TECHETHOS FUTURE O TECHNOLOGY O ETHICS

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D4.1 Analysis of international and EU law and policy Part II: Neurotechnologies

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Draft version submitted to the European Commission for review





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The TechEthos Project

TechEthos is an EU-funded project that deals with the ethics of the new and emerging technologies anticipated to have high socio-economic impact. The project involves ten scientific partners and six science engagement organisations and runs from January 2021 to the end of 2023.

TechEthos aims to facilitate "ethics by design", namely, to bring ethical and societal values into the design and development of new and emerging technologies from the very beginning of the process. The project will produce operational ethics guidelines for three to four technologies for users such as researchers, research ethics committees and policy makers. To reconcile the needs of research and innovation and the concerns of society, the project will explore the awareness, acceptance and aspirations of academia, industry and the general public alike and reflect them in the guidelines.

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Definitions and abbreviations

Table 1: List of Definitions

Term	Explanation
Neurotechnologies	Refers to devices and procedures used to access, monitor, investigate, assess, manipulate, and/or emulate the structure and function of the neural systems of natural persons. ¹

Table 2: List of Abbreviations

Term	Explanation
AIA	Artificial Intelligence Act (AIA)
BCI	Brain-computer interface
ВМІ	Brain-machine interface
САТ	Convention Against Torture
CCPR	United National Human Rights Committee
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CERD	International Convention on the Elimination of All Forms of Racial Discrimination
CIL	Customary international law
CFREU	Charter of Fundamental Rights of the European Union

¹ OECD. (2019) Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD/LEGAL/0457.



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CJEU	Court of Justice of the European Union
CoE	Council of Europe
CPRMW	Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
DA	Data Act (EU)
DBS	Deep brain stimulation
DGA	Data Governance Act (EU)
DNA	Deoxyribonucleic acid
DoA	Description of Action
DSA	Digital Services Act (EU)
EC	European Commission
ECHR	European Convention on Human Rights (CoE)
ECtHR	European Court of Human Rights (CoE)
EEG	Electroencephalogram
EP	European Parliament
EU	European Union
fmri	Functional magnetic resonance imaging
FRA	Fundamental Rights Agency (EU)
GDPR	General Data Protection Regulation (EU)
HRC	Human Rights Council (UN)
IBC	International Bioethics Committee (UNESCO)
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
IEEE	Institute of Electrical and Electronics Engineers
MRI	Magnetic Resonance Imaging



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NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OHCHR	Office of the United Nations High Commissioner for Human Rights
Oviedo Convention	The Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine
SDGs	U.N. Sustainable Development Goals
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
VR	Virtual Reality
XR	Extended reality



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Executive Summary

This Deliverable 4.1, involving an analysis of international and EU law and policies, was developed as part of TechEthos, a project funded by the European Union's Horizon 2020 Research and Innovation Programme. TechEthos aims to facilitate "ethics by design" by bringing ethical and societal values into the design and development of new and emerging technologies with a high socio-economic impact. The technology families selected for the project are climate engineering, neurotechnologies, and digital extended reality (XR).

TechEthos Deliverable 4.1 explores and analyses relevant international and EU laws and policies for their relevance and applicability to each of the technology families. Based on the analysis of the characteristics, applications, ethics and socio-economic impacts of these technologies, as emerged in previous phases of the TechEthos project, the report serves different purposes, including:

- To review the legal domains and related obligations at international and EU levels.
- To identify potential implications for fundamental rights and principles of democracy and rule of law, considering both enhancements and interferences.
- To reflect on issues and challenges of existing legal frameworks to address current and future implications of the technologies.

TechEthos Deliverable 4.1 is divided into three parts. Parts I and III focus on climate engineering and digital extended reality (XR), respectively. Part II focuses on neurotechnologies and the significant legal issues such technologies present.

For the purpose of this report, neurotechnologies are defined as follows:

• **Neurotechnologies** refers to devices and procedures used to access, monitor, investigate, assess, manipulate, and/or emulate the structure and function of the neural systems of natural persons.²

There is no comprehensive or dedicated international or EU law governing neurotechnologies. However, there are many legal obligations under existing legal frameworks. The legal issues and challenges discussed in this report are grouped into applicable legal frameworks at the international and EU level. The legal frameworks relevant to neurotechnologies include human rights law, and privacy and data protection law.

TechEthos Deliverable 4.1 presents the obligations of States (for international law) and/or Member States (for EU law) and the rights of private individuals under those laws for each technology family. Discussion of the obligations of private individuals and entities will be the focus on a report (TechEthos Deliverable 4.2) on the legal frameworks at the national level (forthcoming Winter 2022). The work of these two reports, and the gaps and challenges in existing legal frameworks identified by this work, will form the basis for legal and policy recommendations in the TechEthos project in the coming months (forthcoming Spring 2023).

² OECD. (2019) Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD/LEGAL/0457.



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Neurotechnologies

Part II of Deliverable 4.1 discusses the ways in which neurotechnologies are or may be governed by international and EU law and policy within the frameworks of human rights and privacy and data protection. While no international or EU law directly addresses or explicitly mentions neurotechnologies, many aspects are subject to international and EU law. Following an overview of the international and EU laws for each legal framework, the following specific laws and legal issues are considered:

Legal framework	Legal issues
Human rights law	Right to life Right to dignity Right to autonomy Right to privacy Freedom of opinion and expression Right to health Access to justice and right to a fair trial Right to rest and leisure Right to benefit from science Non-discrimination and vulnerable groups
Privacy and data protection	Right to privacy Classification of data Potential developments and future trends

Table 3: Legal framework and issues in relation to neurotechnologies

It is considered that neurotechnologies present various legal issues and challenges with wide-ranging socio-economic and human rights implications. A survey of the legal landscape, specifically the applicable international and EU law, shows that there is no dedicated legislation with direct application to neurotechnologies. Such technologies are nonetheless subject to various domain-specific legal frameworks, including human rights law and privacy and data protection law, and further regulatory measures with application to neurotechnologies are expected, particularly under EU law.

In the interim, the existing human rights-based framework is designed to be adaptable to the issues raised by new and emerging technologies in order to better protect the rights of individuals against interference, whether it be through expanded interpretations of existing rights or through the introduction of new rights. The introduction of so-called "neurorights" to supplement the existing international and EU human rights frameworks would impact States' obligations vis-à-vis neurotechnologies, potentially requiring that States strengthen the protection of individuals against intrusions by neurotechnologies into, inter alia, notions of mental privacy, cognitive liberty, mental integrity and psychological continuity. The necessity of such additional rights may depend on the effectiveness of existing human rights law to respond to the specific challenges posed by neurotechnologies, which include, inter alia, "neurodiscrimination", the status of brain data, and instances of so-called "brain-hacking".

Without clear initiative to regulate at the international or EU level, it is possible that further governance of this technology family will occur at the national level, the possibility for which will be analysed in a forthcoming TechEthos report on legal frameworks at the national level (TechEthos Deliverable 4.2).



1. Introduction

Neurotechnologies present many significant legal issues that impact socioeconomic equality and fundamental rights. There is no comprehensive or dedicated international and EU law governing this technology family, though many elements of the technologies are subject to existing laws and policies.

Part II of TechEthos Deliverable 4.1 explores and analyses relevant international and EU laws and policies in relation to neurotechnologies. Parts I and III focus on climate engineering and extended digital reality (XR) respectively. While there are some cross-cutting issues, each technology family is subject to different legal frameworks. The following table outlines the legal frameworks presented in Part II.

Table 4: International and EU legal frameworks

Neurotechnologies

- Human rights law
- Privacy and data protection

1.1 Defining the technology family

For the purpose of the TechEthos project and this report, we have used the following definitions for neurotechnologies:

• **Neurotechnologies** refers to devices and procedures used to access, monitor, investigate, assess, manipulate, and/or emulate the structure and function of the neural systems of natural persons.³

For more information about the technology families and their innovation ecosystems, visit: https://www.techethos.eu/resources/.

1.2 Key legal issues

As TechEthos Deliverable 4.1 presents international and EU law, discussions focus on the obligations of States (for international law) and/or Member States (for EU law) and the rights of private individuals under those laws. Discussion of the obligations of private individual and entities will be the focus of a report on the legal frameworks at the national level (forthcoming Winter 2022).

While some of the legal issues considered in Deliverable 4.1 are cross-cutting (e.g., privacy, safety) across the technology families, the issues manifest in different ways. Furthermore, even within a

³ OECD. (2019) Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD/LEGAL/0457.



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technology family, distinct legal frameworks treat the same issues in different ways. Therefore, some legal issues are discussed in the context of more than one technology family and legal framework.

The legal issues considered in relation to neurotechnologies are identified in the table below.

Table 5: Legal issues in neurotechnologies

Legal issues in international and EU law: Neurotechnologies

- Right to life
- o Right to dignity
- Right to autonomy
- Right to privacy
- o Freedom of opinion and expression
- o Right to health
- o Right to education
- o Access to justice and right to a fair trial
- Right to rest and leisure
- Right to benefit from science
- o Non-discrimination and vulnerable groups
- o Emerging 'neurorights'
- o Data protection and classification of 'brain data'
- o Consent
- o Transparency

1.3 Structure of report

Following this introduction, **Section 2** describes the methodology for developing this report. **Section 3** provides a high-level summary of the legal frameworks discussed in relation to neurotechnologies. **Section 4** presents the international and European Union law frameworks with application to neurotechnologies. The report concludes with a high-level discussion of gaps, challenges and trends in **Section 5**. A reference list is included at the end.

2. Methodology and scope

Deliverable 4.1 is part of the policy, legal and regulatory analysis conducted in accordance with the EUfunded TechEthos project. The development of this report followed the description of action in the TechEthos Description of Action (DoA):

T4.2: For each of the 3-4 selected tech, we will identity the legal issues and challenges – with a focus on those affecting/contributing to the stimulation of innovation, socio-economic inequalities including, in health treatment, social status and social inclusion and gender equality and fundamental human rights and freedoms of individuals. We will carry out a literature review of documents addressing legal aspects, i.e., articles in academic and legal practitioner journals, books, legal commentaries or legal policy studies (last five years). This



review will be a starting point to help determine which specific legal issues are being discussed and debated in relation to the selected topic areas and should be further explored in the project and particularly investigated in the country studies.

T4.3: In this task using desktop research, we will identify and analyse relevant international and Ο EU laws and policies with respect to each of the identified technologies and carry out a comparison on both the legal/regulatory and procedural framework (existing or under development) for the identified technologies. We will explore whether international policies and laws cover the issues identified in Task 4.2 and the adequacy of these.

The overall approach to legal analysis, in particular the human rights analysis, was informed by and builds on past work in the EU-funded SHERPA and SIENNA projects, which also looked at the ethical and human rights implications of new and emerging technologies.⁴ Some TechEthos partners with legal expertise were partners in the SHERPA and SIENNA projects and also contributed to the legal analysis work in those projects.

For each technology family, we began by compiling a list of key legal issues. To identify legal issues, we used the TAPP legal analysis method:

- T: Things (What are the relevant objects?) 0
- A: Actions (What actions are done or not done?)
- P: People (Who is involved or impacts by the action?)
- P: Places (Where (physical space or domain) does the action take plan?)⁵

With a TAPP list, we identified the corresponding legal frameworks governing the things, actions, people, and/or places relevant to the three technologies areas. To select the issues discussed in this report, we were guided by the language in the DoA to "focus on those affecting/contributing to the stimulation of innovation, socio-economic inequalities including, in health treatment, social status and social inclusion, and gender equality and fundamental human rights and freedoms of individuals." Additionally, we considered which legal issues were particularly significant and timely, and worked in parallel to an ethical analysis of the three technologies in the project.

The focus of Deliverable 4.1 is legal frameworks at the international and EU level. A subsequent report, to be finalised in late 2022, will look at the same legal issues through the lens of domestic law in nine countries (Deliverable 4.2).

We carried out the research for this report from March-June 2022, primarily through desk research. To best understand the legal context, we looked at both hard (binding) law and soft (non-binding) law, as well as policies and judicial jurisprudence. Our analysis of the laws has been made with reference to

⁵ See, Danner, R.A. (1987) 'From the Editor: Working with Facts', *Law Library Journal*, 79.



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 $^{^4}$ For SHERPA, the technology focus was smart information systems (a combination of artificial intelligence (AI) and Big Data). See: https://www.project-sherpa.eu/. For SIENNA, the three technologies families analysed were genomics, human enhancement, and AI and robotics. See: https://www.sienna-project.eu/.

legal and academic scholarship. To understand how the law may develop, we also look at proposed laws and policies.

As the three technology families are new and emerging, the legal scholarship does not always use the same terminology. For neurotechnologies, we also used the search terms 'neuroscience', 'brain-computer interfaces', and 'brain-machine interfaces', as well as specific forms of neurotechnology (e.g., EEG, fMRI).

The gaps and challenges identified in this report will serve as a basis for legal and policy recommendations in the TechEthos project in the coming months (forthcoming Spring 2023).

3. International laws and policies

The legal issues and challenges discussed in this report are grouped into applicable legal frameworks at the international and EU level. The legal frameworks reviewed in Part II are human rights law, and privacy and data protection law.

The **sources of international law and policy** referred to in this report include binding treaties (which may also be called conventions, covenants, agreements, protocols, etc.), customary international law, decisions from international courts (e.g., International Court of Justice, European Court of Human Rights), non-binding guidance documents, statements from policymakers and official reports. For the purpose of this report, the Council of Europe is included in discussions of international law.

The **sources of EU law and policy** include treaties, directives, regulations, decisions of the European Court of Justice (CJEU), statements from EU policymakers, and reports from EU agencies and committees.

The following sub-sections provide a brief summary of the legal frameworks analysed.

3.1 Human rights law

International human rights law is comprised of international treaties and customary international law (CIL).

The 1948 Universal Declaration of Human Rights (UDHR), while not binding on States, is the primary source of human rights law and many articles are considered customary international law.⁶ Subsequent treaties are legally binding on contracting States.⁷ There are seven core international human rights treaties, each with a committee of experts (treaty body) responsible for monitoring

⁷ Vienna Convention Law of Treaties, Article 2(1).



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⁶ United Nations. *The Foundation of International Human Rights Law* / [Online]. Available at: <u>https://www.un.org/en/about-us/udhr/foundation-of-international-human-rights-</u>

law#:~:text=The%20Universal%20Declaration%20of%20Human,binding%20international%20human%20rights%20tre aties.

treaty implementation.⁸ The UDHR and two of those treaties – International Covenant on Civil and Political Rights (ICCPR) and International Covenant on Economic, Social and Cultural Rights (ICESCR) – are collectively known as the International Bill of Human Rights.⁹ To assist States with interpreting treaty language, the treaty bodies publish non-binding guidance in the form of *General Comments* or General Recommendations.¹⁰ The Office of the United Nations High Commission for Human Rights (OHCHR) is the department of the U.N. Secretariat responsible for promoting and protecting human rights at the international level.¹¹ Human rights experts advise the U.N. High Commission for Human Rights on specific thematic topics or countries, such as 'the rights of persons with disabilities', 'the right to privacy', and 'the issue of human rights and transnational corporations and other business enterprises'.¹² These experts take the form of Working Groups, Independent Experts and Special Rapporteur; collectively, they are known as the OHCHR 'Special Procedures'.¹³ Also relevant is the U.N. Human Rights Council, an inter-governmental body responsible for addressing human rights violations.¹⁴ There is no international human rights court, but U.N. treaty bodies and Special Procedures can respond to complaints filed by victims of human rights abuses.¹⁵ Other relevant rule making bodies for human rights at the U.N. level include the U.N. Secretary-General, who issues statements and commissions reports, and the U.N. General Assembly, which adopt declaration, convention and resolutions.¹⁶ Work on human rights at the international level is complemented by work on the U.N. Sustainable Development Goals, a set of seventeen global goals related to ending poverty, reducing inequality, and protecting the environment.¹⁷

Other international and regional organisations also support the promotion and protection of human rights. For the purpose of this report, the two key organisations are the Council of Europe and the European Union.

The Council of Europe (CoE) is an international organisation with 46 member states, founded to promote and protect human rights, democracy and the rule of law.¹⁸ The European Convention on Human Rights (ECHR) was negotiated within the auspices of the CoE and all CoE Member States are

https://www.coe.int/en/web/about-us/values.



⁸ The seven core treaties and their respective treaty bodies are: (1) Human Right Committee (HRC) - International Covenant on Civil and Political Rights (ICCPR); (2) Committee on Economic, Social and Cultural Rights (CESCR) – International Covenant on Economic, Social and Cultural Rights (ICESCR); (3) Committee on the Elimination of Racial Discrimination (CERD) – International Convention on the Elimination of All Forms of Racial Discrimination (CERD); (4) Committee on the Elimination of Discrimination Against Women (CEDAW) - Committee on the Elimination of Discrimination Against Women (CEDAW) - Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT); (6) Committee on the Rights of the Child (CRC) – Convention on the Rights of the Child (CRC); (7) Committee on Migrant Workers (CMW) - International Convention on Protection of the Rights of All Mirant Workers and Members Their Families (ICMRW).

⁹ U.N. General Assembly. (1948) *Resolution 217 (III) international Bill of Human Rights*, adopted 10 December 1948. ¹⁰ U.N. Office of the High Commissioner for Human Rights. *General Comments* / [Online]. Available at: <u>https://www.ohchr.org/en/treaty-bodies/general-comments</u>.

¹¹ U.N. Office of the High Commissioner for Human Rights. *High Commissioner* / [Online]. Available at: <u>https://www.ohchr.org/en/about-us/high-commissioner</u>.

¹² U.N. Office of the High Commissioner for Human Rights. *About special procedures* / [Online]. Available at: <u>https://www.ohchr.org/en/special-procedures-human-rights-council</u>.

¹³ Ibid.

¹⁴ U.N. Office of the High Commissioner for Human Rights. *United Nations Human Rights Council* / [Online]. Available at: <u>https://www.ohchr.org/en/hrbodies/hrc/home</u>.

¹⁵ See What the treaty bodies do / [Online]. Available at: <u>https://www.ohchr.org/en/treaty-bodies/what-treaty-bodies-do</u> and U.N. Office of the High Commissioner for Human Rights. *What are Communications?* / [Online]. Available at: <u>https://www.ohchr.org/en/special-procedures-human-rights-council/what-are-communications</u>.

¹⁶ United Nations. *Main Bodies* / [Online]. Available at: <u>https://www.un.org/en/about-us/main-bodies</u>.

