the right to refuse or terminate treatment. Any perceived positive duty to promote cognitive liberty must be carefully balanced against the principles of beneficence and non-maleficence—act for the benefits of patients and, critically, do no harm—to ensure that interventions uphold core medical ethics standards.

2.2 Navigating Consent for Treatment within the Carceral System

Furthermore, the issue of valid consent becomes contentious when prisoners are offered neurointerventions as a condition for early release or reduced sentencing.[37] Incarcerated individuals may face significant pressure to accept such treatments, raising doubts about the voluntariness of their consent. The inherent power imbalances within the carceral system can compromise the ability to make free and uncoerced decisions.[38] Therefore, presenting neurointerventions as a prerequisite for release may undermine the authenticity of consent. While some scholars argue that the pressure in these situations does not necessarily invalidate consent, asserting that choices made under such circumstances can still be sufficiently voluntary,[39] the uniquely invasive nature of neurointerventions demands a cautious approach. Empirical studies focusing on prisoners' perceptions of neurointerventions as early release conditions are essential to inform ethical practices and policy decisions.

---

[34] Caruso (n 30).
[35] Elizabeth Shaw, 'The Right to Bodily Integrity and the Rehabilitation of Offenders through Medical Interventions: A Reply to Thomas Douglas' (2016) 12 Neuroethics 97.
[36] Elizabeth Shaw (2018). Against the mandatory use of neurointerventions in criminal sentencing. In Treatment for Crime: Philosophical Essays on Neurointerventions in Criminal Justice, eds. D. Birks and T. Douglas, pp. 321–337. New York: Oxford University Press.
[37] Caruso (n 30).
[38] Jolene van der Kaap-Deeder and others, 'Choosing When Choices Are Limited: The Role of Perceived Afforded Choice and Autonomy in Prisoners' Well-Being.' (2017) 41 Law and Human Behavior 567.
[39] A Wertheimer and FG Miller, 'There Are (STILL) No Coercive Offers' (2013) 40 Journal of Medical Ethics 592; Ryberg (n 5); Caruso (n 30).

To conclude, the right to cognitive liberty not only demands the protection of individuals from unwanted neurotechnological interventions but also calls for proactive measures to support cognitive health and mental autonomy. However, while the promotion of mental autonomy is a laudable objective, it must not override individuals' right to refuse unwanted neurointervention or overshadow the imperative to respect individual rights to bodily and mental integrity. The deployment of neurointerventions, particularly within the criminal justice system, requires meticulous ethical consideration, robust consent protocols, and unwavering respect for personal autonomy to prevent potential abuses and ensure the dignity of all individuals is upheld.

3. **Right to Mental Integrity**

The neuroright to mental integrity encompasses two primary dimensions: (i) ensuring access to mental health services for individuals with psychological conditions, and (ii) safeguarding individuals' mental domains from potential harm, particularly in the form of neural interference.[40] While the European Union's Charter of Fundamental Rights, adopted in 2000, recognises the right to physical and mental integrity, its provisions did not anticipate the rapid advancements in neurotechnology that have since emerged.[41] Thus, although this right exists, it necessitates reconceptualisation and reinterpretation within the contemporary context.

A pressing concern in this realm is the potential for malicious brain hacking – a concept introduced by Ienca and Haselager in 2016.[42] This term refers to criminal activities that directly manipulate neural computations in neurodevice users, akin to how computers are compromised in cybercrimes.[43] For instance, vulnerabilities in brain-computer interfaces (BCIs) could allow malicious actors to intercept or alter neural signals, leading to unauthorised control over BCI-operated devices such as prosthetics or wheelchairs.[44] Similarly, advancements in memory engineering, while promising for treating conditions like

[40] Ienca and Andorno (n 3)
[41] ibid.
[42] Marcello Ienca and Pim Haselager, 'Hacking the Brain: Brain–Computer Interfacing Technology and the Ethics of Neurosecurity' (2016) 18 Ethics and Information Technology 117.
[43] ibid
[44] Laurie Pycroft and others, 'Brainjacking: Implant Security Issues in Invasive Neuromodulation' (2016) 92 World Neurosurgery 454.

Alzheimer's disease and PTSD, raise concerns about misuse, such as the deliberate erasure or modification of potentially incriminating memories.[45]

Beyond the threat of malicious third-party interference, the right to mental integrity also protects against situations where the risks associated with treatment outweigh the projected benefits. For instance, while DBS offers therapeutic advantages for treatment-resistant neurological conditions—such as movement disorders like Parkinson's disease and neuropathic pain—it carries inherent risks. These include neuropsychiatric adverse effects like apathy, compulsive behaviour, and hallucinations, as well as surgical risks such as infection, haemorrhage, and rejection of the implanted neurostimulator.[46] These considerations underscore the necessity of ensuring that the projected benefits of neurointerventions outweigh their associated risks before approval and implementation.