 ¹⁷ U.N. Department of Economic and Social Affairs. *The 17 Goals* / [Online]. Available at: <u>https://sdqs.un.org/qoals</u>.
 ¹⁸ Council of Europe. *Values: Human rights, Democracy, Rule of Law* / [Online]. Available at: <a href="https://www.sea.iet/eo/web/abaut-us/

party to the Convention.¹⁹ The European Court of Human Rights (ECtHR) is the body of the CoE responsible for hearing cases under the ECHR.²⁰ Decisions of the ECtHR are binding on Member States of the CoE.²¹

Human rights within the 27-Member State European Union (EU) are enshrined in the Charter of Fundamental Rights of the European Union (Charter of Fundamental Rights or CFREU).²² The European Court of Justice (CJEU), the supreme court of the EU, is responsible for interpreting EU law, including the Charter of Fundamental Rights.²³ The current EU policy on human rights is laid out in the *EU Action Plan on Human Rights and Democracy (2020-2024)*, which includes 'new technologies: harnessing opportunities and addressing challenges' as one of the five main areas of action.²⁴ The Fundamental Rights Agency (FRA) is the EU agency that supports the promotion and protection of human rights within the EU.²⁵ EU policy and work on human rights is complemented by the 'European Pillar of Social Rights', an initiative for "building a fairer and more inclusive European Union" through work on twenty principles.²⁶

3.2 Privacy and data protection law

The right to privacy is applicable to everyone under international law.²⁷ The right to privacy is, moreover, recognised in regional organisations, including the Council of Europe. The European Convention on Human Rights (ECHR), for instance, provides that "Everyone has the right to respect for his private and family life and his correspondence."²⁸ Conversely, the right to data protection is not explicitly protected under international law. However, the United Nations Human Rights Committee (CCPR) has suggested that the protection of personal data is an integral aspect of the right to privacy, as indicated by the explanation that '[i]n order to have the most effective protection of his private life, every individual should have the right to ascertain in an intelligible form, whether, and if so, what personal data is stored in automatic data files, and for what purposes.'²⁹

There are various EU laws and draft legislation applicable to privacy and data protection, including the Charter of Fundamental Rights of the European Union (CFREU), the General Data Protection Regulation (GDPR), and legislative proposals, including the Regulation on Privacy and Electronic

- ²² Charter of Fundamental Rights of the European Union (entry into force 18 December 2009), 2000/C 364/01 (CFREU).
- ²³ E.U. Court of Justice. *Presentation* [Online] Available at: <u>https://curia.europa.eu/jcms/jcms/Jo2_7024/en/</u>.

²⁶ European Commission. *European Pillar of Social Rights* / [Online]. Available at:

https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-

investment/european-pillar-social-rights_en.

²⁷ Universal Declaration of Human Rights (8 December 1948) G.A. Res 217(A) III, Article 12; International Covenant on Civil and Political Rights (entry into force 23 March 1976) G.A. Res 2200A (XXI), Article 17; Convention on the Rights of the Child (entry into force 2 September 1990) 1577 U.N.T.S. 3, Article 16; International Convention on the Protection of All Migrant Workers and Members of Their Families (entry into force 18 December 1990) G.A. Res 45/158, Article 14; Convention on the Rights of Persons with Disabilities (entry into force 3 May 2008) A/RES/61/106, Article 22.
²⁸ ECHR, Article 8.

²⁹ CCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8th April 1988), para. 10.



¹⁹ European Convention on Human Rights (ECHR) (as amended by Protocols 11, 14 and 15) (entry into force 3 September 1953) E.T.S. 5, 4.XI.1950.

²⁰ Council of Europe. *European Court of Human Rights* / [Online]. Available at: https://echr.coe.int/Pages/home.aspx?p=home.

nttps://echr.coe.int/Pages/nome.aspx/p=nome. 21 ECHP_Asticle_46

²¹ ECHR, Article 46.

²⁴ Council of the European Union. (2020) *EU Action Plan on Human Rights and Democracy 2020-2024*, 18 November 2020, 12848/20

²⁵ E.U. Fundamental Rights Agency. *FRA – Promoting and protecting your fundamental rights across the EU /* [Online]. Available at: <u>https://fra.europa.eu/en</u>.

Communications (e-Privacy Regulation), the Artificial Intelligence Act (AIA), the Digital Services Act (DSA), the Data Governance Act (DGA) and the Data Act (DA).

Charter of Fundamental Rights of the European Union (CFREU)³⁰ The CFREU provides citizens of the EU with an essential catalogue of fundamental rights protections, with the enactment of the Treaty on European Union (TEU) in 2009 establishing that the Charter is primary EU law and has "the same legal value as the Treaties."³¹ The Charter makes provision for various fundamental freedoms, including a substantive right to respect for private and family life,³² and a procedural right to data protection,³³ as discussed below.³⁴ Each of these articles has a shared provenance in the ECHR, in accordance with which the CFREU provides that, whilst not precluding "Union law providing more extensive protection", the meaning and scope of the rights contained in the Charter "shall be the same as those laid down by the said Convention."³⁵ According to the Explanations relating to the Charter, this formulation "is intended to ensure the necessary consistency between the Charter and the ECHR".³⁶ As the Grand Chamber of the Court of Justice of the EU (CJEU) has observed, "the rights enshrined in Articles 7 and 8 of the Charter are not absolute rights but must be considered in relation to their function in society".³⁷ According to the Charter, however, "[a]ny limitation on the exercise of the rights and freedoms recognised by the Charter must be provided for by law and respect the essence of those rights and freedoms."³⁸ Further, in view of "the principle of proportionality, limitations may be made only if they are necessary and genuinely meet objectives of general interest recognised by the Union or the need to protect the rights and freedom of others."³⁹ In addition to these restrictions on derogations, the protection of the various fundamental rights contained in the CFREU is enhanced by the rights to an effective remedy and a fair trial for those whose rights and freedoms guaranteed under EU law are violated.⁴⁰

General Data Protection Regulation (GDPR)⁴¹ Adopted in April 2016 and implemented in May 2018, the General Data Protection Regulation (GDPR) lays down a harmonised framework for data protection in the EU which seeks to strike a balance between "the protection of natural persons with regard to the processing of personal data", as provided for under Article 8 CFREU (see above) and the Treaty on the Functioning of the European Union (TFEU),⁴² and "the free movement of personal data."⁴³ The GDPR "applies to the processing of personal data wholly or partly by automated means",⁴⁴ with data controllers⁴⁵ and processors⁴⁶ required to comply with various principles relating to the

⁴⁶ Ibid, Article 4(8).



³⁰ Charter of Fundamental Rights of the European Union (CFREU) (entry into force 18 December 2009) 2000/C 364/01.

³¹ Consolidated Version of the Treaty on European Union (TEU) 2012/C 326/15, Article 6(1).

³² CFREU, Article 7.

³³ Ibid, Article 8.

³⁴ Politou E., Alepis E., and Patsakis C., (2018) 'Forgetting personal data and revoking consent under the GDPR: Challenges and proposed solutions', *Journal of Cybersecurity*, vol.4(1), pp.1-20, pp.2.

³⁵ CFREU, Article 52(3).

³⁶ Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02). Available at: <u>https://eur-</u>lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32007X1214%2801%29.

³⁷ Judgement of 16 July 2020, *Data Protection Commissioner v Facebook Ireland Ltd and Maximillian Schrems*, C-311/18,

ECLI:EU:C: 2020:559, para. 172.

³⁸ CFREU, Article 52(1).

³⁹ Ibid.

⁴⁰ Ibid, Article 47

⁴¹ Regulation (EU) 2016/679 (General Data Protection Regulation) COM/2012/010 final.

⁴² Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union 2012/1 326/01, Article 16(1).

⁴³ GDPR, Article 1(1).

⁴⁴ Ibid, Article 2(1).

⁴⁵ Ibid, Article 4(7).

processing of personal data,⁴⁷ such as the requirement that personal data shall be "processed lawfully, fairly, and in a transparent manner in relation to the data subject".⁴⁸

In addition to compliance with these principles, the processing of personal data must have a lawful basis, yet this differs depending on the type of personal data being processed, specifically whether or not such data is listed in the "special categories of personal data" under the GDPR.⁴⁹ Pursuant to this distinction, the processing of personal data characterised as special category is, in principle, prohibited,⁵⁰ unless one of the exhaustively listed exceptions to the rule applies,⁵¹ for instance "the data subject has given explicit consent to the processing of those personal data for one or more specified purposes",⁵² whereas the processing of all other personal data is in principle permitted provided that at least one of the in principle less rigorous conditions for lawfulness of processing is applicable,⁵³ for instance "the data subject has given consent to the processing of his or her personal data for one or more specific purposes".⁵⁴ The types of personal data characterised as special category are exhaustively listed in the GDPR and include,⁵⁵ inter alia, "genetic data", ⁵⁶ "biometric data for the purpose of uniquely identifying a natural person"⁵⁷ and "data concerning health".⁵⁸

Consistent with the framing in the language of fundamental rights,⁵⁹ the GDPR makes provision for various rights of the "data subject", including to "the rectification of inaccurate personal data concerning him or her",⁶⁰ the "right to erasure" or the "right to be forgotten",⁶¹ and the right to "data portability".⁶² Furthermore, the data subject is empowered to lodge a complaint with a supervisory authority⁶³ and to an effective judicial remedy against either a supervisory authority,⁶⁴ or a controller or a processor.⁶⁵ Such rights are contained within Chapter 8, which details the remedies, liabilities and penalties associated with breaches of the GDPR, such as the general conditions for imposing administrative fines, principally that such penalties shall be "effective, proportionate and dissuasive."⁶⁶ Thus, for infringements of "the basic provisions for processing, including conditions for consent", the financial penalty is up to 4% of an organisation's global annual turnover or 20 million euros, whichever is higher.⁶⁷

⁴⁷ Ibid, Article 5.
⁴⁸ Ibid, Article 5(1).
⁴⁹ Ibid, Article 9.
⁵⁰ Ibid, Article 9(1).
⁵¹ Ibid. Article 9(2)(a)-(i).
⁵² Ibid. Article 9(2)(a).
⁵³ Ibid, Article 6.
⁵⁴ Ibid. Article 6(1)(a).
⁵⁵ Ibid. Article 9(1).
⁵⁶ Ibid. Article 4(13).
⁵⁷ Ibid Article 4(14).
⁵⁸ Ibid, Article 4(15).
⁵⁹ Politou E. Alepis E. and Patsakis C. (2018), supra note 34, pp.2.
⁶⁰ GDPR. Article 16.
⁶¹ Ibid. Árticle 17.
⁶² Ibid. Article 20.
⁶³ Ibid. Article 77.
⁶⁴ Ibid. Article 78.
⁶⁵ Ibid. Article 79.
⁶⁶ Ibid. Article 83.
⁶⁷ Ibid, Article 83(5)(a).



D4.1

Proposed Regulation on Privacy and Electronic Communications (e-Privacy Regulation)⁶⁸ The draft e-Privacy Regulation, one of several legislative changes proposed as part of the European Commission's Digital Single Market Strategy,⁶⁹ purports to repeal and replace Directive 2002/58/EC (e-Privacy Directive) on the basis that the former "has not fully kept pace with the evolution of technological reality, resulting in an inconsistent or insufficient effective protection of privacy and confidentiality in relation to electronic communications."⁷⁰ It follows that the draft Regulation seeks to enhance the protection of the "fundamental rights and freedoms of natural and legal persons in the provision and use of electronic communication services",⁷¹ specifically the rights to privacy and data protection provided for in the CFREU (see above). According to the proposal, "the processing of electronic communications data"⁷² is prohibited "by persons other than the end-users" under the principle of confidentiality,⁷³ except for the instances in which such processing is permitted,⁷⁴ for example "if all end-users concerned have given their consent to the processing of their electronic communications content for one or more specified purposed that cannot be fulfilled by processing information that is made anonymous".⁷⁵ Consistent with the legislative intention to "particularise and complement" the GDPR under the principle of *lex specialis*,⁷⁶ the proposed e-Privacy Regulation provides that the definition of and conditions for consent of end-users are the same as those provided for under the GDPR.⁷⁷

4. Neurotechnologies

Neurotechnologies are subject to international and EU laws and policies on human rights and privacy and data protection.

The following sections discuss some of the ways that neurotechnologies are or may be governed by international and EU law and policy within the frameworks of human rights and privacy and data protection. Each section begins with a brief introduction to the relevant legal issues and a summary of the international and EU legal framework (for more details on the legal frameworks, see Section 3). Specific legal issues within the legal framework are then presented in more detail; each discussion includes specific references to existing (and proposed) law and an explanation of how the law may apply to neurotechnologies.

- ⁷² Ibid, Article 2(1).
- ⁷³ Ibid, Article 5.
- ⁷⁴ Ibid, Article 6.
 ⁷⁵ Ibid, Article 6(3)(b).
- ⁷⁶ Ibid, Article 8(3)(D
- ⁷⁷ Ibid, Article 9.



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⁶⁸ Proposal for a Regulation of the European Parliament and the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM/2017/010 final.

⁶⁹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Digital Single Market Strategy for Europe COM/2015/0192 final. ⁷⁰ Proposal for a Regulation of the European Parliament and the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications) COM/2017/010 final, para. 6.

⁷¹ Ibid, Article 1(1).

While no international or EU law directly addresses or explicitly mentions neurotechnologies, many aspects are subject to international and EU law.

4.1 Human rights and neurotechnologies

Neurotechnologies have the potential to impact human rights in many ways, both positive and negative. In relation to some rights in particular contexts, neurotechnologies have the potential to enhance enjoyment of rights, such as when neurotechnologies provide innovative treatment options that improve health and positively impact the right to health. But in other situations, such as the use of neurotechnologies in courtroom in ways that violate the right to fair trial and the prohibition on self-incrimination, neurotechnologies can interfere with and may even violate protected human rights.

The human rights discussed in this section are:

- o Right to life
- Right to dignity
- o Right to autonomy
- o Right to privacy
- Freedom of opinion and expression
- o Right to health
- o Right to education
- Access to justice and right to a fair trial
- Right to rest and leisure
- Right to benefit from science
- o Non-discrimination and vulnerable groups
- o Trends and emerging rights

All sections outline the relevant international and EU laws and policies, then move to a discussion of key issues, gaps and challenges. For many rights, this discussion is organised into the positive and negative impacts that neurotechnologies have on realisation of a right ('potential enhancements' and 'potential interferences'); the impacts discussed include both current examples and potential future impacts, sometimes drawn from science fiction.⁷⁸ Some rights do not have distinct positive and

⁷⁸ "By highlighting possible futures, science fiction enables law to consider different strategies for dealing with new events and scenarios." Mitchell, T. (2014) 'Making Space: Law and Science Fiction', *Law and Literature*, 32(2), pp241-261, p. 248.



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negative impacts, and therefore the key legal issues are discussed more generally. All sections conclude with remarks on States' current obligations under the law and identifies where the law may be updated to address gaps and challenges.

The final subsection presents a summary of the trend in human rights law towards the realisation of new human rights to explicitly address emerging challenges posed by neurotechnologies. Collectively known as 'neurorights', these proposed new rights are cognitive liberty, mental privacy, mental integrity, and psychological continuity.

4.1.1 International and EU law and policies

In the context of neurotechnologies, the most frequently referenced international legal documents are the Universal Declaration of Human Rights, International Covenant on Civil and Political Rights (ICCPR), International Covenant on Economic, Social and Cultural Rights (ICESCR), International Convention on the Elimination of All Forms of Racial Discrimination (CERD); Committee on the Elimination of Discrimination Against Women (CEDAW), Convention on the Rights of the Child (CRC), and the European Convention on Human Rights (ECHR). General Comments and General Recommendations from U.N. treaty bodies and reports from Special Procedures provide interpretative guidance explaining how the rights apply in specific contexts. Where relevant, specific reference is made to the U.N. Sustainable Development Goals and the jurisprudence of the European Court of Human Rights. At the EU level, the primary legal document is the Charter of Fundamental Rights of the European Union (CFREU). Where relevant, specific reference is made to jurisprudence of the European Court of Justice (CJEU) and the EU Pillar of Social Rights.

Neurotechnologies are not explicitly referenced in international or EU human rights law, nor is the technology family the explicit topic of any guidance or reference documents. However, States' obligation to respect, protect and fulfil human rights apply in the context of neurotechnologies.

4.1.2 Right to life

Neurotechnologies may challenge our understanding of the right to life as the meaning of 'alive' and 'dead', in a strict dichotomy, changes in response to developments in neurotechnology research. For example, though in the realm of science fiction, some argue that neurotechnologies may someday be used to bring someone "back from the dead" or create a virtual afterlife where life arguable continues after death. Currently, many private entities offer the possibility immortality through neurotechnologies (and related technologies), perhaps already influencing how an individual enjoys the right to life with dignity. While international human rights law on right to life does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not violate enjoyment of the right.

International law and policies

Under international law, everyone has the right "to life."⁷⁹ This right is also recognised in regional organisations, including the Council of Europe.⁸⁰

 ⁷⁹ Universal Declaration of Human Rights (8 December 1948), G.A. Res. 217(A) III. (UDHR), Article 3; International Covenant on Civil and Political Rights (entry into force 23 March 1976) G.A. Res 2200A (XXI) (ICCPR), Article 6; Convention on the Rights of the Child (entry into force 2 September 1990), 1577 U.N.T.S. 3 (CRC), Article 6.
 ⁸⁰ European Convention on Human Rights (as amended by Protocols 11,14 and 15) (entry into force 3 September 1953), E.T.S. 5, 4. XI. 1950 (ECHR), Article 2.



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The right includes both a prohibition against arbitrary deprivation of life and duty to protect life.⁸¹ States have a "duty to refrain from engaging in conduct resulting in arbitrary deprivation of life"⁸² and "must establish a legal framework to ensure the full enjoyment of the right to life,"⁸³ which should include taking appropriate measures to address conditions in society that interfere with "enjoying the right to life with dignity."⁸⁴ The right is non-derogable⁸⁵ and must be ensured without discrimination.⁸⁶ In the context of international human rights law, right to life is most commonly associated with discussions on the death penalty, armed conflict, actions by law enforcement, abortion, assisted suicide, and torture.⁸⁷

EU law and policies

The EU Charter of Fundamental Rights includes the "right to life".88

Key issues, gaps and challenges

Neurotechnologies may change the way we think of life and death, and consequently would fundamentally change what it means to enjoy the right to life.

The right to life is predicated on the understanding of a dichotomy between 'life' and 'death'. Every person has the right to live, and a State is in violation of the right when it is responsible for an arbitrary death, i.e., the deprivation of life. While international law does not define 'life' or 'death', the general definition of death as the permanent cessation of all biological functions comes readily to mind. This includes the body's respiratory, circulatory, and neurological systems. Simply put, a person's life ends and death begins when the body stops functioning.

Neurotechnologies that enable a body or brain to somehow 'function' beyond the cessation of other frustrates the dichotomy between life and death. With advances neurotechnologies and related technologies, such as cryogenics, brain scanning and uploading, and cyborgs and robotic brains, some believe humankind will be able to achieve a form of immortality through neurological functioning independent of other bodily functions.⁸⁹ In essence, if one understands 'life' to be possible through neural activity exclusively, one could be arguably alive and dead simultaneously. Such an

⁸¹ 'Deprivation of life' involves "intentional or otherwise foreseeable and preventable life-terminating harm or injury, caused by an act or omission." Human Rights Committee. (2019) *General Comment No. 36: Article 6: right to life*, CCPR/C/CG/36, 3 September 2019, para. 6.

⁸² Ibid, para. 7.

⁸³ Ibid, para. 18.

⁸⁴ Ibid, para. 26.

- ⁸⁵ Ibid, para. 2.
- ⁸⁶ Ibid, para. 61.

⁸⁷ See, e.g., ibid; and Korff, D. (2006). *The right to life: A guide to the implementation of Article 2 of the European Convention on Human Rights.* Council of Europe, Human rights handbooks, No. 8. Available at: <u>https://rm.coe.int/168007ff4e</u>.

https://rm.coe.int/16800/ff4e.

⁸⁸ Charter of Fundamental Rights of the European Union (entry into force 18 December 2009), 2000/C 364/01 (CFREU), Article 2.