These concerns align with the Council' 2013 report, which emphasised the importance of safe interventions and protection from harm in healthcare practices. In the context of neurotechnology, it is imperative to establish ethically sound safeguards that uphold the principles of beneficence and non-maleficence. Determining the safety and ethical acceptability of neurotechnological treatments necessitates rigorous empirical research to assess potential harms relative to anticipated benefits. Consequently, neuroscientists and medical professionals have a responsibility to rigorously investigate and provide empirical evidence on the safety and efficacy of neurotechnological interventions. This includes determining when the benefits of such interventions outweigh potential harms, thereby informing the development of regulatory frameworks grounded in both empirical data and ethical considerations.

4. **Psychological Continuity**

The neuroright to psychological continuity, as proposed by Ienca and Andorno, seeks to preserve the coherence of an individual's personal identity from unconsented modification by third parties.[47] This right addresses concerns that neurotechnological interventions, which

[45] Przemysław Zawadzki and Agnieszka K Adamczyk, 'To Remember, or Not to Remember? Potential Impact of Memory Modification on Narrative Identity, Personal Agency, Mental Health, and Well-Being' (2021) 35 Bioethics.
[46] Robin Mackenzie, 'Who Should Hold the Remote for the New Me? Cognitive, Affective, and Behavioral Side Effects of DBS and Authentic Choices over Future Personalities' (2011) 2 AJOB Neuroscience 18.
[47] Ienca and Andorno (n 3).

operate at the most fundamental neural levels, may significantly disrupt a person's cognition and sense of self.[48] This concern is particularly pronounced when personality alterations may arise as side effects of neurotechnological medical treatments. Evidence assessing the validity of this concern is provided below in section 4.2.

4.1 Understanding Numerical and Narrative Identity

A critical ethical consideration in this context, rightly identified by Caruso, involves differentiating between narrative identity and numerical identity.[49] Narrative identity pertains to the characteristics and personal experiences that define an individual's self-conception, while numerical identity concerns the persistence of an individual as the same biological and psychological entity over time.[50] Focquaert and Ridder emphasise that while altering an individual's numerical identity is inherently problematic, modifications to narrative identity are not necessarily unethical.[51] Mild or moderate changes in narrative identity are in fact integral to people's daily life and a part of the normal course of personal development.[52]

4.2 Assessing Neurotechnology's Impact on Identity Disruption

The concern regarding neurotechnology's potential disruption to personal identity is valid. Ienca and Andorno have highlighted studies indicating that DBS can induce behavioural changes in certain patients. Documented cases report increased impulsivity, aggressiveness, and alterations in sexual behaviour following DBS procedures.[53] Notably, a study highlighted a 62-year-old patient developed manic symptoms post-DBS, exhibiting chaotic behaviour, megalomania, and impaired mental competence.[54]

Conversely, other research suggests that extreme disturbances, such as psychosis, are relatively rare, and DBS does not necessarily lead to significant personality alterations.

---

[48] ibid.
[49] Caruso (n 30).
[50] ibid
[51] Dirk Ridder and Farah Focquaert, 'Direct Intervention in the Brain: Ethical Issues Concerning Personal Identity' (2009) 4(2) Journal of Ethics in Mental Health.
[52] ibid
[53] MJ Frank and others, 'Hold Your Horses: Impulsivity, Deep Brain Stimulation, and Medication in Parkinsonism' (2007) 318 Science 1309; JL Houeto and others, 'Behavioural Disorders, Parkinson's Disease and Subthalamic Stimulation' (2002) 72 Journal of Neurology, Neurosurgery & Psychiatry 701.
[54] Laura Klaming and Pim Haselager, 'Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence' (2010) 6 Neuroethics 527.