⁸⁹ See, e.g., Parry, C. (2004) 'Technologies of immortality: the brain on ice', *Studies in History and Philosophy of Biological and Biomedical Sciences*, 35, pp.391-413, DOI: 10.1016/j.shpsc.2004.03.012; Turchin et al. (2017) 'Artificial Intelligence in Life Extension: from Deep Learning to Superintelligence', *Informatica*, 41(4), 401-417; Kruger, O. (2018) 'The Quest for Immortality as a Technical Problem: The Idea of Cybergnosis and the Visions of Posthumanism', in Blamberger, G. and Kakar, S (eds.) *Imaginations of Death and the Beyond in India and Europe*. Singapore: Springer, pp. 47-58; McGee, E.M. and Maguire G.Q. (2007) 'Becoming Borg to Become Immortal: Regulating Brain Implant Technologies', *Cambridge Quarterly of Healthcare Ethics*, 16. DOI: 10.1017/S0963180107070326; Kurzweil, R. (2004) 'Human Body Version 2.0' in Immortality Institute (ed.) *The Scientific Conquest of Death: Essays on Infinite Lifespans*. Buenos Aires: LibrosEnRed, pp. 93-106; and Moravec, H. (1988) *Mind Children: The Future of Robot and Human Intelligence*. Boston: Harvard University Press.



understanding of life and death would require a re-framing or clarification of States' duties to refrain from causing death and protecting life.

Furthermore, although still in the realm of science fiction, ideas about achieving immortality through neurotechnologies present possible futures where the concept of life and death can be exploited, e.g., worlds where consciousness is involuntarily transferred into new bodies like in the book (and now Netflix series) *Altered Carbon*⁹⁰ or uploaded to a fully-commercialised virtual afterlife like in Amazon Prime Video series *Upload*.⁹¹ In a fictional world like these, the State plays a role in blurring the lines between life and death and may benefit from directly causing 'life' or 'death'. How the right to life in these worlds would apply is not clear. Should States be prohibited from involuntarily creating life, just as they are prohibited from depriving life? Can a State be prohibited from destroying a digital upload of consciousness? Is a virtual afterlife entitled to the same legal protections as 'life' as understood now, and would a State be responsible for addressing conditions that interfere with the enjoyment of a virtual afterlife with dignity? Would States have an obligation to regulate the actions of private actors within these worlds?

While many may consider it impossible or very far-fetched to achieve immortality with the assistance of neurotechnologies, a more immediate risk is that of undue or exploitative influence of private commercial actors today who offer services for those who want to someday benefit from the promise of immortality. It is an open question whether these services, especially if offered with no actual intention of fulfilling the promise of immortality, would constitute a condition in society that interferes with the right to life with dignity (see Section 4.1.3).⁹² Furthermore, the fact that death may be a requirement to benefit from the service (e.g., cryogenics) poses a unique challenge: who would have the right to know and seek redress from any harms or failed promises, particularly if the failure does not materialise for many decades or generations?

States' obligations and areas for legal development

Neurotechnologies are subject to existing international human rights law on the right to life and States have an obligation to ensure that the use of neurotechnologies support realisation of the right. States cannot use neurotechnologies to arbitrarily deprive someone of life and must ensure neurotechnologies are deployed in such a way that does not interfere with the enjoyment of life with dignity. However, neurotechnologies may challenge our understanding of 'life' and therefore necessitate a change in how the right to life is interpreted and applied. In the future, further guidance many be necessary to clarify whether a State should be prohibited from engaging with certain neurotechnology applications if such a use constitutes 'deprivation of life' or undermines life with dignity. At present, in the absence of operational 'immortality' technologies, guidance is necessary to address the current commercial market for immortality services, particularly whether marketing practices should be regulated to protect the right to life with dignity.

4.1.3 Right to dignity

Neurotechnologies have the potential to both enhance and interfere with the right to dignity. By providing new and better insights into the human brain, neurotechnologies can bolster our understanding of dignity and of ourselves, but intrusive, non-consensual, or unjustified applications of neurotechnologies may undermine enjoyment of the right. Whilst there is no specific international or

⁹² These concerns would also overlap with consumer protection rights, which prohibit false advertising.



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 ⁹⁰ Morgan, R.K. (2003) Altered Carbon. Random House Publishing Group; and Altered Carbon (2018-2020) Netflix.
 ⁹¹ Upload (2020-) Amazon Prime Video.

EU law that addresses neurotechnology, there is an obligation on States to ensure neurotechnologies are developed and applied in a manner that respects the right to dignity.

International law and policy

Although not recognised as a freestanding legal right, dignity is subject to specific references within legal doctrine pertaining to international human rights law. The Universal Declaration of Human Rights (UDHR), the foundational document of the International Bill of Human Rights, provides that "All human beings are born free and equal in dignity and rights." ⁹³ Although primarily symbolic and not formally binding upon State parties to the United Nations (UN), this provides the normative basis for the various civil, political, economic, social, and cultural rights contained within the International Covenant on Civil and Political Rights (ICCPR)⁹⁴ and the International Covenant on Economic, Social and Cultural Rights (ICESCR),⁹⁵ both of which assert within the preamble to the text that the rights contained therein "derive from the inherent dignity of the human person". It follows from this that explicit reference to dignity can be found in the text of several Articles, for instance the right to education under the ICESCR⁹⁶ and the rights of persons deprived of their liberty through imprisonment or detention under the ICCPR.⁹⁷ Various other major conventions, for instance on the Rights of the Child,⁹⁸ the Rights of Migrant Workers,⁹⁹ and the Rights of Persons with Disabilities,¹⁰⁰ have also since included specific references to dignity. Similarly, in international humanitarian law Common Article 3 of the Geneva Conventions protects wounded, sick and shipwrecked soldiers on (i) land and (ii) sea, (iii) prisoners of war and (iv) civilians against "outrages upon personal dignity, in particular humiliating and degrading treatment".¹⁰¹

Within the legal framework of the Council of Europe, the most relevant legal instruments are the European Convention on Human Rights (ECHR)¹⁰², the Convention on Human Rights and Biomedicine (Oviedo Convention),¹⁰³ and the Convention on Action against Trafficking in Human Beings.¹⁰⁴ The former eschews establishing a codified right and instead, analogous to the formulation of the two Covenants (see above), conceptualises dignity as an overarching principle. In *Pretty*, for instance, the European Court of Human Rights (ECHR) observed that "[t]he very essence of the Convention is respect for human dignity and human freedom."¹⁰⁵ The Oviedo Convention, meanwhile, whilst not defining dignity explicitly, refers within the preamble to "the importance of ensuring the dignity of the human being", and moreover, imposes an obligation on State Parties to "protect the dignity and

⁹³ UDHR, Article 1.

- ⁹⁴ ICCPR.
- ⁹⁵ ICESCR.
- ⁹⁶ Ibid, Article 13.
- ⁹⁷ ICCPR, Article 10(1).
- ⁹⁸ CRC, Preamble, Articles 23, 28, 37 and 39.

⁹⁹ Convention for the Protection of the Rights of All Migrant Workers and Members of their Families (entry into force 1 July 2003) GA Res.45/158 (CPRMW), Articles 17 and 70.

¹⁰⁰ Convention on the Rights of Persons with Disabilities (entry into force 3 May 2008) GA Res. A/61/611 (CRPD), Preamble, Articles 1, 3, 8, 16, 24 and 25.

¹⁰¹ See, for example, Geneva Convention relative to the Protection of Civilian Persons in Time of War (Fourth Geneva Convention) (entry into force 21 October 1950) 75 UNTS 287.
 ¹⁰² ECHR.

¹⁰³ Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (Oviedo Convention) (entry into force 1 December 1999), E.T.S 164 4.IV.1997.

¹⁰⁴ Convention on Action against Trafficking in Human Beings (entry into force 1 February 2008), E.T.S No 197 16.V.2005 (Convention on Action against Trafficking Human Beings).

¹⁰⁵ European Court of Human Rights. (2002) *Pretty v the United Kingdom*, 29 July 2002, No. 2346/02, CE:ECHR:2002:0429JUD000234602, para. 65.



identity of all human beings", specifically within the context of biology and medicine.¹⁰⁶ Finally, the Council of Europe adopted the Convention on Action against Trafficking in Human Beings in 2005, the preamble of which asserts "that trafficking in human beings constitutes a violation of human rights and an offence to the dignity and the integrity of the human being". Further reference to dignity is provided in relation to measures to discourage demand for trafficking of human beings, ¹⁰⁷ and repatriation and return of victims.¹⁰⁸

EU law and policy

Mirroring the international human rights law approach to human dignity, Article 2 of the Treaty on European Union (TEU)¹⁰⁹ establishes dignity as the first of the EU's foundational values.¹¹⁰ In a clear separation from the former, however, EU law also codifies a substantive and enforceable right to human dignity in primary law under the terms of the Charter of Fundamental Rights (CFREU), specifically within Chapter 1 entitled "Dignity", wherein it is asserted that "Human dignity is inviolable. It must be respected and protected."¹¹¹ Whilst judicial interpretation is limited, with the Court of Justice of the EU (CJEU) often referring to dignity in conjunction with other protected rights,¹¹² such as the prohibition of torture and inhuman or degrading treatment or punishment¹¹³ and the right to privacy,¹¹⁴ an indication of the European Commission's understanding of the right to dignity can be obtained from the 2018 Annual Report on the Application of the EU Charter of Fundamental Rights, according to which human dignity "guarantees the right of human beings to be protected from being treated as mere objects by the state or by their fellow citizens."¹¹⁵ The prominence of the positioning of the right, coupled with the eponymous title of the Chapter, is indicative of the fundamental importance of dignity in the CFREU.¹¹⁶ Furthermore, the inclusion of, inter alia, the right to the integrity of the person,¹¹⁷ the prohibition of torture, inhuman and degrading treatment or punishment¹¹⁸ and the prohibition of slavery, forced labour and human trafficking¹¹⁹ within the Title of Dignity is a reflection of the interrelationship between dignity and other protected rights, ¹²⁰ as constituted by the former being, according to the Explanations Relating to the Charter, "the real basis of fundamental rights."¹²¹ Finally, dignity is explicitly referred to within the rights of the elderly "to lead a life of dignity"¹²² and the right of workers to fair and just working conditions "which respect his or her health, safety and dignity."¹²³

¹⁰⁶ Oviedo Convention, supra note 103, Article 1.

¹⁰⁹ Consolidated Version of the Treaty on European Union C 326/15 (TEU).

¹¹⁷ CFREU, Article 3.

- ¹¹⁹ Ibid, Article 5.
- ¹²⁰ Dupré, supra note 112.

¹²² CFREU, Article 25.

¹²³ Ibid, Article 31.



¹⁰⁷ Convention on Action against Trafficking Human Beings, supra note 104, Article 6.

¹⁰⁸ Ibid, Article 16.

¹¹⁰ Alongside freedom, democracy, equality, the rule of law and respect for human rights, including the rights of persons belonging to minorities. ¹¹¹ CFREU, Article 1.

¹¹² Dupré, C. (2021) 'Article 1' in Peers S., Hervey T., Kenner J., and Ward A., (eds) The EU Charter of Fundamental Rights: A Commentary (Hart Publishing) pp.3-24.

¹¹³ CFREU, Article 4.

¹¹⁴ Ibid, Article 7.

¹¹⁵ 2018 Report on the Application of the EU Charter of Fundamental Rights COM (2019) 257 final. Available at: https://data.europa.eu/doi/10.2838/44400.

¹¹⁶ Jones J. (2012) 'Human Dignity in the EU Charter of Fundamental Rights and Its Interpretation Before the European Court of Justice', Liverpool Law Review, 33, pp. 281-300.

¹¹⁸ Ibid, Article 4.

¹²¹ Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).

Potential enhancements

Neurotechnologies have potential to enhance the right to dignity. Their use in a healthcare setting, for instance, can be used to better understand a person's mental condition, allowing for appropriate treatment or support as required. Such application can help reduce the risk of interfering with the right to dignity, which – without the use of neurotechnologies – may result in a misunderstanding one's mental state or a lack of understanding of their needs. Furthermore, neuroscience bolsters the value of protecting human rights such as the right to dignity, since "fundamental, species-typical features of the human nervous system undergird universal rights already articulated in existing [international human rights] agreements."¹²⁴ The concept of 'dignity neuroscience' underpins the idea that universal rights are rooted in human brain science, and that violations of these rights can cause lasting neurological and psychological effects.¹²⁵

Potential interferences

In addition to potential enhancements of the right to dignity, the advancement of neurotechnologies also comes with the risk of interferences with this right. According to some, non-consensual mind-reading, for instance, constitutes a "fundamental affront to human dignity", and should therefore be avoided.¹²⁶ Neurotechnologies such as deep brain stimulation (DBS), or even less invasive techniques such as neural advertising, may interfere with neural processes and affect one's psychological continuity, i.e. the experience of oneself as "persisting through time as the same person."¹²⁷ As such, these technologies have the potential to affect "the realisation of the rights needed for one's dignity and free development of their personality" to which everyone is entitled."¹²⁸

States' obligations and areas for legal development

The right to dignity is often regarded as closely connected to other fundamental rights. In the context of neurotechnologies, the effective protection of the right to dignity, may extend to or require the protection of one's cognitive liberty, freedom of mind, and mental integrity. These concepts are regarded by some scholars as constituting a new set of human rights,¹²⁹ which are considered in more detail in Section 4.1.13.

4.1.4 Right to autonomy

Neurotechnologies have the potential to both enhance and interfere with the right to autonomy. Whilst international and European Union human rights law on the right to autonomy does not specifically refer to neurotechnologies, the right applies in the context of neurotechnologies and relevant provisions under international law and EU law are applicable.

¹²⁹ Ienca and Andorno, supra note 127.



 ¹²⁴ White T. L. and Gonsalves M. A. (2021) 'Dignity neuroscience: universal rights are rooted in human brain science' Annals of the New York Academy of Sciences, 1505 [Online]. Available at: <u>https://doi.org/10.1111/nyas.14670</u>, p. 49.
 ¹²⁵ Kimball J. (2021) To advance human rights, consult neuroscience / News from Brown [Online]. Available at: <u>https://www.brown.edu/news/2021-08-05/dignity</u>.

¹²⁶ Stanley J. (2012) *High-Tech "Mind-Readers" Are Latest Effort to Detect Lies* / ACLU [Online]. Available at: <u>https://www.aclu.org/blog/national-security/high-tech-mind-readers-are-latest-effort-detect-lies?redirect=blog/high-tech-mind-readers-are-latest-effort-detect-lies</u>.

¹²⁷ Ienca M. and Andorno R. (2017) 'Towards new human rights in the age of neuroscience and neurotechnology', *Life Sciences, Society and Policy*, 13 (5) [online]. Available at <u>https://doi.org/10.1186/s40504-017-0050-1</u>, p. 20.
¹²⁸ UDHR, Article 22. https://www.un.org/en/about-us/universal-declaration-of-human-rights; Ienca and Andorno, supra

note 127, p. 22.

International law and policy

Although not expressly provided for within any of the major conventions under international human rights law, the right to "autonomy" is nonetheless listed as one of the general principles of the Convention on the Rights of Persons with Disabilities (CRPD),¹³⁰ finding specific reference in articles pertaining to freedom from exploitation, violence and abuse,¹³¹ and health.¹³² The right, alongside associated variations,¹³³ has also been recognised in regional organisations, including the Council of Europe. The European Court of Human Rights (ECtHR) has recognised the right to autonomy as derivative of, and therefore protected by, the right to respect for private and family life, conceptualised as "the personal sphere of each individual".¹³⁴ In *Pretty v UK*, for instance, the ECtHR observed that "[a]lthough no previous case has established as such any right to self-determination as being contained in Article 8 of the Convention, the Court considers that the notion of personal autonomy is an important principle underlying the interpretation of its guarantees."¹³⁵ Furthermore, the ECtHR has strengthened this position by recognising that protecting "the right to personal autonomy" imposes positive obligations on States, ¹³⁶ in addition to the classical formulation of a negative obligation of non-interference.¹³⁷ The factual elements of these cases highlights the primary basis upon which the right to autonomy is given legal effect, namely healthcare decision-making and, more specifically, "the requirement for consent to treatment and a corresponding right to refuse treatment."138

EU law and policy

The right to "autonomy" is not directly protected within the Charter of Fundamental Rights of the European Union (CFREU); however, it can be construed as an aspect of several protected fundamental rights. In accordance with Article 52(3) CFR, pursuant to which the rights in the CFR which correspond with the European Convention of Human Rights (ECHR) are to have the same "meaning and scope", there are three potential bases of protection for the right to autonomy. The first potential source, for the reasons outlined above, is Article 7 CFR corresponding to Article 8 ECHR. A further potential source of protection, derived from reference the ECtHR's reference to "a person's physical and psychological integrity" in conjunction with "the right to personal autonomy", ¹³⁹ is the right to integrity of the person.¹⁴⁰ A final potential basis for protection of the right to "autonomy" is Article 1 CFREU, with legal scholars having highlighted the conceptual overlap with the right to human dignity.141

- ¹³⁵ Pretty v. The United Kingdom, supra note 105, para.61.
- ¹³⁶ European Court of Human Rights. (2007) *Tysiaç v. Poland*, 20 March 2007, No.5410/03,
- CE:ECHR:2007:0320JUD000541003, para.107.
- ¹³⁷ Donnelly M., (2011) Healthcare Decision-Making and the Law: Autonomy, Capacity and the Limits of Liberalism (Cambridge University Press), p.78. ¹³⁸ Ibid, p.52.

¹⁴¹ See, e.g., Dupré, supra note 112



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¹³⁰ CRPD, Article 3.

¹³¹ Ibid, Article 16(4).

¹³² Ibid, Article 25(d).

¹³³ See, e.g., African Charter om Human and Peoples' Rights (Banjul Charter) (entry into force 21 October 1986) CAB/LEG/67/3 rev.5, 21 I.L.M. 58, Article 20 on the "unquestionable and inalienable right to self-determination." ¹³⁴ See, e.g., European Court of Human Rights. (2002) *Christine Goodwin v. The United Kingdom*, 11 July 2002, No.28957/95, CE:ECHR2002:0711JUD002895795, para.90.

¹³⁹ *Tysiaç v. Poland*, supra note 136, para.107.

¹⁴⁰ CFREU, Article 3.

Potential enhancements

Neurotechnologies have potential to enhance the right to autonomy. The use of neurotechnologies such as deep brain stimulation (DBS) to treat certain diseases, including essential tremor, Parkinson's disease, dystonia, or OCD,¹⁴² may enhance the right to autonomy by giving patients back a sense of autonomy which they had lost as a result of their disease. Furthermore, neurotechnologies – and neuroscience more generally – can unveil insights into the neurological and psychological roots of universal rights, including the right to autonomy.¹⁴³ This may help to understand the value of and increase respect for the right to autonomy.

Potential interferences

Neurotechnologies, in some instances, may interfere with the right to autonomy. The non-consensual use of deep brain stimulation (DBS) to treat a medical condition, for example, would go against the requirement for consent to treatment and the right to refuse treatment, which give legal effect to the right to autonomy in a healthcare setting.¹⁴⁴ Also, neurotechnologies which rely on machine learning techniques and computer-brain interfaces (BCI), 'completing' automated tasks on behalf of the user, may threaten the right to autonomy, and certainly give rise to various questions around the extend of the individuals autonomy and agency versus the decisions made by the computer.¹⁴⁵ Arguably, even less invasive, unconscious neuromarketing techniques may constitute a threat to the right to autonomy, if they unduly influence one's cognitive liberty and psychological continuity.¹⁴⁶

States' obligations and areas for legal development

The right to autonomy is closely related to a sense of cognitive liberty, one's entitlement to freedom of thought, mental integrity, and psychological continuity. Without respect for these notions, one's right to autonomy may be compromised. This has prompted a scholarly debate around the possible need to recognise a new set of human rights, called neurorights, which is considered in section 4.1.13 below.

4.1.5 Right to privacy

Neurotechnologies, such as neuroimaging, can give unique insights into people's mental states and behaviour.¹⁴⁷ Neuroimaging can show whether information is new or familiar, and the use of such techniques in criminal proceedings, for instance, could help establish whether the person concerned is concealing further information.¹⁴⁸ This raises important legal questions as the unrestricted use of neurotechnologies may threaten the right to privacy. Whether the general right to privacy provides

¹⁴² Ienca and Andorno, supra note 127, p. 5.

¹⁴⁸ Ligthart S., et al. (2021) 'Forensic Brain-Reading and Mental Privacy in European Human Rights Law: Foundations and Challenges', *Neuroethics*, 14, 191-203 [online]. Available at <u>https://doi.org/10.1007/s12152-020-09438-4</u>, p. 193. See also Ganis G. 'Detecting Deception and Concealed Information with Neuroimaging' in Peter J. Rosenfeld (ed) (2018) *Detecting Concealed Information and Deception: Recent Developments*. Academic Press, pages 145-163. Available at: <u>https://groups.psych.northwestern.edu/rosenfeld/documents/Rosenfeld,%20J.%20Peter.%20Detecting%20Concealed</u> <u>%20Information%20and%20Deception%20Recent%20Developments.%20(PDF).pdf</u>.



¹⁴³ White and Gonsalves, supra note 124.

¹⁴⁴ Donnelly, supra note 137, p.52.

¹⁴⁵ Yuste R., Goering S., Arcas B., et al. (2017) 'Four ethical priorities for neurotechnologies and AI', *Nature*, 551, 159-163. Available at <u>https://doi.org/10.1038/551159a</u>, p. 162.

¹⁴⁶ Ienca and Andorno, supra note 127, p. 22.

¹⁴⁷ Ibid, p. 3.

sufficient safeguards, or whether there is a need to recognise a novel right to mental privacy, is considered in section 4.1.13 below.

International law and policy

Everyone has the right to privacy under international law.¹⁴⁹ This right entails that "No one shall be subjected to arbitrary or unlawful interference with his privacy, family, correspondence, nor to unlawful attacks on his honour and reputation."¹⁵⁰ It follows that States are under an obligation "to adopt legislative and other measures to give effect to the prohibition against such interferences and attacks as well as to the protection of this right."¹⁵¹ The right to privacy is also recognised in regional organisations, including the Council of Europe.¹⁵²

The OECD adopted a Recommendation of the Council on Responsible Innovation in Neurotechnology,¹⁵³ calling upon adherents and actors to "avoid harm, and show due regard for human rights and societal values, especially privacy, cognitive liberty, and autonomy of individuals."¹⁵⁴ Confidentiality and privacy should be promoted to "safeguard brain data and other information gained through neurotechnology."¹⁵⁵ Furthermore, adherents and actors should "anticipate and monitor the potential unintended use and/or misuse of neurotechnology" by "implement[ing] safeguards and consider[ing] mechanisms to support the protection of private life to anticipate and monitor the potential."¹⁵⁶

EU law and policy

The EU Charter of Fundamental Rights similarly provides that under EU law everyone has the "right to respect for his or her private and family life, home, and communications."¹⁵⁷ The right to privacy is closely related to the right to data protection, pursuant to which "data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law."¹⁵⁸

Potential enhancements

Neurotechnologies have the potential to facilitate more informed decision-making in the criminal justice system.¹⁵⁹ Brain imaging techniques, for instance, can be used to help assess criminal responsibility, rehabilitation, or the risk of recidivism.¹⁶⁰ Offenders may no longer need to be subjected to the level of interrogations or the use of lie detectors that would have occurred in the past to extract the same information from an individual. Furthermore, neurotechnologies give individuals access and control over their brain data, allowing for only that information to be released

¹⁵⁶ Ibid, principle 9 (b).

¹⁵⁹ Ienca and Andorno, supra note 127, p. 5.

¹⁶⁰ Ibid, p. 5; Ligthart, et al., supra note 148, p. 1.



¹⁴⁹ UDHR, Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14.

¹⁵⁰ UDHR, Article 12; ICCPR, Article 17.

¹⁵¹ CCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8 April 1988) [1].

¹⁵² ECHR, Article 8.

¹⁵³ OECD 2019, Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD/LEGAL/0457.

¹⁵⁴ Ibid, principle 1 (d).

¹⁵⁵ Ibid, principle 7 (f).

¹⁵⁷ CFREU, Article 7.

¹⁵⁸ Ibid, Article 8(2).

as is relevant to the case.¹⁶¹ In such instances, neurotechnologies have the potential to enhance the right to privacy.

Potential interferences

Despite the possible enhancements to the right to privacy, neurotechnologies raise important legal questions as to the scope of the right to privacy, and to the adequacy of existing safeguards to protect against privacy infringements. A 2013 study indicated that offenders with low activity in the brain region associated with decision-making and action were twice as likely to be rearrested within 4 years than those with high activity in that region.¹⁶² Reliance on such brain scans in an individual case to determine the conditions for a convict's release, or their risk of recidivism, for instance, could interfere with the convict's right to privacy. Whilst the right to privacy is not absolute and may be compromised for legitimate purposes such as the protection of public security, it is unclear whether brain data has – or should have – a lower threshold for triggering a violation of the right to privacy given its highly sensitive nature and intrinsic connection to personal identity and integrity. This leads into the discussion whether the right to privacy can provide sufficient safeguards, or whether there is indeed a need to recognise a new right to mental privacy.

States' obligations and areas for legal development

One of the uncertainties around neurotechnologies is whether brain data is protected by the right to privacy. Whilst perhaps beyond dispute at face value, the question is whether brain data constitutes more than just personal information covered by the right to privacy, given its highly sensitive nature and intrinsic connection to one's personal identity and integrity. There is no consensus as to whether brain data should simply be treated as biological data, similar to DNA tissue or blood samples, and may therefore be legitimately accessed on certain grounds during criminal proceedings, for instance, or whether brain data requires a higher level of protection because of its relation to personal identity and freedom of thought.¹⁶³

One challenge with treating brain data the same way as other personal data, is that brain data would be subject to the same privacy rules as any other personal data.¹⁶⁴

Tech companies who profit from the commercialisation of personal data will have a particular interest in accessing brain data.¹⁶⁵ In today's privacy paradigm, however, companies often rely on users' implied consent, as opposed to informed consent, to use their personal data. This means that users often agree to their data getting used without fully understanding the value of that data. The lack of informed consent may be particularly problematic for the commercial use of brain data.¹⁶⁶ Some scholars are therefore calling for the adoption of a right to mental privacy to provide enhanced protection,¹⁶⁷ which is considered in section 4.1.13.

¹⁶⁷ Ienca and Andorno, supra note 127, p. 11-17.



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¹⁶¹ lenca and Andorno, supra note 127, p. 11.

¹⁶² Aharoni E., Vincent G. M., Kiehl, K. A. (2013) 'Neuroprediction of future rearrest', PNAS, 110 (15), [Online]. Available at https://doi.org/10.1073/pnas.1219302110; lenca and Andorno, supra note 127, p. 6.

¹⁶³ Paz A. W. (2021), 'Is Mental Privacy a Component of Personal Identity?', Frontiers in Human Neuroscience, 15 (773441), [Online]. Available at: <u>https://doi.org/10.3389/fnhum.2021.773441</u>, p. 1.

¹⁶⁴ Ienca and Andorno, supra note 127, p. 14.

¹⁶⁵ Mackenzie R. (2021) Privacy in the Brain: The Ethics of Neurotechnology / Technology Networks: Neuroscience News & Research [Online]. Available at: https://www.technologynetworks.com/neuroscience/articles/privacy-in-the-brain-theethics-of-neurotechnology-353075.

4.1.6 Freedom of expression

States cannot arbitrarily restrict the right to freedom of expression, and they have an obligation to ensure private actors do not interfere with the right. Beneficial applications of neurotechnologies in clinical contexts may enhance the right to freedom of expression for some, particularly those with verbal communication impairments. The use of neurotechnologies for the purposes of assisting communication may also have application in various real-world legal contexts, including, inter alia, participation in legal proceedings and consent to medical procedures.¹⁶⁸ Although international human rights law on the right to freedom of expression does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not violate enjoyment of the right.

International law and policy

The right to freedom of expression is enshrined in international law in various human rights instruments, including the Universal Declaration of Human Rights (UDHR), ¹⁶⁹ the International Covenant on Civil and Political Rights (ICCPR),¹⁷⁰ the International Convention on the Elimination of All Forms of Racial Discrimination (CERD),¹⁷¹ the Convention on the Rights of the Child (CRC),¹⁷² the Convention on the Rights of Persons with Disabilities (CRPD),¹⁷³ and the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families.¹⁷⁴ State parties have an obligation to guarantee the right, which includes the "freedom to seek, receive and impart information of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media".¹⁷⁵ The right "protects all forms of expression and the means of their dissemination", including spoken, written and non-verbal expression, in addition to all forms of audiovisual, "electronic and internet-based modes of expression."¹⁷⁶ Included within the broad remit of protection are expressions considered "deeply offensive", ¹⁷⁷ as well as "expressions of an erroneous opinion or an incorrect interpretation of past events."¹⁷⁸ However, exercising of the right to freedom of expression entails "special duties and responsibilities", consistent with which enjoyment of the right may be limited in exceptional circumstances if provided by law for the protection of an enumerated purpose and the restriction is necessary to achieve that purpose.¹⁷⁹ Further, based on its fundamental importance to the enjoyment of all other human rights, any such limitation to the right

¹⁶⁸ Chandler J.A. et al (2022) 'Brain Computer Interfaces and Communication Disabilities: Ethical, Legal, and Social Aspects of Decoding Speech from the Brain', *Frontiers in Human Neuroscience*, 16. DOI: <u>https://doi.org/10.3389/fnhum.2022.841035</u>.

¹⁷⁹ The enumerated purposes are: "(a) For respect of the rights or reputation of others; (b) For the protection of national security or of public order (*ordre public*), or of public health or morals." ICCPR, Article 19(3).



¹⁶⁹ UDHR, Article 17.

¹⁷⁰ ICCPR, Article 19.

¹⁷¹ International Convention on the Elimination of All Forms of Racial Discrimination (entry into force 4 January 1969) G.A. Res. 2106 (XX) (ICERD), Article 5.

¹⁷² CRC, Article 13.

¹⁷³ CRPD, Article 21.

¹⁷⁴ CPRMW, Article 13(2).

¹⁷⁵ ICCPR, Article 19(2).

¹⁷⁶ Human Rights Committee, *General comment No.34, Article 19: Freedom of opinion and expression*. CCPR/C/GC/34. 12 September 2011, para.12.

¹⁷⁷ Ibid, para. 11.

¹⁷⁸ Ibid, para. 49.

to freedom of expression must satisfy the conditions of legality, legitimacy, necessity, and proportionality.¹⁸⁰

The right to freedom of expression is also recognised in regional organisations, including the Council of Europe.¹⁸¹ The enjoyment of this right is not absolute and can be restricted where such interferences are "prescribed by law and are necessary in a democratic society", for the purposes of, inter alia, preventing crime or disorder, or the protection of health or morals.¹⁸² However, based on the right to freedom of expression being "one of the essential foundations of a democratic society and one of the basic conditions for its progress and for each individual's self-fulfilment",¹⁸³ the European Court of Human Rights (ECtHR) has established a high threshold for legitimate interference, observing that "the adjective "necessary" in Article 10(2) implies the existence of a pressing social need...[which]...must be convincingly established."¹⁸⁴ Domestic legislators and judicial bodies are, in principle, conferred a margin of appreciation to make such determinations, subject to the European Court of Human Rights' (ECtHR) overall supervisory function and ability "to give the final ruling" on whether an interference has occurred and, if so, whether it is permitted.¹⁸⁵

EU law and policy

The EU Charter of Fundamental Rights (CFREU) also protects "the right to freedom of expression and information", corresponding to Article 10 of the ECHR (see above) in accordance with Article 52(3) of the CFREU, included within which is the right "to receive and impart information and ideas without interference by public authority and regardless of frontiers."¹⁸⁶ The right to freedom of expression under EU law is not absolute, however, any limitation "must be provided for by law and respect the essence" of the right, in addition to being "necessary" and genuinely meeting "objectives of general interest recognised by the Union or the need to protect the rights and freedoms of others", pursuant to the principle of proportionality.¹⁸⁷

Potential enhancements

The use of neurotechnologies in a clinical context may enhance the right to freedom of expression for some neurological patients, particularly those suffering from verbal communication impairments.¹⁸⁸ It has been suggested that neurotechnologies "are capable of decoding mental states and translating them into observable outputs such as text, verbal signals or graphic images", ¹⁸⁹ the effectiveness of which has been demonstrated by research into neuroimaging technologies, such as non-invasive

https://www.ohchr.org/sites/default/files/Documents/Issues/Opinion/A 74 486.pdf.

¹⁸⁹ Ienca and Andorno, supra note 127.



¹⁸⁰ Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, A/74/486, 9 October 2019, para.6. Available at:

¹⁸¹ See, e.g., ECHR, Article 10.

¹⁸² Ibid, Article 10(2).

¹⁸³ European Court of Human Rights. (2021) Sanchez v. France, 2 September 2021, No.45581/15,

CE:ECHR:2021:0902:JUD004558115, para.76.

¹⁸⁴ Ibid, para. 77.

¹⁸⁵ European Court of Human Rights. (1976) *Handyside v. The United Kingdom*, 7 December 1976, No.5493/72, CE:ECHR:1976:1207JUD000549372, para. 49.

¹⁸⁶ CFREU, Article 11.

¹⁸⁷ CFREU, Article 52(1).

¹⁸⁸ See, e.g., Lazarou et al. (2018) 'EEG-Based Brain-Computer Interfaces for Communication and Rehabilitation of People with Motor Impairment: A Novel Approach of the 21st Century', *Frontiers in Human Neuroscience*, 12(14). DOI: <u>https://doi.org/10.3389/fnhum.2018.00014</u>.

electroencephalography (EEG),¹⁹⁰ intracranial electrophysiological monitoring techniques, such as electrocorticography (ECoG),¹⁹¹ as well as invasive and non-invasive brain computer interfaces (BCIs).¹⁹² Each of these applications may enhance the right to freedom of expression, particularly for those with speech-affected neurological conditions such as locked-in syndrome,¹⁹³ specifically by enabling the production of communication directly from neural activity. The use of neurotechnologies for the purposes of assisting communication in persons whose verbal communication skills are impaired may, moreover, be required by the Convention on the Rights of Persons with Disabilities (CPRD), which provides that, in order to ensure that the right to freedom of expression of persons with disabilities is guaranteed "on an equal basis with others", State Parties shall accept and facilitate the use of "augmentative and alternative communication and all other accessible means, modes and formats of communication" that persons with disabilities may choose for the purposes of official

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interactions.¹⁹⁴

The use of neurotechnologies to assist communication may have application in various real-world legal contexts, including participation in legal proceedings, consent to medical procedures, and harm to users and/or others. Whilst these use cases may not constitute interferences per se, the application of neurotechnologies in such contexts could impact the right to freedom of expression, alongside the rights of vulnerable groups, such as persons with disabilities (see Section 4.1.12).

Participation in legal proceedings: The CRPD requires that "State Parties shall ensure effective access to justice for persons with disabilities on an equal basis with others, including in order to facilitate their effective role as direct and indirect participants, including as witnesses, in all legal proceeding, including at investigative and other preliminary stages."¹⁹⁵ Nonetheless, persons with communication disabilities may encounter various challenges to their participation in legal proceedings, "from initial difficulty in reporting a crime to exclusion from testifying if the legal system regards a person as lacking testimonial capacity due, for example, to co-occurring mental disability."¹⁹⁶ Neurotechnologies, such as neuroimaging (see above), may be used to assist those with verbal communication disabilities in both civil and criminal law contexts, for instance to provide witness testimony, thereby enhancing their right to freedom of expression and ensuring their effective participation in legal proceedings may suffer from a lack of transparency and reliability, ¹⁹⁷ based on which their use for participation in legal proceedings may be restricted in order to avoid harms to both users and third parties, such as a miscarriage of justice.¹⁹⁸ In seeking to strike a balance between these competing interests, it may be necessary for developers of communication neurotechnologies

¹⁹⁶ Chandler, supra note 168.

¹⁹⁸ Chandler J.A. et al (2021) 'Building communication neurotechnology for high stakes communications', *Nature Reviews Neuroscience*, vol.22, pp.587-588. DOI: <u>https://doi.org/10.1038/s41583-021-00517-w</u>.



¹⁹⁰ See, e.g., Mirkovic B. Debener S. Jaeger M. De Vos M. (2015) 'Decoding the attended speech stream with multi-channel EEG: implications for online, daily-life applications', *Journal of Neural Engineering*, 12 (4). DOI: <u>https://doi.org/10.1088/1741-2560/12/4/046007</u>.

¹⁹¹ See, e.g., Herff et al. (2015) 'Brain-to-text: decoding spoken phrases from phone representations in the brain', *Frontiers in Neuroscience*, 9. DOI: <u>https://doi.org/10.3389/fnins.2015.00217</u>.

¹⁹² See, e.g., McFarland D.J. and Wolpaw J. (2011) 'Brain-Computer Interfaces for Communication and Control', *Communications of the ACM*, 54 (5), pp.60-66. DOI: <u>https://doi.org/10.1145%2F1941487.1941506</u>.

¹⁹³ See, e.g., Ienca, M. (2021) Common Human Rights Challenges Raised by Different Applications of Neurotechnologies in the Biomedical Fields. Council of Europe. Available at: <u>https://rm.coe.int/report-final-en/1680a429f3</u>.

¹⁹⁴ CRPD, Article 21(b).

¹⁹⁵ Ibid, Article 13.

¹⁹⁷ Ibid.

to take specific technical measures, such as introducing a mechanism by which the user can endorse or reject a given output based on the accuracy and voluntariness of the content that is communicated.¹⁹⁹

Consent Another potentially high impact real-world legal context in which the right to freedom of expression may be impacted by neurotechnologies is in the attainment of valid and lawful consent, specifically for those with verbal communication disabilities. The central question here is whether consent obtained via communication neurotechnologies, such as EEG, ECoG and BCI, will be treated as legally valid for the purposes of, inter alia, medical treatment, contractual obligations and sexual interactions.²⁰⁰ The significance of this issue lies in the possibility that miscommunication in a clinical context, for instance, "could impede the recognition of decision-making capacity or result in life-changing treatment decisions",²⁰¹ meanwhile miscommunication of consent could more generally lead to action taken by others which would otherwise constitute a breach of contract, a crime or a tortious infringement.²⁰² In order to mitigate against such risks, whilst also supporting the realisation of the right to freedom of expression, particularly for those with verbal communication disabilities, it may be necessary for States to adopt specific guidance on the situations in which consent obtained via communication neurotechnologies will be legally valid and effective.

States' obligations and areas for legal development

Neurotechnologies are subject to existing international human rights law on the right to freedom of expression and States have an obligation to ensure that the use of neurotechnologies supports realisation of the right. States have a particular responsibility to ensure non-discrimination and equal opportunity to enjoy the right to freedom of expression. In relation to the right to freedom of expression, further human rights guidance specific to neurotechnologies may be required to clarify concerns around the use of communication neurotechnologies to enable participation in legal proceedings and the attainment of consent.

4.1.7 Right to health

Neurotechnologies have the potential to both enhance and undermine the right to health. Beneficial applications of neurotechnologies in medical contexts may help enhance the right to health for some, particularly when used to diagnose and treat neurological disorders, illness, or injury. However, neurotechnologies also have the potential to cause physical and mental harm through accident, negligence, or intentional misuse and abuse. While international human rights law on the right to health does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not violate enjoyment of the right.

²⁰² Chandler, supra note 168.



¹⁹⁹ Ibid; Chandler, supra note 168.