Studies have shown that while some patients experience mood improvements and reduced anxiety, there is no substantial evidence of changes in dispositional traits or overall personality structure.[55] A review concluded that dispositional traits remained stable post-DBS, with no significant personality changes observed.[56]

Similarly, neurofeedback therapy has demonstrated positive effects without fundamentally altering personality. Dalkner et al. (2017) investigated the short-term benefits of twelve neurofeedback sessions on avoidant personality traits in individuals with alcohol use disorder. The study found improvements in avoidant personality accentuation, with no significant changes in other personality traits or global Big Five personality dimensions post-training.[57]

In contrast, memory modification technologies (MMTs) present distinct challenges to personal identity.[58] These interventions involve selectively removing, altering, adding, or replacing memories. Research in this field is advancing rapidly, with significant efforts dedicated to developing safe, effective, and non-invasive MMTs for human application. This progress underscores the immediacy of addressing the ethical and personal implications associated with these interventions.[59] Memory plays a pivotal role in shaping personal identity; thus, altering memories may profoundly disrupt an individual's self-narrative, leading to a reconstructed self that diverges from the original identity.[60] While MMTs hold therapeutic potential for conditions like PTSD by attenuating traumatic memories, they also pose risks to the authenticity and continuity of one's personal identity.[61]

Assessing the ethical permissibility of identity alterations thus necessitates a nuanced assessment of the extent and impact of such changes. Central questions include: What degree of change in narrative identity is considered too radical to constitute a threat to numerical psychological identity? How frequently do such instances occur? Addressing these questions

---

[55] Caruso (n 30); Ridder and Focquaert (n 50).
[56] Joshua A Wilt and others, 'Does Personality Change Follow Deep Brain Stimulation in Parkinson's Disease Patients?' (2021) 12 Frontiers in Psychology 643277.
[57] Nina Dalkner and others, 'Short-Term Beneficial Effects of 12 Sessions of Neurofeedback on Avoidant Personality Accentuation in the Treatment of Alcohol Use Disorder' (2017) 8 Frontiers in Psychology.
[58] Przemysław Zawadzki and Agnieszka K Adamczyk, 'To Remember, or Not to Remember? Potential Impact of Memory Modification on Narrative Identity, Personal Agency, Mental Health, and Well-Being' (2021) 35 Bioethics.
[59] ibid; Megan Rich and others, 'A Noninvasive Approach to Optogenetics Using Focused Ultrasound Blood Brain Barrier Disruption for the Delivery of Radioluminescent Particles' [2020] bioRxiv (Cold Spring Harbor Laboratory); Claire N Bedbrook and others, 'Machine Learning-Guided Channelrhodopsin Engineering Enables Minimally Invasive Optogenetics' (2019) 16 Nature Methods 1176.
[60] S Matthew Liao and Anders Sandberg, 'The Normativity of Memory Modification' (2008) 1 Neuroethics 85.
[61] Alain Brunet and others, 'Reduction of PTSD Symptoms with Pre-Reactivation Propranolol Therapy: A Randomized Controlled Trial' (2018) 175 American Journal of Psychiatry 427.

requires empirical research to evaluate the frequency and severity of psycho-behavioural changes resulting from neurotechnological interventions. Such research is essential to inform guidelines and policies that balance the therapeutic benefits of neurotechnologies with the imperative to preserve individual identity and autonomy.

4.3 Neurotechnological Interventions for Personality Modification in Incarcerated Populations

In their discourse on psychological continuity, Ienca and Andorno revisit the contentious issue of employing neurointerventions to induce personality changes in persistent violent offenders, such as serial rapists, killers, and podophiles.[62] They suggest that such measures could be justified to protect public safety and offer these individuals an alternative to lifelong incarceration.[63] However, they also emphasise the necessity for extreme caution and extensive public deliberation before authorising such profound intrusions into personal identity.[64]

While the intention to enhance public safety is paramount, mandating non-consensual neurointerventions to prisoners cannot be justified on that ground, especially when the intervention is to a degree that could cause fundamental changes to individuals personality and identity, leading to a fragmented sense of self and serious psychological distress. As I've argued in the 'cognitive liberty' section, the invasive nature of these procedures, which directly alter an individual's mental processes, can be perceived as a fundamental violation and attack of the person. Compulsory neurointerventions infringe upon the neuroright to cognitive liberty—the right to make free and informed decisions about one's own mental states—and the right to mental integrity, which protects against unwarranted and harmful intrusions into one's mental sphere.

Given these profound implications, it is imperative to approach the use of neurointerventions, especially in correctional settings, with utmost caution. Any consideration of their application should be preceded by comprehensive ethical evaluations, valid consent, robust legal safeguards, and inclusive public discourse to ensure that the rights and dignity of all individuals are upheld.

---

[62] Ienca and Andorno (n 3).
[63] ibid.
[64] ibid.

5. **Right to Mental Privacy**

The neuroright to mental privacy, as defined by Ienca and Andorno, seeks to protect individuals from unauthorised access to and dissemination of brain data.[65] This right is particularly pertinent in therapeutic contexts, where the collection and processing of such data are integral to patient care.