²⁰⁰ Chandler, supra note 168.

²⁰¹ Chandler, supra note 198.

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International law and policies

Under international law, everyone has the right "to the enjoyment of the highest attainable standard of physical and mental health."²⁰³ This right is also recognised in regional organisations, including the Council of Europe.²⁰⁴

It is not a right to be *healthy*, but rather a right to certain freedoms (right to control one's health and be freed from interference) and entitlements (equal opportunity to enjoy the highest attainable level of health).²⁰⁵ States have an obligation to "take the necessary steps to the maximum of its available resources" to ensure access to timely, acceptable, and affordable healthcare.²⁰⁶

Also relevant to the right to health and neurotechnologies is the Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine (Oviedo Convention).²⁰⁷ It is the only international binding legal instrument on human rights and biomedicine and includes provisions on relevant topics including equitable access and informed consent.

The Council of Europe's Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025) elaborates how the international organisation will address emerging challenges posed by new technologies, including neurotechnologies.²⁰⁸ For example, its Committee on Bioethics intends to prepare a Recommendation 'on equitable and timely access to innovative treatments and technologies in healthcare systems'.²⁰⁹

EU law and policy

The EU Charter of Fundamental Rights includes the right "of access to preventative health care and the right to benefit from medical treatment under the conditions established by national laws and practices."²¹⁰

Potential enhancements

Neurotechnologies can enhance an individual's health in many ways. Brain imaging techniques like MRI, fMRI and EEG are used to identify disorders, illness, and injuries such as brain tumours, strokes,²¹¹ and mood disorders.²¹² Neuromodulation and neurostimulation technologies are already used to help treat physical disorders like chronic pain (e.g., spinal cord stimulation to relieve pain), Parkinson's (e.g., deep-brain stimulation to reduce tremors), and stroke (e.g., targeted nervous system stimulation to

²⁰⁶ Ibid, paras. 11-12, 47.

²¹² See*, e.g.*, Chen, R. (2020) 'Precision biomarkers for mood disorders based on brain imaging', *The BMJ*, 371 [Online]. Available at: <u>https://doi.org/10.1136/bmj.m3618</u>.



²⁰³ ICESCR, Article 12. See, also, UDHR, Article 25(1); ICERD, Article 5(e)(iv); Convention on the Elimination of All Forms of Discrimination against Women (entry into force 3 September 1981), 1249 U.N.T.S. 13 (CEDAW), Article 12; CRC, Article 24; and CRPD, Annex I, Article 25.

 ²⁰⁴ European Social Charter (entered into force 26 February 1965), E.T.S. 35 – Social Charter, 18.X.1961, Part I, para. 11.
 ²⁰⁵ Committee on Economic, Social and Cultural Rights. (2000) *General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12)*, adopted 11 August 2000, para. 8.

²⁰⁷ Oviedo Convention, supra note 103.

²⁰⁸ Council of Europe. (2019) 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)'. Available at: <u>https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2</u>.

²⁰⁹ Ibid, p. 11.

²¹⁰ ECHR, Art. 35.

 ²¹¹ EEG (electroencephalogram) / Mayo Clinic [Online]. Available at: <u>https://www.mayoclinic.org/tests-procedures/eeg/about/pac-20393875</u>.
 ²¹² See, e.g., Chen, B. (2020) 'Precision biomerican for more large for more
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improve physical movement).²¹³ Neurostimulation techniques, including deep-brain stimulation and magnetic brain stimulation, may also be used to treat brain diseases like dementia and Alzheimer's,²¹⁴ and mental illness like addiction²¹⁵ and depression.²¹⁶ Research on neural implants suggest they may also be effective at helping treat disorders like Parkinson's²¹⁷ and depression.²¹⁸ Progress is being made on neuroprosthesis to replace or restore sensory, motor or cognitive functions; applications include cochlear implants for hearing impairments,²¹⁹ retinal prostheses for blindness,²²⁰ and prothesis for missing limbs.²²¹ Brain-machine interfaces (BMI) could enable someone with locked-in syndrome to communicate through a brain-computer interface²²² or a quadriplegic control an external robotic exoskeleton.²²³ Wearable neurotechnologies are being developed for real-time collection of neural data that can be shared with users and health care providers to help develop individualized treatment protocols and alert in case of emergency.²²⁴ All of these applications have the potential to enhance an individual's ability to enjoy the highest attainable standard of health by improving access to health-related information, alleviating pain and suffering, replacing or restoring functions, and overall enhancing health and quality of life

Potential interferences

The use of neurotechnologies may create or contribute to situations that negatively impact the right to health. For example, neurotechnologies may cause accidental physical or mental harm that negatively impact health, such as biocompatibility failure from neural implants (e.g., implantation

²¹⁷ See., *e.g.*, Wonders C. P. (2018) *Self-tuning brain implant could help treat patients with Parkinson's disease* / National Institutes of Health [Online]. Available at: <u>https://www.nih.gov/news-events/news-releases/self-tuning-brain-implant-could-help-treat-patients-parkinsons-disease</u>.

<u>could-help-treat-patients-parkinsons-disease</u>. ²¹⁸ See., *e.g.*, Stix, G. (2021) *Experimental Brain Implant Could Personalize Depression Therapy* / Scientific American [Online]. Available at: <u>https://www.scientificamerican.com/article/experimental-brain-implant-could-personalize-depression-therapy</u>/.

²¹⁹ See., *e.g.*, Carlyon, R. and Goehring, T. (2021) 'Cochlear Implant Research and Development in the Twenty-first Century: A Critical Update', *Journal of the Association for Research in Otolaryngology*, 22. DOI: 10.1007/s10162-021-00811-5.

²²⁰ See., *e.g.*, Fernandez, E., Alfaro, A., and Gonzalez-Lopez, P. (2020) 'Toward Long-Term Communication With the Brain in the Blind by Intracortical Stimulation: Challenges and Future Prospects', *Frontiers in Neuroscience*, 14. DOI: <u>10.3389/fnins.2020.00681</u>.

²²¹ See., *e.g.*, Yildiz, K.A., Shin, A.Y., and Kaufman, K.R. (2020) 'Interfaces with the peripheral nervous system for the control of a neuroprosthetic limb: a review', *Journal of NeuroEngineering and Rehabilitation*, 17. DOI: 10.1186/s12984-020-00667-5.

²²² See, *e.g.*, Lazarou et al., supra note 188.

²²³ See., *e.g.*, Lempriere, S. (2019) 'Brain-machine interaction improves mobility', *Nature Reviews Neurology*, 15 (685). Available at: <u>https://www.nature.com/articles/s41582-019-0285-y</u>.

²²⁴ See., *e.g.*, Cannard, C. (2020) 'Self-health monitoring and wearable neurotechnologies' in Ramsey, N.F. and Millan, J.R. (eds). *Handbook of Clinical Neurology*. 3rd ed., vol. 168, Elsevier, pp. 207-33.



²¹³ See, generally, *Neurotechnologies: The Next Technology Frontier* / IEEE Brain [Online]. Available at: <u>https://brain.ieee.org/topics/neurotechnologies-the-next-technology-frontier</u>/.

²¹⁴ See., *e.g.*, Ning, S. et al. (2022) 'Neurotechnological Approaches to the Diagnosis and Treatment of Alzheimer's Disease', *Frontiers in Neuroscience*, 16 (854992). DOI:10.3389/fnins.2022.854992.

²¹⁵ See., *e.g.*, Habelt, B. (2020) 'Biomarkers and neuromodulation techniques in substance use disorders', *Bioelectrical Medicine*, 6(4). DOI: 10.1186/s42234-020-0040-0.

²¹⁶ See., *e.g.*, Erickson, M. (2021), *Experimental depression treatment is nearly 80% effective in controlled study* / Stanford Medicin News Center [Online]. Available at: <u>https://med.stanford.edu/news/all-news/2021/10/depression-treatment.html</u>.

trauma or serious foreign body reactions as a device deteriorates over time)²²⁵ or irreversible changes to personality (e.g., depression) from deep brain stimulation.²²⁶

These risks also raise concerns on informed consent, a basic principle of bioethics, as current consent forms are very difficult to understand and do not typically acknowledge the uncertainty of outcomes, such as unanticipated psychological impacts.²²⁷ A related issue is compulsory medical treatment, which is generally prohibited under international law.²²⁸ However, there is an exception under the Oviedo Convention for persons with mental disorders,²²⁹ and the Council of Europe is looking to elaborate a legal instrument to ensure human rights are protected in the exceptional cases that consent cannot be given.²³⁰

Another concern is the potential that the neurotechnology, and the companies that develop and deploy them, may fail. A recent example is the bankruptcy of Second Sight, a company that offered 'bionic eyes' for the visually impaired; those who already have the implants are faced with uncertainty as the devices are now obsolete and unsupported while still implanted.²³¹

Other concerns are emerging around neurodiscrimination (i.e., discrimination based on neural features)²³² and compounded bias in the underlying research and algorithms²³³ that may impact access to and quality of healthcare. Furthermore, inequitable access to beneficial neurotechnologies – due to prohibitive costs or other limiting factors – would negatively impact the right to health for those individuals unable access the medical benefits.²³⁴

Lastly, risks associated intentional misuse and abuse of neurotechnologies (so-called 'neurocrimes'), like brain-hacking, could cause significant physical and mental harm.²³⁵

States' obligations and areas for legal development

Neurotechnologies are subject to existing international human rights law on the right to health and States have an obligation to ensure that the use of neurotechnologies support realisation of the right. States must take all necessary steps possible to guarantee that neurotechnologies do not interfere with individual's right to control their own health and that everyone has equal opportunity to benefit from neurotechnologies if desired. In relation to right to health, further human rights guidance

²³² lenca, supra note 193, pp. 32. 41.

²³⁵ Ienca, M. (2015) 'Neuroprivacy, neurosecurity and brain-hacking: Emerging issues in neural engineering', *Bioethica Forum*, 8(2). Available at: <u>http://www.bioethica-forum.ch/docs/15_2/05_lenca_BF8_2.pdf</u>.



 ²²⁵ See, *e.g.*, Stieglitz, T. (2021) 'Why Neurotechnology? About the Purposes, Opportunities and Limitations of Neurotechnologies in Clinical Application', *Neuroethics*, 14, p. 10. Available at: <u>https://doi.org/10.1007/s12152-019-09406-7</u>.
 ²²⁶ See, *e.g.*, Muller, O. and Rotter, S. (2017) 'Neurotechnology: Current Development and Ethical Issues', *Frontiers in*

 ²²⁶ See, *e.g.*, Muller, O. and Rotter, S. (2017) 'Neurotechnology: Current Development and Ethical Issues', *Frontiers in Systems Neuroscience*, 11. DOI: <u>10.3389/fnsys.2017.00093</u>.
 ²²⁷ International Risethics Committee (2021) Presette 5the later of State of S

²²⁷ International Bioethics Committee (2021) *Report of the International Bioethics Committee of UNESCO (ICB) on the ethical issues of neurotechnology.* SHS/BIO/IBC-28/2021/3 Rev., Paris: UNESCO.

²²⁸ See., e.g., ECHR, Articles 3 (right to freedom from cruel, inhuman or degrading treatment), 5 (right to liberty), and 8 (right to respect private life).

²²⁹ Oviedo Convention, supra note 103, Article 7. See, *also*, Council of Europe Recommendation No. Rec(2004)10 of the Committee of Ministers to member States concerning the protection of the human rights and dignity of persons with mental disorder and its Explanatory Memorandum (adopted 22 September 2004) REC(2004)10.

 ²³⁰ Council of Europe. (2019) 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)'
 [Online]. Available at: <u>https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2</u>, p. 15.
 ²³¹ Strickland, E. and Harris, M. (2022) *Their bionic eyes are now obsolete and unsupported* / IEEE Spectrum [Online].

²³¹ Strickland, E. and Harris, M. (2022) *Their bionic eyes are now obsolete and unsupported* / IEEE Spectrum [Online]. Available at: <u>https://spectrum.ieee.org/bionic-eye-obsolete</u>.

 ²³³ Yuste et al., supra note 145, p. 162; and Webb, E.K., Etter, J.A., and Kwasa, J.A. (2022) 'Addressing racial and phenotypic bias in human neuroscience methods', *Nature Neuroscience*, 25. DOI: <u>10.1038/s41593-022-01046-0</u>.
 ²³⁴ International Bioethics Committee, supra 227, p.17.

specific to neurotechnologies may be required to address concerns related to, among other issues, consent, obsolescence, neurodiscrimination and bias, inequality of access, and intentional misuse and abuse.

4.1.8 Right to education

Neurotechnologies have the potential to both enhance and undermine the right to education. Neurotechnologies already help provide insights into learning, which may be applied to make educational systems more effective, particularly for persons with disabilities. If realised, information 'downloads' directly into the brain would revolutionise education and improve access to information. However, concerns about the use of neurotechnologies in educational setting include the adoption of ineffective methods propped up on false or misleading claims, long-term harm to development and learning capacities, risk of cognitive overload, negative impacts from commercialisation and privatisation, and inequality of access to beneficial applications. While international human rights law on the right to education does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not interfere with the enjoyment of the right.

International law and policy

Under international law, everyone has the right to education.²³⁶ This right is also recognised in regional organisations, including the Council of Europe.²³⁷

Education should be "directed to the full development of the human personality and the sense of its dignity".²³⁸ States are obligated to provide free, compulsory primary education to children and ensure equal access to secondary and higher education without discrimination.²³⁹ All education should be available, accessible, acceptable, and adaptable within the specific context of the State.²⁴⁰ Particular care should be afforded to persons with disabilities; States are obligated to provide reasonable accommodation to ensure equal access to education.²⁴¹

To address concerns about the privatisation and commodification of human rights, human rights experts adopted the Adibjan Principles in 2019 to provide guidance on regulating private actors' involvement in education.²⁴² Under the States must established effective regulation of private actors consistent with international rights and standards.²⁴³ The Adibjan Principles have been endorsed by

²³⁶ UDHR, Article 26; ICESCR, Article 13; ICERD, Article 5(e)(v); CEDAW, Article 10; CRC, Article 28; and CRPD, Annex I, Article 24.

²³⁷ ECHR, Article 2.

²³⁸ UDHR, Article 26; and ICESCR, Article 13.

²³⁹ Ibid.

²⁴⁰ Committee on Economic, Social and Cultural Rights. (1999) *General Comment No. 13: The Right to education (article 13 of the Covenant)*, E/C.12/1999/10, 8 December 1999, para.6.

²⁴¹ Committee on the Rights of Persons with Disabilities. (2016) *General Comment No. 4 (2016) on the right to inclusive education*, CRPD/C/GC/4, 25 November 2016, paras.28-33; and Committee on the Rights of the Child. (2007) *General Comment No. 9 (2006) on the rights of children with disabilities*, CRC/C/GC/9, 27 February 2007, Section VIII(D).
²⁴² Abidjan Principles (Guiding Principles on the human rights obligations of States to provide public education and to

regulate private involvement in education), adopted 13 February 2019. ²⁴³ Ibid, para. 53.



the U.N. High Commission for Human Rights,²⁴⁴ U.N. Special Procedures (including the then U.N. Special Rapporteur on the right to education),²⁴⁵ and the U.N. Human Rights Council,²⁴⁶ among others.

Goal 3 of the UN Sustainable Development Goals is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".²⁴⁷

EU law and policy

The EU Charter of Fundamental Rights includes the right to education, including free compulsory education."²⁴⁸ The European Pillar of Social Rights also includes a principle on education, training and life-long learning.²⁴⁹

Potential enhancements

Neurotechnologies may enhance education and learning. Research on neuroscience and neurotechnologies is already providing information on how the brain works during the learning process.²⁵⁰ Learnings from this field of research may be used to make educational methods more effective and improve learning at all ages. Neuroscience research related to issues like attention in digital environments,²⁵¹ spaced lessons over time,²⁵² or the impacts of periodic social activities²⁵³ may help educators better develop curricula and learning environments to improve education.²⁵⁴ Better understanding of an individual's brain and learning functions could also help teachers develop personalised learning plans.²⁵⁵ For these reasons, investments in neurotechnologies may help States fulfil their obligation to ensure education is available, accessible, acceptable, and adapted in their national context.

Students with disabilities may particularly benefit from the integration of neurotechnologies in educational contexts.²⁵⁶ Neurotechnologies might assist not only with diagnosing learning

²⁴⁹ European Pillar of Social Rights, Principle 1.

²⁵⁶ See, generally, Muller, E. (2011). *Neuroscience and Special Education.* inForum Brief Policy Analysis [Online]. Available at: <u>https://nasdse.org/docs/72_f2f7f9b7-ff92-4cda-a843-c817497e81e4.pdf</u>.



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²⁴⁴ U.N. High Commissioner for Human Rights (2019) *Statement by UN High Commissioner for Human Rights Michelle Bachelet at the Social Forum: The promotion and protection of the rights of children and youth through education*, 1 October 2019. Available at: <u>https://www.ohchr.org/en/statements/2019/10/social-forum-promotion-and-protection-rights-children-and-youth-through?LangID=E&NewsID=25085</u>.

²⁴⁵ U.N. Special Rapporteur on the right to education. (2019) *Right to education: the implementation of the right to education and Sustainable Development Goal 4 in the context of the growth of private actors in education*, A/HRC/41/37, 10 April 2019.

²⁴⁶ U.N. Human Rights Council. (2021) *Resolution on the right to education*, A/HRC/4/L.26/Rev.1, 8 July 2021; U.N. Human Rights Council. (2019) *Resolution on the right to education: follow-up to Human Rights Council resolution 8/4*, A/HRC/4/L.26, 9 July 2019.

²⁴⁷ Sustainable Development Goals, Goal 4.

²⁴⁸ CFREU, Art. 14.

²⁵⁰ See, *e.g.*, McCandliss B. and Toomarian, E. (2020) 'Putting Neuroscience in the Classroom: How the Brain Changes As We Learn', *Trend.* Available at: <u>https://www.pewtrusts.org/en/trend/archive/spring-2020/putting-neuroscience-in-the-classroom-how-the-brain-changes-as-we-learn</u>.
²⁵¹ See., *e.g.*, Lodge, J.M. and Harrison, W.H. (2019) 'The Role of Attention in Learning in the Digital Age', *Yale Journal of*

²⁵¹ See., *e.g.,* Lodge, J.M. and Harrison, W.H. (2019) 'The Role of Attention in Learning in the Digital Age', *Yale Journal of Biology and Medicine*, 92. Available at: <u>https://pubmed.ncbi.nlm.nih.gov/30923470/</u>.

²⁵² See., *e.g.*, Sisti, H.M., Glass, A.L, and Shors, T.J. (2007) 'Neurogenesis and the spacing effect: Learning over time enhances memory and the survival of new neurons', *Learning and Memory*, 14(5). DOI: <u>10.1101/lm.488707</u>.

²⁵³ See., *e.g.*, Mazzoli et al. (2021) 'Breaking up classroom sitting time with cognitively engaging physical activity; Behavioural and brain responses', *PLoS ONE*, 16(7). DOI: <u>10.1371/journal.pone.0253733</u>.

²⁵⁴ See, *e.g.*, Willis, J. and Willis, M. *Research-based Strategies to Ignite Student Learning: Insights from Neuroscience and the Classroom*. 2nd ed. Alexandria, VA: USCD.