In the United Kingdom, operating within the European context, the General Data Protection Regulation (GDPR) serves as the primary legislative framework governing the processing of personal data. While the GDPR encompasses health-related data, its application to neural data presents unique challenges. Neural data is intrinsically linked to the neural processes that generate it, rendering it exceptionally sensitive. This inseparability means that neural data is not merely information but also reflects the source of that information—the individual's cognitive processes and, by extension, the person.[66] Consequently, medical professionals bear a heightened responsibility to handle neural data with utmost care, ensuring compliance with data protection principles and safeguarding patients' mental privacy.

The GDPR mandates stringent protections for sensitive data; however, the inseparability of neural data from the person—the so-called 'inception problem'—complicates traditional data protection approaches.[67] Scholars have suggested that while the GDPR provides a robust framework, its provisions may require adaptation to address the specificities of neural data, emphasising the need for processing characteristics to be carefully considered.[68]

Given these complexities, it is imperative to consider whether existing data protection regulations sufficiently address the nuances of neural data. While the GDPR offers a comprehensive framework for personal data protection, its application to neural data may necessitate further clarification and adaptation. Regulatory bodies, such as the Information Commissioner's Office (ICO) in the UK, have begun to explore these issues, emphasising the importance of determining when neural data should be classified as health data under Article

[65] ibid.
[66] Marcello Ienca and others, 'Towards a governance framework for brain data' (2022) 15 Neuroethics 20.
[67] Ienca and Andorno (n 3).
[68] Philipp Kellmeyer, 'Big brain data: On the responsible use of brain data from clinical and consumer-directed neurotechnological devices' (2021) 14 Neuroethics 83.

9 of the UK GDPR.[69] This determination is crucial, as it dictates the level of protection afforded to such data and informs the obligations of entities processing neural information.

In conclusion, the right to mental privacy is a critical consideration in the era of advancing neurotechnologies. Ensuring the protection of neural data requires a multifaceted approach that includes the adaptation of existing data protection frameworks, the development of specialised guidelines for neural data processing, and the implementation of robust security measures to prevent unauthorised access and misuse. As neurotechnological applications continue to evolve, so too must our legal and ethical paradigms to safeguard the mental privacy of individuals.

Conclusion

This response has examined the ethical, legal, and policy implications of neurotechnological advancements through the framework of neurorights, with particular emphasis on cognitive liberty and psychological continuity. These rights are becoming increasingly relevant as neurotechnologies advance, raising profound questions regarding autonomy, consent, identity, and data protection.

A recurring theme throughout this response has been the necessity of safeguarding individuals' rights in both therapeutic and carceral contexts. The principle of cognitive liberty underscores the right of individuals to make autonomous decisions regarding neurointerventions while also prompting discussions on whether states have a positive duty to promote cognitive well-being. The issue becomes especially contentious in prison settings, where the inherent coercive nature of incarceration may undermine the validity of consent to neurointerventions. Similarly, the right to mental integrity necessitates robust protections against neurotechnological risks, including invasive procedures and potential neurocriminal activities such as brain hacking. The right to psychological continuity addresses concerns about unintended personality changes resulting from neurointerventions, particularly in cases involving memory engineering technologies. Lastly, the right to mental privacy raises critical

[69] 'ICO Tech Futures: Neurotechnology. Regulatory Issues' <https://ico.org.uk/about-the-ico/research-reports-impact-and-evaluation/research-and-reports/technology-and-innovation/ico-tech-futures-neurotechnology/regulatory-issues/> accessed 12 February 2025.

questions about the adequacy of existing data protection frameworks in regulating the collection and processing of neural data.

As neurotechnologies continue to develop, policymakers must proactively engage with these issues to ensure that legal and ethical standards evolve alongside scientific advancements. This response has underscored the importance of adopting a rights-based approach to neurotechnology regulation, ensuring that fundamental human rights remain at the core of decision-making. Given the increasing integration of neurotechnologies into healthcare, criminal justice, and other domains, it is imperative to establish clear legal safeguards that balance innovation with human dignity and autonomy.

Moving forward, further empirical research is required to assess the long-term impacts of neurotechnological interventions, particularly regarding their effects on personal identity. Additionally, regulatory bodies must consider refining existing frameworks, such as the GDPR, to address the unique challenges posed by neural data. A multidisciplinary approach—integrating perspectives from law, neuroscience, ethics, and policy—will be essential in shaping the future governance of neurotechnologies.

Ultimately, this response advocates for a proactive, ethically sound, and legally robust approach to neurotechnology regulation—one that ensures that innovation serves humanity while respecting the fundamental rights and dignity of all persons involved.