²⁵⁵ See, generally, Posey, A. (2020) *Leveraging Neuroscience in Lesson Design / ASCD* [Online]. Available at: <u>https://www.ascd.org/el/articles/leveraging-neuroscience-in-lesson-design</u>.

disabilities,²⁵⁷ but may also offer interventions to help students with disabilities learn better. For example, research suggests that screen-based technologies may help students with ADHD²⁵⁸ or neurofeedback treatment may help students with dyslexia.²⁵⁹ Neurotechnologies could, therefore, be used as a tool of reasonable accommodation to adapt learning methods to specific needs. Neuroscience research may also be used to address discrimination against persons with disabilities and promote acceptance of 'neurodiversity'.²⁶⁰

In the future, neurotechnologies, including neural implants, may also have the potential to directly improve learning and education. Current research suggests that learning for a particular skill can be improved through targeted neurostimulation to the brain²⁶¹ and many claim that it may one day be possible to download information into the brain through a brain-computer interface as the technologies improve.²⁶² Such technologies could drastically expand access to information and enhance education.

Potential interferences

The use of neurotechnologies may create or contribute to situations that negatively impact the right to education. For example, some argue that false claims and promises of neuroscience research in education have led to the emergence of myths about learning, which, when applied, may undermine the learning process and support ineffective educational policies in place of more effective methods and interventions.²⁶³ In some instances, these misconceptions could negatively impact decisions on the distribution of limited resources in such a way that effective teaching measures are deprioritised or unfunded.

²⁶⁰ See, generally, Armstrong, T. (2017) Neurodiversity: The Future of Special Education? / ASCD [Online]. Available at: https://www.ascd.org/el/articles/neurodiversity-the-future-of-special-education. Neurodiversity' is a term coined in the 1990s by Judy Singer to the "virtually infinite neuro-cognitive variability within Earth's human population". Singer, J. (2020) What is Neurodiversity? / Reflections on Neurodiversity [Online]. Available at: https://neurodiversity2.blogspot.com/p/what.html.

²⁶¹ See., *e.g.*, Kurzweil, R. (2016) *Now you can learn to fly a plan from expert-pilot brainwave patterns /* Kurzweil [Online]. Available at: <u>https://www.kurzweilai.net/now-you-can-learn-to-fly-a-plane-from-expert-pilot-brainwave-patterns</u>; Choe et al. (2016) 'Transcranial Direct Current Stimulation Modulates Nueronal Activities and Learning in Pilot Training', *Frontiers in Human Neuroscience*, 10. DOI: 10.3389/fnhum.2016.00034).

<u>https://www.psychologytoday.com/us/blog/memory-medic/201601/fables-and-facts-in-educational-neuroscience</u> (questioning 'myths' on, for example, teaching to different learning styles and the special importance of prekindergarten education).



²⁵⁷ See, *e.g.*, Prado, J. (2019) *Can neuroscience help predict learning difficulties in children / International Brain Research Organisation* [Online]. Available at: <u>https://solportal.ibe-unesco.org/articles/can-neuroscience-help-predict-learning-difficulties-in-children/</u>.

²⁵⁸ See., *e.g.*, Kulman, R. (2022) *Why Neurotechnology May Help Your Child with ADHD* / Psychology Today [Online]. Available at: <u>https://www.psychologytoday.com/us/blog/screen-play/202205/why-neurotechnologies-may-help-your-</u> <u>child-adhd</u>.

²⁵⁹ See, *e.g.*, Coben et al. (2015) 'The Impact of Coherence Neurofeedback on Reading Delays in Learning Disabled Children: A Randomized Controlled Study', *NeuroRegulation*, 2(4). DOI: <u>10.15540/nr.2.4.168</u>.

²⁶² See., e.g., Kolitz, D. (2021) Will It Be Possible to Upload Information To My Brain? / Gizmodo [Online]. Available at: https://gizmodo.com/will-it-be-possible-to-upload-information-to-my-brain-1847698784; Papadopoulous, L. (2019) "Brain Implants" Will Make Learning Obsolete in 20 Years, AI Expert Says / Interesting Engineering [Online]. Available: https://interestingengineering.com/google-brain-implants-could-make-learning-obsolete-in-20-years-says-ai-expert; Villarica, H. (2012) Study of the Day: Soon, You May Download News Skills to Your Brain / The Atlantic [Online]. Available at: https://www.theatlantic.com/health/archive/2012/01/study-of-the-day-soon-you-may-download-new-skills-to-your-brain/250775/.

²⁶³ See, *e.g.*, Macdonald et al. (2017) 'Dispelling the Myth: Training in Education or Neuroscience Decreases but Does Not Eliminate Beliefs in Neuromyths', *Frontiers in Psychology*, 8. DOI: 10.3389/fpsyg.2017.01314; and Klemm, W.R. (2016) *Fables and Facts in Educational Neuroscience* / Psychology Today [Online]. Available at:

Additionally, as long-term risks and effects on brain development from neurotechnologies is still unknown,²⁶⁴ the use of neurotechnologies may result in impacts that impair the brain's ability to develop and learn, thereby negatively impacting enjoyment of the right to education.

It is also important to note that the promise of wide or even unlimited access to information through neurotechnologies does not necessarily equate to enhanced learning or knowledge comprehension. Research on information overload in the context of the internet and digital technologies²⁶⁵ should inform discussions on whether individuals learn more with neurotechnologies and whether they should be used in educational settings.

Other concerns include potential negative effects from the use of commercial neurotechnologies that are not adapted or appropriately integrated into the educational context,²⁶⁶ or that give private actors too much control over learning content and systems while benefitting financially.²⁶⁷

Lastly, inequitable access to beneficial neurotechnologies in educational settings could exacerbate existing inequalities and frustrate a State's ability to fulfil their obligations to ensure equal access to education.²⁶⁸

States' obligations and areas for legal development.

Neurotechnologies are subject to existing international human rights law on the right to education and States have an obligation to ensure that the use of neurotechnologies support realisation of the right. States must ensure that neurotechnologies do not interfere with their obligations to provide free primary education to all children and equal access to secondary and higher education without discrimination. States have a particular responsibility to ensure equal access and non-discrimination for students with disabilities. Furthermore, States must regulate commercial neurotechnologies so that they, too, are consistent with international standards. In relation to right to education, further human rights guidance specific to neurotechnologies may be required to address concerns related to, among other issues, policy based on false or misleading claims, equality for and accommodation of students with disabilities, regulation of private actors and inequality of access.

4.1.9 Access to justice and right to a fair trial

Neurotechnologies have the potential to both enhance and undermine access to justice. XR may increase access to proceedings and allow for novel ways to present evidence, and its use may reduce the risk of judge, jury, or prosecutorial bias. However, XR may also encourage inferior participation and mask non-verbal cues, and it raises concerns about the accuracy and risk of image manipulation, inequalities of access to the technology, and privacy and data protection. All of these factors together may erode judicial legitimacy and undermine access to justice. While international human rights law on

²⁶⁸ International Bioethics Committee, supra note 227, p.37.



 ²⁶⁴ International Bioethics Committee, supra note 227, para. 98; and Muller and Rotter, supra note 226:
 ²⁶⁵ See, *e.g.*, Lehman, A. and Miller, S.J. (2020) 'A Theoretical Conversation about Responses to Information Overload', Information, 11(8). DOI: 10.3390/info11080379; and Kurelovic, E.K., Tomljanovic, J. and Davidovic, V. (2016) 'Information Overload, Information Literacy and Use of Technology by Students', *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 10(3).

²⁶⁶ See, *e.g.*, Taherisadr et al. (2021) 'Future of Smart Classroom in the Era of Wearable Neurotechnology'. Available at: <u>https://www.researchgate.net/publication/355495131</u> Future of Smart Classroom in the Era of Wearable Neurote chnology.

²⁶⁷ See, generally, Hogan, A. and Thompson, G. (eds) (2021). *Privatisation and commercialisation in public education: How the nature of public schooling is changing*. Abingdon, Oxon United Kingdom: Routledge; and Selwyn et al. (2020) 'What's next for Ed-Tech? Critical hopes and concerns for the 2020s', L*earning, Media and Technology*, 45:1, 1-6, DOI: 10.1080/17439884.2020.1694945.

access to justice does not explicitly address the impacts of XR, States have an obligation to ensure that the development and deployment of XR does not violate enjoyment of the right.

International law and policy

Access to justice is a basic principle of law constituted by several related rights. These rights include equal access and treatment before the law, a "fair and public hearing by a competent, independent and impartial tribunal" in criminal cases,²⁶⁹ and the right to an effective remedy.²⁷⁰ Specific requirements include the right to be heard, the right to a defence, and the right to a public trial.²⁷¹ In addition to specific guarantees, States have an obligation to ensure that access to courts and tribunals is not "systematically frustrated" by any *de jure* or *de facto* factors.²⁷²

Individuals also have the right to the presumption of innocence until proven guilty²⁷³ and the right "not to be compelled to testify against himself or to confess guilt."²⁷⁴

These rights are also recognised in regional organisations, including the Council of Europe.²⁷⁵ While XR has not been the topic of guidance or jurisprudence in relation to international human rights law, the European Court of Human Rights has considered the use of videoconferencing and found no violation of a defendant's right to a fair trial if certain conditions are met.²⁷⁶

EU law and policy

The EU Charter of Fundamental Rights includes the right "to an effective remedy" and "a fair and public hearing within a reasonable time by an independent and impartial tribunal."²⁷⁷

Potential enhancements

Neurotechnologies can be incorporated into the justice systems in ways that may help guarantee an individual's right to a fair trial by enhancing fairness, limiting bias, and ensuring justice is served. For example, neuroimaging is already used in some jurisdictions to establish competency of individuals to stand trial,²⁷⁸ establish an insanity defence,²⁷⁹ and assess a victim's injury in personal injury cases.²⁸⁰ Findings on childhood brain development could also inform rules and standards on the age of criminal responsibility.²⁸¹ Research also suggests that neurotechnologies could be used in jury selection,

²⁶⁹ UDHR, Article 10; ICCPR, Article 14.

- ²⁷¹ Human Rights Committee. (2007) *General Comment No. 32: Article 14: Right to equality before courts and tribunals and to a fair trial*, CCPR/C/GC/32, adopted 23 August 2007, para.28, 32, and 37.
- ²⁷² Ibid, para.9. Latin for "in law or in fact."
- ²⁷³ UDHR, Article 11; ICCPR, Article 14(2).
- ²⁷⁴ ICCPR, Article 14(3)(g).
- ²⁷⁵ ECHR, Article 6.
- ²⁷⁶ European Court of Human Rights. (2006) Marcello Viola v Italy (No. 1), 5 October 2006, No. 45106/04,
- CE:ECHR:2006:1005JUD004510604, para.76.

²⁷⁸ Kolla, N. J., Brodie, J.D. (2012) Application of Neuroimaging in Relationship to Competence to Stand Trial and Insanity In. Simpson, J.R. (ed) (2012) *Neuroimaging in Forensic Psychiatry: From the Clinic to the Courtroom*. Chichester, West Sussex: Wiley-Blackwell, p. 159.

²⁷⁹ Aono, D., Yaffe, G., Kober, H. (2019) 'Neuroscientific Evidence in the Courtroom: A Review', *Cognitive Research: Principles and Implications*, 4 (40), pp. 2-20.

²⁸⁰ Alces, P.A. (2018) *The Moral Conflict of Law and Neuroscience*. Chicago: The University of Chicago Press, p. 183.
 ²⁸¹ See, e.g., Wishart, H. (2018) 'Young Minds, Old Legal Problems: Can Neuroscience Fill the Void Young Offenders and the Age of Criminal Responsibility Bill – Promise and Peril', *The Journal of Criminal Law*, 82(3), pp. 311-320. DOI:



²⁷⁰ ICCPR, Article 2(a).

²⁷⁷ CFREU, Article 47

assessing judge bias in sentencing, in memory elicitations, and determining guilt of an individual.²⁸² If accurate and fair, these applications could enhance judicial proceedings.

Potential interferences

The use of neurotechnologies can also interfere with access to justice and the right to a fair trial, particularly if used in way that undermines the right to presumption of innocence or violates the right to not self-incriminate.

Regardless of how neurotechnologies come into the judicial system, a general concern is that the standards of evidence for law and science do not always align.²⁸³ The law requires proving an alleged set of facts at the individual level with specificity (a specific defendant did a specific thing at a specific time). Neuroscience, instead, often makes inferences about an individual based on group data (group to individual, or G2i, inference). Therefore, the tension between standards of proof from the two disciplines when neurodata is introduced to legal proceedings can undermine fairness and accuracy in the justice system.

Of particular concern is the potential use brain scans are introduced to show guilt, which poses many issues related accuracy, privacy, and mental integrity.²⁸⁴ If found guilty, a related concern is using neurotechnologies in criminal sentencing to assess risk of recidivism (i.e., will the defendant commit the same crime again?).²⁸⁵ While insights into the brain could be used as mitigating factors that contribute to a lesser sentence, there is a significant risk of assessments based on a G2i inference, resulting in a non-personalised decision (i.e. other people with a similar brain may commit another crime, therefore the defendant will likely commit another crime and should have a longer sentence).

The use of neurotechnologies in detention and correctional facilities (e.g., for addiction or mental illness treatment) presents concerns related to efficacy, safety, and consent, especially when the treatment is court-ordered or involuntary.²⁸⁶

Lastly, neurotechnologies in judicial proceedings may also present privacy and data protection concerns, as many proceedings involve highly sensitive materials and brain data is particularly

²⁸⁶ See, *e.g.*, Gkotsi, G.M. and Benaroyo, L. (2012) 'Neuroscience and the Treatment of Mentally Ill Criminal Offenders: Some Ethical Issues', Journal of Ethics in Mental Health, Neuroethics Supplement. Available at: http://www.antoniocasella.eu/dnlaw/Gkotsi 2012.pdf.



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^{10.1177/0022018318779830;} and Mercurio et al. (2020). 'Adolescent Brain Development and Progressive Legal Responsibility in the Latin American Context', Frontiers in Psychology, 11. DOI: 10.3389/fpsyg.2020.00627. ²⁸² Reese, B. (2009) 'Using fMRI as a Lie Detector- Are We Lying to Ourselves?', Journal of Science and Technology, 19 (1), 206-230. See also: Rusconi, E., Mitchener-Nissen, T. (2003) 'Prospects of Functional Magnetic Resonance Imaging as Lie

Detector', Frontiers in Human Neuroscience, 7 (594), pp. 1-12; Pulice, E.B. (2010) 'The Right to Silence at Risk: Neuroscience-Based Lie Detection in The United Kingdom, India, and the United States', The George Washington International Law Review, 42 (4), pp. 865-896.

²⁸³ See, *e.g.*, Faigman et al. (2014) 'Group to Individual (G2i) Inference in Scientific Expert Testimony', University of Chicago Law Review, 81 (2). Available at:

<u>https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2298909</u>. ²⁸⁴ See, *e.g.*, Aharoni et al. (2008) 'Can Neurological Evidence help Courts Assess Criminal Responsibility? Lessons from Law and Neuroscience', Annals of the New York Academy of Sciences, 1124. DOI: 10.1196/annals.1440.007; and Kraft, C.J. and Giordano, J. (2017) 'Integrating Brain Science and Law: Neuroscientific Evidence and Legal Perspectives on Protecting Individual Liberties', Frontiers in Neuroscience, 11. DOI: 10.3389/fnins.2017.00621.

²⁸⁵ See, e.g., Gertner, N. (2016) 'Neuroscience and Sentencing', Fordham Law Review, 85; and Ling, S. and Raine, A. (2017) 'The Neuroscience of Psychopathy and Forensic Implications', Psychology, Crime & Law. DOI: 10.1080/1068316X.2017.1419243.

sensitive (see Section 4.2).²⁸⁷ This would be especially relevant to non-parties (e.g., jury members, witnesses) who have expectations of privacy but whose privacy rights are subservient to the parties' rights; for example, a juror may not have the right to refrain from answering a question during jury selection if the answer to a question is necessary to assess bias and ensure a defendant's right to an impartial jury.²⁸⁸

States' obligations and areas for legal development

Neurotechnologies is subject to existing international human rights law on access to justice and the right to a fair trial, and States have an obligation to ensure that the use of neurotechnologies supports realisation of the rights. States must take all necessary steps possible to guarantee that the use of neurotechnologies does not create circumstances constituting a *de jure* or *de facto* interference with individual's right to equal access to justice, a fair trial, the presumption of innocence, and the right not to self-incriminate. In relation to right to a fair trial access to justice, further human rights guidance specific to neurotechnologies may be required to address concerns related to, among other issues, presumption of innocence and self-incrimination for defendants, standard of proof for neurodata, recidivism assessments in sentencing, and privacy and data protection for all parties.

4.1.10 Right to rest and leisure

Neurotechnologies have the potential to both enhance and undermine the right to rest and leisure. Neurotechnologies may unlock new creative outlets, free-up time for leisure, and improve access and enjoyment of certain activities for persons with disabilities. However, neurotechnologies can also interfere with rest and leisure, particularly when their use (and misuse) in workplace settings results in prolonged periods of work without sufficient rest. While international human rights law on the right to rest and leisure does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not violate enjoyment of the right. Furthermore, developments on 'right to disconnect' are directly relevant to neurotechnologies.

International law and policy

Under international law, everyone has the right to rest and leisure." ²⁸⁹ This right is related to the right to work and labour protection, as it includes "reasonable limitation of working hours and periodic holidays with pay."²⁹⁰ Children are specifically entitled "to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts."²⁹¹ All individuals have a right to equally participate in leisure activities, including persons with disabilities.²⁹² The Council of Europe also recognises the right to rest, leisure and play for children.²⁹³

In some cases, the right to rest and leisure has been interpreted to include the 'right to disconnect' from work and associated digital technologies. While not codified in international law, the right to

²⁹³ Council of Europe. *Leisure time / Council of Europe* [Online]. Available at: <u>https://www.coe.int/en/web/childrens-voices/leisure-time</u>.



 ²⁸⁷ See, *e.g.*, Kraft, C.J. and Giordano, J. (2017) 'Integrating Brain Science and Law: Neuroscientific Evidence and Legal Perspectives on Protecting Individual Liberties', *Frontiers in Neuroscience*, 11. DOI: 10.3389/fnins.2017.00621.
 ²⁸⁸ See, *e.g.*, Suskin, Z.D. (2021) 'Lady Justice may be Blind, but is She Racist? Examining Brain, Biases and Behaviors Using Neuro-Voir Dire', *Cambridge Quarterly of Healthcare Ethics*, 30(2). DOI: <u>10.1017/S0963180121000177</u>.
 ²⁸⁹ UDHR, Article 24; ICESCR, Article 7(d).

²⁹⁰ Ibid.

²⁹¹ CRC, Article 31.

²⁹² CRPD, Article 30.

disconnect has been discussed by the World Health Organization and the International Labour Organization in a technical brief on telework.²⁹⁴

EU law and policy

In relation to fair and just working conditions, the EU Charter of Fundamental Rights includes the right "to daily and weekly rest periods."²⁹⁵ Member states are directed to take necessary measures to ensure restrictions on working hours.²⁹⁶ Work-life balance, particularly in the context of telework, is one of the European Pillars of Social Rights.²⁹⁷

Potential enhancements

Neurotechnologies, and our understanding of the brain through neuroscience research, may enhance the enjoyment of leisure by 'unlocking' or enhancing an individual's creative abilities, thus fostering new leisure activities and outlets.²⁹⁸ The use of neurotechnologies in non-leisure (a.k.a. work) activities may also improve efficiency, thus freeing time for more leisure activities. Neurotechnologies may offer particular benefits to persons with disabilities, for example smart glasses for children with autism that gives cues on facial expressions to help a child develop social skills and play with peers²⁹⁹ or neuro-prosthesis and mind-controlled exoskeletons that enable someone with mobility limitations to participate more fully in sport.³⁰⁰

Potential interferences

The use of neurotechnologies, particularly in the workplace setting, may negatively impact an individual's ability to enjoy the right to rest and leisure. For example, neurotechnologies to enhance productivity may have the inverse effects of increasing workload, thus maintaining the *status quo* or even further limiting time available for rest and leisure.³⁰¹ Misuse and abuse of neurotechnologies could, in theory, be used to coerce or force individuals to perform activities or take actions. In the

²⁹⁴ World Health Organization and the International Labour Organization. (2021) *Healthy and Safe Telework*. Available at: <u>https://www.who.int/publications/i/item/9789240040977</u>.

investment/european-pillar-social-rights en.

0416#:~:text=Neuroscience%20and%20art%2C%20therefore%2C%20each,sense%20of%20incoming%20visual%20dat a; Ricker, E.R. (2021) *This is how to truly unlock your creativity* / Fast Company [Online]. Available at:

https://www.fastcompany.com/90665894/this-is-how-to-truly-unlock-your-creativity; and Kirkwood, C. (2014) Unlocking Creativity in the Brain / BrainFacts.org [Online]. Available at: <u>https://www.brainfacts.org/Neuroscience-in-Society/The-Arts-and-the-Brain/2014/Unlocking-Creativity-in-the-Brain;</u> Nijholt A., et al. (2018) 'Brain-Computer Interfaces for Artistic Expression', CHI'18 Extended Abstracts, April 21–26, 2018, Montreal, QC, Canada. DOI: 10.1145/3170427.3170618.

²⁹⁹ See, *e.g.*, Digitale, E. (2018) *Google Glass helps kids with autism read facial expressions* / Stanford Medicine News Center [Online]. Available at: <u>https://med.stanford.edu/news/all-news/2018/08/google-glass-helps-kids-with-autism-read-facial-expressions.html</u>.

³⁰⁰ See, *e.g.*, Martins, A. and Rincon, P. (2014) *Paraplegic in robotics suit kicks off World Cup* / BBC [Online]. Available at: <u>https://www.bbc.com/news/science-environment-27812218</u>.

³⁰¹ See, *e.g.*, Hopkins, P.D. & Fiser, H.L. (2014) "This Position Requires Some Alteration of your Brain": On the Moral and Legal Issues of Using Neurotechnology to Modify Employees', *Journal of Business Ethics*. DOI: 10.1007/s10551-016-3182-y.



²⁹⁵ CFREU, Art. 31(2).

²⁹⁶ Directive 2003/88/EC of the European Parliament and of the Council of 4 November 2003 concerning certain aspects of the organisation of working time [2003] OJ L299/9.

²⁹⁷ European Commission. (2021) European Pillar of Social Rights. Available at:

https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-

²⁹⁸ See, *e.g.*, Blaszczyk, C. (2019) *3Q: The interface between art and neuroscience* / MIT News [Online]. Available at: https://news.mit.edu/2019/3-questions-sarah-schwettmann-interface-between-art-and-neuroscience-

context of work, this could manifest as prolonged periods of work without sufficient periods of rest, raising concerns related to the 'right to disconnect' and forced labour.

States' obligations and areas for legal development:

Neurotechnologies are subject to existing international human rights law on the right to rest and leisure and States have an obligation to ensure that the use of neurotechnologies support realisation of the right. Further human rights guidance specific to neurotechnologies may be required to address concerns related to, among other issues, the 'right to disconnect' and misuse and abuse in the workplace.

4.1.11 Right to benefit from science

Everyone has the right under international law to benefit from scientific progress, which includes neurotechnologies. States may not arbitrarily interfere with the ability to enjoy this right, which includes ensuring access to neurotechnologies without discrimination, particularly when the use of neurotechnologies is "instrumental" for enjoyment of other fundamental rights. States may not, however, force the use of technologies like neurotechnologies, excepted in limited situations.

International law and policy

Under international law, everyone has the right to "to share in scientific advancement and its benefits."³⁰² Historically, this right is one of the least studied or applied in international human rights, but recent interest from UNESCO, the UN Special Rapporteur in the Field of Cultural Rights, and the UN Committee on Economic, Social and Cultural Rights as prompted new interest in the right.³⁰³

In this context, the definition of 'science' encompasses both process and the results of process³⁰⁴ and "the technology deriving from scientific research".³⁰⁵ The term 'benefits' refers to "the material results" and "the scientific knowledge and information directly deriving from scientific activity".³⁰⁶ States have obligations "to abstain from interfering in the freedom of individuals and institutions to develop science and diffuse its results" and to ensure individuals can enjoy the benefits of science without discrimination.³⁰⁷ In particular, States must ensure "that everyone has equal access to the applications of science, particularly when they are instrumental for the enjoyment of other economic, social and cultural rights."³⁰⁸ The U.N. Committee on Economic, Social and Cultural rights identifies that new emerging technologies present many risks and promises for the enjoyment of other rights, and calls on States to "adopt policies and measures that expand the benefits of these new technologies while at the same time reducing their risks."³⁰⁹

³⁰⁵ Ibid, para.7.

³⁰⁶ Ibid, para.8.

³⁰⁷ Ibid, para.15.

³⁰⁹ Ibid, para.74.



³⁰² UDHR, Article 27. In the ICESCR, the right is articulated as the "right to benefit from scientific progress and its application". ICESCR, Article 15(b).

³⁰³ See Yotova, R. and Knoppers, B.M. (2020) 'The Right to Benefit from Science and Its Implications for Genomic Data Sharing', *The European Journal of International Law*, 31(2).

³⁰⁴ Committee on Economic, Social and Cultural Rights. (2020) *General comment No. 25 (2020) on science and economic, social and cultural rights (article 15 (1) (b), (2), (3), and (4) of the International Covenant on Economic, Social and Cultural Rights,* E/C.12/GC/25, 20 April 2020, paras.4-5 (discussing United Nations Educational, Scientific and Cultural Organization. (2017) *Records of the General Conference, 39th session, Annex II – Recommendation on Science and Scientific Research.*

³⁰⁸ Ibid, para.17.

This right does not create an obligation on individuals to benefit from or use technologies. For example, in the context of medical treatment, States "must guarantee everyone has the right to choose or refuse the treatment they want with the full knowledge of the risks and benefits."³¹⁰ Anything contrary to this guarantee must be determined by law and "solely for the purpose of promoting the general welfare in a democratic society".³¹¹

To address risks associated with some science and technologies and their applications, State may put limits on scientific research, but they must also be in law and promote "the general welfare in a democratic society".³¹²

In the specific context of biomedicine, the Council of Europe stresses "the need for international cooperation so that all humanity may enjoy the benefits of biology and medicine."³¹³

EU law and policy

The EU Charter of Fundamental Rights includes 'freedom of the arts and sciences' to ensure scientific research is "free of constraint",³¹⁴ but a similar right to benefit from scientific progress does not exist.

Key issues, gaps and challenges

Neurotechnologies are unlikely to directly enhance or interfere with the right to benefit from scientific progress. Instead, enjoyment of the right is possible through the use of neurotechnologies, as the right extends to new and emerging technologies including neurotechnologies. States must ensure that individuals have access to neurotechnologies without discrimination, particularly when neurotechnologies are instrumental to the enjoyment of other rights like the right to health and education. To those individuals who choose, a State cannot arbitrarily interfere in the development, deployment, or enjoyment of neurotechnologies. On the other hand, except in certain circumstances determined by law, individuals cannot be forced to use neurotechnologies. The use of neurotechnologies in justice systems presents a particular challenge if a compelled use of neurotechnologies interferes with the right to fair trial, presumption of innocence, or the right to be free from self-incrimination.

States' obligations and areas for legal development

States have an obligation to not arbitrarily interfere with the ability to enjoy the benefits of scientific progress, particularly when the use of neurotechnologies is "instrumental" for enjoyment of other fundamental rights. At the same time, States may not force the use of technologies like neurotechnologies, except in limited situations. To ensure that an individuals' choice to 'benefit from science' is respected, there is an interest in a right of refusal to not use a technology or engage its use in a specific application.³¹⁵ A right to refusal may enhance an individual's ability to enjoy other rights

³¹³ Oviedo Convention, supra note 103.

<u>https://www.ted.com/talks/dr_seeta_pena_gangadharan_technologies_of_control_and_our_right_of_refusal;</u> and Benjamin, Ruha. (2016) 'Informed Refusal: Toward a Justice- Based Bioethics.' Science, Technology, & Human Values 41 (6), 967–90. <u>https://doi.org/10.1177/0162243916656059</u>.



³¹⁰ Ibid, para.44.

³¹¹ ICESCR, Article 4.

³¹² Committee on Economic, Social and Cultural Rights, supra note 304, para.21.

³¹⁴ CFREU, Article 13.

³¹⁵ This is distinct from involuntary limitations on access because of the 'digital divide'. See Gangadharan, S.P. (2021) 'Digital Exclusion: A Politics of Refusal' in Bernholz, L., Landemore, H. and Reich, R. (eds) *Digital Technology and Democratic Theory*. University of Chicago Press: Chicago; Gangadharan, S.P. (2019) Video: 'Technologies of control and our right of refusal', TEDxLondon. Available at:

without the potential negative impacts of XR. However, the idea is not widely discussed or codified in any laws, though there is a proposal for a 'neuroright' to 'cognitive liberty' to guarantee an individual's freedom to use or refuse to use technologies that alter mental state (See Section 4.1.13).

4.1.12 Non-discrimination and vulnerable groups

Neurotechnologies have the potential to both enhance and interfere with the rights of vulnerable groups, including women, children and persons with disabilities. Beneficial applications in educational contexts may enhance the right to education for children, particularly those with disabilities, while the use of neurotechnologies, such as neurostimulation, may be used to treat a variety of neurological disorders and physical disabilities, which may enhance the right to health of persons with disabilities. However, the use of neurotechnologies also carries the risk of neurodiscrimination, particularly for neurodiverse individuals, the experiencing of which may negatively impact upon the enjoyment of other protected rights. Although international human rights law on the rights of vulnerable groups does not explicitly address the impacts of neurotechnologies, States have an obligation to ensure that the development and deployment of neurotechnologies does not interfere with the enjoyment of the protected rights of such groups, including to non-discrimination.

International law and policy

The rights of all persons to equality and non-discrimination are explicitly guaranteed under international law.³¹⁶ The right to non-discrimination prohibits specific instances of discrimination, such as racial discrimination,³¹⁷ whilst also protecting particular groups against discriminatory treatment, including women,³¹⁸ children,³¹⁹ migrant workers,³²⁰ and persons with disabilities,³²¹ the particularised rights relating to whom are contained in specific international conventions. The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), for instance, is the most comprehensive of the treaties on the rights of women, requiring that State Parties, inter alia, 'take all appropriate measures for the elimination of discrimination against women' in the context of employment,³²² healthcare,³²³ and other areas of economic and social life.³²⁴ In addition to the elimination of discrimination and the establishment of equality between men and women, the CEDAW also contains more targeted provisions, such as the imposition of an obligation on State Parties to "take all appropriate measures, including legislation, to suppress all forms of traffic in women and exploitation of women."³²⁵

In relation to children, meanwhile, the Convention on the Rights of the Child (CRC) establishes the Committee on the Rights of the Child (CRC Committee)³²⁶ and provides, inter alia, that State Parties "shall take all appropriate measures to ensure that the child is protected against all forms of discrimination",³²⁷ while also establishing "the best interests of the child" as a "primary consideration"

³²⁷ Ibid, Article 2.



³¹⁶ UDHR, Article 7; ICERD, Article 2; ICESCR, Articles 2 and 3; ICCPR, Articles 2(1), 3 and 26; CEDAW, Article 2; CRC, Article 2; CPRMW, Article 1; CRPD, Articles 1, 3, 4 and 5.

³¹⁷ ICERD, Article 2.

³¹⁸ CEDAW, Article 2.

³¹⁹ CRC, Article 2.

³²⁰ CPRMW, Article 1. ³²¹ CRPD, Articles 1, 3, 4 and 5.

³²² CEDAW, Article 11.

³²³ Ibid, Article 12.

³²⁴ Ibid, Article 13.

³²⁵ Ibid, Article 6.

³²⁶ CRC, Article 43.

in actions taken by public and private sector bodies relating to children.³²⁸ The rights of persons with disabilities under international law, meanwhile, are contained in the Convention on the Rights of Persons with Disabilities (CRPD), the primary purpose of which "is to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity."³²⁹ Akin to the CEDAW and the CRC (see above), the CRPD requires that State Parties "promote equality and eliminate discrimination", ³³⁰ thereby permitting "specific measures which are necessary to accelerate or achieve de facto equality of persons with disabilities", ³³¹ whilst also explicitly recognising the intersectionality between vulnerable groups through particular provisions relating to women and children with disabilities.³³² Furthermore, the CRPD introduces various Convention-specific rights, such as the right of accessibility to, inter alia, "information and communications, including information and communications technologies and systems", ³³³ and the right to live independently and be included in the community.³³⁴

The rights of women, children and persons with disabilities are also recognised in regional organisations. For instance, the European Convention on Human Rights, a treaty of the Council of Europe providing for civil and political rights, contains a prohibition upon discrimination that is applicable to each of the identified vulnerable groups,³³⁵ meanwhile the corresponding European Social Charter guarantees various fundamental rights directly addressed to women, children and persons with disabilities.³³⁶ Pursuant to the latter, there is an obligation upon Contracting Parties to "recognise the right of men and women workers to equal pay for work of equal value", ³³⁷ and moreover commit to taking measures consistent with "ensuring the effective exercise of the right of employed women to protection", such as establishing provision for paid maternity leave.³³⁸ Children and young persons are similarly entitled to specific protection under the European Social Charter, both alongside mothers in a joint right to social and economic protection,³³⁹ and as specific group; the protections in relation to which are primarily focused upon the age of, remuneration for, and general working conditions relevant to the employment context.³⁴⁰ Lastly, persons with a disability have a right to vocational training, rehabilitation and social resettlement under the European Social Charter, pursuant to which Contracting Parties have an obligation 'to take adequate measures' relating to the provision of training facilities and the placing of persons with disabilities in employment.³⁴¹

EU law and policy

The Charter of Fundamental Rights guarantees that "[e]veryone is equal before the law"³⁴² and prohibits "[a]ny discrimination based on any ground".³⁴³ Alongside the rights to equality and nondiscrimination, the specific rights of women, children and persons with disabilities under EU law are

³²⁸ Ibid, Article 3. 329 CRPD, Article 1. ³³⁰ Ibid, Article 5(1)-(3). ³³¹ Ibid, Article 5(4). ³³² Ibid, Articles 6 and 7. ³³³ Ibid, Article 9(1). ³³⁴ Ibid, Article 19. ³³⁵ ECHR, Article 14. ³³⁶ European Social Charter, supra note 204. ³³⁷ Ibid, Article 4(3). ³³⁸ Ibid, Article 8(1). ³³⁹ Ibid, Article 17. ³⁴⁰ Ibid, Article 7(1)-(10). ³⁴¹ Ibid, Article 15. ³⁴² CFREU, Article 20. ³⁴³ Ibid, Article 21.



contained in Chapter III of the EU Charter of Fundamental Rights (CFREU), entitled Equality.³⁴⁴ In relation to the former, Article 23(1) ensures equality between men and women "in all areas, including employment, work and pay", whilst not precluding "the maintenance or adoption of measures providing for specific advantages in favour of the under-represented sex."³⁴⁵ The specific Article containing the rights of the child is based on the CRC (see above) and includes, inter alia, a right to "protection and care" as is necessary for wellbeing,³⁴⁶ whilst the CFREU also lays down a requirement that the working conditions of young people be age-appropriate and protective against associated harms to health, safety and general development, in addition to establishing a prohibition upon child labour.³⁴⁷ Finally, building upon the equivalent provision under the European Social Charter (see above),³⁴⁸ persons with disabilities are entitled "to benefit from measures designed to ensure their independence, social and occupational integration and participation in the life of the community."³⁴⁹

Potential enhancements

Neurotechnologies may enhance the rights of vulnerable groups in various ways. Research into neuroscience and neurotechnologies, for instance, is enhancing understanding of how children's' brains develop during the learning process, the learnings from which may be used to improve educational performance (see Section 4.1.8).³⁵⁰ Children with disabilities may particularly benefit from the use of neurotechnologies in educational settings.³⁵¹ More generally, the use of neurotechnologies by persons with disabilities may lead to enhancements linked to the right to health. In addition to the role of neurotechnologies, such as electroencephalography (EEG), electrocorticography (ECoG), and brain computer interfaces (BCIs), in assisting communication for those with verbal communication impairments (see Section 4.1.6), neurotechnologies can be used to study and treat the medical conditions underlying a range of disabilities. For instance, neurostimulation and neuromodulation techniques, such as deep brain stimulation (DBS), may be used to treat neurological disorders such as Alzheimer's,³⁵² movement disorders such as Parkinson's disease,³⁵³ and neuropsychiatric disorders such as schizophrenia.³⁵⁴ Further, the emerging field of neuroprosthesis may facilitate the treatment of spinal cord injuries,³⁵⁵ while efforts are underway to develop neuroprosthetic interfaces enabling individuals to gain more intuitive control over prosthetic limbs.³⁵⁶ Each of these applications of

³⁴⁴ CFREU.

³⁴⁶ Ibid, Article 24(1)-(2).

³⁴⁷ Ibid, Article 32.

³⁴⁸ Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02), Explanations on Article 26. 349 CFREU, Article 26.

https://n.neurology.org/content/98/18 Supplement/1509.

³⁵⁴ See, *e.g.*, Sui Y. et al. (2021) 'Deep Brain Stimulation Initiative: Toward Innovative Technology, New Disease Indications, and Approaches to Current and Future Clinical Challenges in Neuromodulation Therapy', Frontiers in Neurology, 11. DOI: https://doi.org/10.3389/fneur.2020.597451.

³⁵⁵ See, *e.g.*, Nightingale T.E. et al (2019) 'Ergogenic effects of an epidural neuroprosthesis in one individual with spinal cord injury', Neurology, 92 (7). DOI: https://n.neurology.org/content/92/7/338.

³⁵⁶ See, *e.g.*, Yildiz, Shin and Kaufman, supra note 221.



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³⁴⁵ Ibid, Article 23(2).

³⁵⁰ McCandliss B. and Toomarian E. (2020) Putting Neuroscience in the Classroom: How the Brain Changes As We Learn / Trend [Online]. Available at: https://www.pewtrusts.org/en/trend/archive/spring-2020/putting-neuroscience-in-the-<u>classroom-how-the-brain-changes-as-we-learn</u>. ³⁵¹ See, *e.g.*, Simos P.G. et al. (2002) 'Dyslexia-specific brain activation profile becomes normal following successful

remedial training', Neurology, 58 (8). DOI: https://doi.org/10.1212/wnl.58.8.1203.

³⁵² See, *e.g.*, Ning S. et al. (2022) 'Neurotechnological Approaches to the Diagnosis and Treatment of Alzheimer's Disease', Frontiers in Neuroscience, 16. DOI: https://doi.org/10.3389/fnins.2022.854992.

³⁵³ See, *e.g.*, Spagna S. Askari A. Patil P and Chou K. (2022) 'Social Support and Clinical Outcomes in Patients with Parkinson Disease After Deep Brain Stimulation', Neurology, 98. DOI:

neurotechnologies has the potential to enhance the rights of persons with disabilities, specifically the right to health (see Section 4.1.7).³⁵⁷

Potential interferences

The use of neurotechnologies may create or exacerbate situations that compromise the right of everyone under international law to non-discrimination. A particular concern is that the processing of brain data in neurotechnologies, particularly neuroimaging, may lead to "neurodiscrimination", a phenomenon characterised by "discrimination based on a person's neural signatures (indicating for example, a dementia predisposition), or mental health, personality traits, cognitive performance, intentions and emotional states."³⁵⁸ This is based on research which indicates that neurodiverse individuals, such as those with mental health problems, may suffer from both anticipated and experienced discrimination, one effect of which may be to create obstacles to receiving healthcare,³⁵⁹ and, moreover, that persons with disabilities may experience discrimination in employment settings, potentially receiving lower pay, job security and job flexibility in comparison to employees without disabilities.³⁶⁰ This raises the possibility that the use of neurotechnologies for clinical purposes may exacerbate existing or lead to increased *de facto* discrimination, particularly in employment and insurance contexts, the experiencing of which may compromise the right to non-discrimination and other protected rights, such as the right to health (see Section 4.1.7) and the right to work and employment.³⁶¹

States' obligations and areas for legal development

Neurotechnologies are subject to existing human rights law on the rights of women, children and persons with disabilities, and States have an obligation to ensure that the use of such technologies supports realisation of these rights. States must ensure that neurotechnologies do not interfere with their obligations to guarantee the rights of vulnerable groups on the basis of non-discrimination. Further human rights guidance specific to neurotechnologies may be required to address concerns related to neurodiscrimination, in relation to which it has been suggested that the prohibition on genetic discrimination in the Oviedo Convention³⁶² may serve as a reference point for comparable treatment.³⁶³

4.1.13 Trends and emerging rights

Neurotechnologies open the door to a new and previously unattainable set of possibilities to study the human brain and develop a better understanding of its functioning. The emergence of these technologies has prompted a scholarly debate around the possible negative impacts on one's human rights and the suitability of the existing human rights law framework to provide adequate safeguards against intrusive applications of neurotechnologies. It has been argued that the emergence of

³⁶³ lenca, supra note 193, p. 32.



³⁵⁷ CRPD, Article 25.

³⁵⁸ lenca, supra note 193, p.32.

³⁵⁹ See, *e.g.*, Henderson C. et al. (2012) 'A decision aid to assist decisions on disclosure of mental health status to an employer: protocol for the CORAL exploratory randomised controlled trial', *BMC Psychiatry*, 12. DOI: <u>https://doi.org/10.1186/1471-244X-12-133</u>.

³⁶⁰ See, *e.g.*, Schur L. (2017) 'Disability at Work: A Look Back and Forward', *Journal of Occupational Rehabilitation*, 27 (4), pp.482-497. DOI: <u>https://doi.org/10.1007/s10926-017-9739-5</u>.

³⁶¹ CRPD, Article 27.

³⁶² Oviedo Convention, supra note 103, Article 11.

neuroscience and neurotechnologies has given rise to need for a new set of human rights, called neurorights.³⁶⁴

In particular, a set of four new human rights have been proposed lenca and Andorno:

- Right to cognitive liberty
- o Right to mental privacy
- o Right to mental integrity
- o Right to psychological continuity.³⁶⁵

Acknowledging the importance of avoiding rights inflation, lenca and Andorno argue that neurotechnologies give a specific rise to the need for these neurorights, because existing human rights alone cannot offer adequate protection in some applications of neurotechnologies. In fact, it is argued that neurorights are essential for the protection of other human rights.³⁶⁶ The right to remain silent and the privilege against self-incrimination during criminal proceedings, for instance, would become redundant if one's decision to remain silent can easily be bypassed through mind-reading techniques. Furthermore, the advancement of pervasive neurotechnologies used for sub-conscious neuromarketing,³⁶⁷ for instance, gives rise to new legal questions and the suitability of the existing human rights law framework to provide adequate safeguards. This section considers these four neurorights in short, and touches upon the ongoing scholarly debate around these rights.

Cognitive liberty By examining current and possible applications of neurotechnologies in the courtroom, a lot of attention is given to possible implications to constitutional rights of due process and equality before the law. Furthermore, application of neurotechnologies is considered against the protection of privacy and data retention. The former may be related to a more general right of privacy to one's mind against, while the latter may relate to privacy issues arising from neurodata retainment in a courtroom setting. At present, there seems to be no existing rights which may be specifically utilized to the application of neurotechnologies, although scholars have made proposals for such an introduction. Chile is an exception, as it recently initiated the introduction of "neurorights" as a constitutional amendment.

The concept of cognitive liberty may be defined as a right to mental self-determination.³⁶⁸ As a legal concept, the right can protect individuals against coercive use of neurotechnologies. An individual may accept or refuse the use of neurotechnologies in the context of their mind. Although such a right is currently not adopted in existing laws,³⁶⁹ similar notions may be found when examining the right of bodily integrity. For instance, Article 3 of the EU Charter of Fundamental Rights outlines the rights of physical and mental integrity.³⁷⁰ However, creating a clear separation between the concept of the

³⁷⁰ CFREU, Article 3 (1).



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³⁶⁴ Ienca and Andorno, supra note 193; see also Yuste, et al., supra note 145.

³⁶⁵ lenca and Andorno, supra note 193.

³⁶⁶ Ibid, p. 9.

³⁶⁷ Ibid, p. 4.

³⁶⁸ Bublitz, C. (2013) 'My Mind is Mine!? Cognitive Liberty as a Legal Concept', in: Hildt, E., Franke, A. (eds) Cognitive Enhancement: Trends in Augmentation of Human Performance, vol 1. Springer, Dordrecht. <u>https://doi.org/10.1007/978-</u> 94-007-6253-4 19.

³⁶⁹ Ibid, p. 9.

"mental" and "bodily" may be useful in the emerging application of neurotechnologies. The right to cognitive liberty and mental integrity could help safeguard existing due process rights in a legal setting. It goes beyond this as well, as neurotechnologies may be proposed for treatment purposes post-conviction³⁷¹. Adopting a right to cognitive liberty may thus be a useful human rights development, as there is growing concern around the adoption of neurotechnologies and whether existing rights are enough to protect against possible misuse³⁷².

One such recent development occurred in Chile, whose senate recently approved an amendment to their constitution to extend protection of brain rights and mental privacy³⁷³. Once signed into law by the president would be first of such developments, essentially creating a clear right for possible neurotechnological applications. This marks a movement towards the notion of "neurorights" which aim to address the human rights challenges neurotechnologies may present³⁷⁴.

There are obvious connections between the right to cognitive liberty and other human rights and fundamental freedoms. It would be difficult to imagine how the right to human dignity, or freedom of thought, speech or religion, for instance, would not be affected if one's cognitive liberty is restricted due to the application of neurotechnologies. In fact, the freedom of thought is at the heart of other fundamental freedoms,³⁷⁵ and the right to cognitive liberty may be regarded as a necessary upgrade from the freedom of thought because it takes into account the technological ability to monitor and manipulate cognitive function, which previously was not held possible before the advancement of neurotechnologies.

However, pushback from some scholars argues that neurorights do not necessarily address the issue of evolving technological advancements which effect law, as they may overly emphasise the neuroscientific application.³⁷⁶ The result of this may be that such a law would not be sufficient to address growing concern among other areas.

Nonetheless, the concept of cognitive liberty may be a useful tool in addressing the growing concern of the use of neurotechnologies in law and above the scope of law. Adopting such concepts in international jurisprudence may set a path by which individual States may interpret and form the law within their jurisdiction.

The right to mental privacy The application of neurotechnologies in certain scenarios, such as the use of brain-reading technologies in the criminal justice system, has given rise to the scholarly debate around the need to recognise the right to mental privacy.³⁷⁷ This right has been defined as "the right

 ³⁷¹ For instance, see discussion on bodily integrity in Neurotechnologies in Ireland, including Bestgen B. (2020) *Neurolaw – mental integrity and psychological continuity* / Irish Legal News [Online]. Available at <u>https://www.irishleqal.com/articles/benjamin-bestgen-neurolaw-mental-integrity-and-psychological-continuity</u>.
 ³⁷² Yuste, et al., supra note 145; Zúñiga-Fajuri A., et al. (2021) 'Neurorights in Chile: Between neuroscience and legal science' in Hevia M. (ed), *Developments in Neuroethics and Bioethics*, Academic Press, 4, 165-179. Available at <u>https://doi.org/10.1016/bs.dnb.2021.06.001</u>; Bublitz J. (2022) 'Novel Neurorights: From Nonsense to Substance' *Neuroethics*, 15 (7) [Online]. Available at <u>https://doi.org/10.1007/s12152-022-09481-3</u> (accessed 2 June 2022).
 ³⁷³ Guzmán L. (2022) *Chile: Pioneering the protection of neurorights/Unesco* [Online]. Available at: <u>https://www.unesco.org/en/articles/chile-pioneering-protection-neurorights</u>.

³⁷⁴ Yuste, et al., supra note 145, p. 157.

³⁷⁵ Ienca M. (2021) 'On Neurorights', Frontiers in Human Neuroscience, 15 (701258) [online]. Available at: https://doi.org/10.3389/fnhum.2021.701258, p. 7; Ienca and Andorno, supra note 127, p.10; Sententia W. (2004) 'Neuroethical considerations: cognitive liberty and converging technologies for improving human cognition' Ann N Y Acad Sci, 1013 (1). Available at https://doi.org/10.1196/annals.1305.014.

³⁷⁶ Bublitz, supra note 372, p 7.

³⁷⁷ Ligthart, et al., supra note 148.



against unconsented intrusion into brain data and the collection of that data."³⁷⁸ Unsurprisingly, the right to mental privacy is closely related to the general right to privacy. One might expect that privacy of the mind would be covered by one's "reasonable expectation of privacy" and protected by the right to privacy.³⁷⁹ Yet, the right to mental privacy seeks to offer more enhanced protection to brain data specifically. Ienca and Andorno (2017) argue that the right to privacy by itself cannot offer the kind of protection that would be desired for brain data. Brain data would be exposed to the same level of exposure and intrusiveness of other personal information protected by the right to privacy.³⁸⁰ The highly sensitive nature of brain data, and their intrinsic connection with the individual's "inner life and personhood" – the data source – give rise to the need for a specific right to mental privacy to provide additional safeguards.³⁸¹

Related to mental privacy is the concept of neuroprivacy. Mental privacy relates to the protection of mental information regardless of how this information is collected, whilst neuroprivacy relates specifically to the protection of neural data.³⁸² This distinction may become important, for example, when a criminal court is tasked with considering the admissibility of mental information as biological evidence and the protection of the principle against self-incrimination. In that context, questions like whether data gathered through neurotechnologies can be regarded as physical evidence which can be compelled in a similar vein to other biological evidence such as DNA or blood samples will need to be considered. Or does this data so closely relate to 'testimony' and the 'will' of the individual so that its use in court could constitute a violation of the individual's privilege against self-incrimination.³⁸³ While this leads into a philosophical debate beyond the scope of this analysis around the distinction between neural processes and a person's 'will', it is an important discussion when determining the suitability of existing right to privacy to protect mental information and neural data, or whether there is a need to recognise a novel right to mental privacy.

The scholarly debate around mental privacy has focused around two approaches. Some scholars, following the first approach, call for the recognition of a new right to mental privacy as part of the European human rights framework.³⁸⁴ This approach has also been suggested in the US legal context,³⁸⁵ as well as in the context of the Chile mentioned above with respect to the proposed

³⁸⁵ Ligthart, supra note 384, p. 4; Farahany N. A. (2012) 'Incriminating Thoughts', Stanford Law Review 64 (351), 351-408, p. 406.



³⁷⁸ Ienca, supra note 375, p. 7; Shen F. X. (2013) 'Neuroscience, mental privacy, and the law' *Harvard Journal of Law and Public Policy*, 36, 653-713; Ienca and Andorno 2017, 'A New Category of Human Rights: Neurorights' (*BMC Research in Progress Blog, 26 April 2017*) [online]. Available at: <u>https://blogs.biomedcentral.com/bmcblog/2017/04/26/new-category-human-rights-neurorights/</u>; Ienca and Andorno, supra note 127; Yuste, et al., supra note 145.

³⁷⁹ lenca and Andorno, supra note 127, p. 13; Shen, supra note 378; *Katz v. United States* (1967) 389 U.S. 347.

³⁸⁰ Ienca and Andorno, supra note 127, p. 12.

³⁸¹ Ibid, p. 14.

³⁸² Ienca, supra note 375, p. 7; Hallinan D., et al. (2014) 'Neurodata and neuroprivacy: data protection outdated?' Surveillance & Society, 12, [Online]. Available at: <u>https://doi.org/10.24908/ss.v12i1.4500</u>; Ienca, supra note 235; Wolpe P. R. (2017) 'Neuroprivacy and Cognitive Liberty' in Johnson L. S. M. and Rommelfanger K. S. (eds) *The Routledge Handbook of Neuroethics* (New York: Routledge, Taylor & Francis Group), 214-224 [Online]. Available at: <u>https://doi.org/10.4324/9781315708652</u>.

³⁸³ Ienca and Andorno, supra note 127, p. 17; *Saunders v. United Kingdom*, ECtHR 1996-VI, para 69; US Supreme Court, *Miranda v. Arizona*, 384 U.S. 436 (1966).

³⁸⁴ Ligthart S. (2020) 'Freedom of Thought in Europe: do advances in 'brain-reading' technology call for revision? *Journal of Law and the Biosciences*, 7 (1). Availabe at doi:10.1093/jlb/lsaa048, p. 3-4; Ienca and Andorno, supra note 127, p. 11-17. See also, Lavazza A. (2018) 'Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis, *Frontiers in Neuroscience*, 12 [online]. Available at DOI=10.3389/fnins.2018.00082 (accessed 1 June 2022), p. 1, 4.

amendment to the constitution to include neurorights.³⁸⁶ The main argument for the adoption of a new right to mental privacy, is that the specific nature of brain data, deserves a higher degree of protection than other data covered by the general right to privacy.³⁸⁷ Furthermore, brain data may be inseparable from the data source,³⁸⁸ meaning that justified access to brain data alone would arguably also lay the source bare. The right to privacy has traditionally sought to protect 'external data' and therefore would fall short in an attempt to protect 'internal data' related to an individual's mental state and neural information.

The second approach, and this reasoning arguably applies to all considerations for existing human rights law and the need for novel neurorights, suggests that the general right to privacy can and should be interpreted to include the protection of the brain data and neural activity. To some extent, this approach may require a clarification of the right to privacy, a broadening of scope, or specification of the inclusion of brain data. In the context of criminal justice, Ligthart argues that the information gathered through brain-reading techniques, for instance, is not necessarily more sensitive than other personal information obtained through other (non-consensual) methods.³⁸⁹ Yet, a court of law may find that such use of brain-reading techniques would trigger stronger legal protection under other existing human rights, such as the freedom of thought.³⁹⁰ This would suggest that the existing human rights law framework is at least capable of providing adequate safeguards in the context of neurotechnologies.

Right to mental integrity The right to mental integrity refers to the idea that individuals should be protected from illicit and harmful manipulations of their mental activity.³⁹¹ Whilst the right to physical and mental integrity is protected under EU human rights law,³⁹² it is generally understood to relate to mental health.³⁹³ Ienca and Andorno argue, that the right to mental integrity should be reconceptualised to protect against mental harm, such as could occur from the unauthorised manipulation of neural activity resulting in harm.³⁹⁴ Neurostimulators and memory engineering methods are other examples of neurotechnologies which, despite their therapeutic benefit potential, may result in mental harm if applied in an illicit manner or for malevolent purposes.³⁹⁵

There is an ongoing debate as to the definition of the right to mental integrity. Whilst Ienca and Andorno define the right as the right to protection from mental harm through the use of neurotechnologies, Lavazza defines mental integrity as "the individual's mastery of his mental states and brain data".³⁹⁶ These mental states and brain data cannot be accessed or altered without the individual's consent.³⁹⁷ This interpretation of mental privacy could be regarded as synonymous to cognitive liberty, meaning the right to mental integrity could be regarded as a substitute of the right

³⁸⁶ Guzmán, supra note 373; Ligthart, supra note 384, p. 4; Muñoz J. M. (2019) 'Chile-Right to Free will Needs Definition', 574 Nature 634, [Online]. Available at: <u>https://doi.org/10.1038/d41586-019-03295-9</u>. See also Yuste, et al., supra note 145.

³⁹¹ Ienca and Andorno, supra note 127, p. 18.

- ³⁹³ Ienca and Andorno, supra note 127, p. 18.
- ³⁹⁴ Ibid.

³⁹⁷ Ibid.



³⁸⁷ Ienca and Andorno, supra note 127, p. 14.

³⁸⁸ Ibid, p 15.

³⁸⁹ Ligthart, et al., supra note 148, p. 200.

³⁹⁰ Ibid; ECHR, Article 9.

³⁹² CFREU, Article 3.

³⁹⁵ Ibid, p. 19.

³⁹⁶ Lavazza, supra note 384, p. 4; lenca, supra note 375, p. 8.

to cognitive liberty.³⁹⁸ Ienca and Andorno, however, draw an important distinction with the right to cognitive liberty, by stating that the right to mental integrity relates to the protection from harm related to an individual's mental domain.³⁹⁹

Arguably, violations of the right to mental integrity could have occurred before the advancement of the neurotechnologies seen today. Harsh interrogations, polygraph-based lie detection methods, and even psychological torture and manipulation may in some scenarios have constituted violations of these concepts of neurorights. The use of psychoactive drugs and hypnosis that cause harm to one's mental state may be regarded as threats to one's mental integrity. Yet, lenca and Andorno argue that advanced "the degree of perturbation of advanced neurotechnology on the current ethical-legal framework is quantitatively higher than non-computational techniques",⁴⁰⁰ calling for the recognition of the right to mental integrity as a basic human right.⁴⁰¹ Furthermore, Douglas and Forsberg argue that the right to bodily integrity necessitates the need to recognise a right to mental integrity, for justificatory consistency.⁴⁰²

Right to psychological continuity Psychological continuity is a key element of personal identity, and has been defined as "experiencing oneself as persisting through time as the same person."⁴⁰³ The right to psychological continuity seeks to preserve personal identity and protect against unconsented external interference.⁴⁰⁴ The right to identity is already recognised in the UDHR,⁴⁰⁵ and as part of the right to private life by the ECtHR.⁴⁰⁶ Ienca and Andorno distinguish personal identity from privacy by stating that the right to psychological continuity aims to protect against third party alterations of brain functioning, whereas the right to privacy is limited to protecting against unrestricted access to brain data.⁴⁰⁷

Neurotechnologies such as memory engineering techniques may impact a person's identity if certain memories related to their experience of themself as a particular individual are changed or otherwise affected.⁴⁰⁸ Furthermore, neuromarketing techniques, such as unconscious neural advertising where an individual does not consciously register an intervention, may affect one's psychological continuity and therefore impact on their personal identity.⁴⁰⁹

Ienca and Andorno argue that psychological continuity may be impacted by neurotechnologies separately from mental privacy and integrity.⁴¹⁰ The right to psychological continuity may be violated if an application of neurotechnologies results in the unconsented alteration of one's mental state despite not causing any harm.⁴¹¹ The absence of harm is an important as this scenario would otherwise

³⁹⁸ Ibid.

401 Ibid.

⁴⁰⁴ Ienca and Andorno, supra note 127, p. 21.

⁴¹¹ Ibid, p. 21.



³⁹⁹ Ienca, supra note 375, p. 8; Ienca and Andorno, supra note 127, p. 17-20.

⁴⁰⁰ Ienca and Andorno, supra note 127, p. 10.

 ⁴⁰² Douglas T., Forsberg L. (2021) 'Three Rationales for a Legal Right to Mental Integrity' in Ligthart S., et al. (eds.) *Neurolaw*, Palgrave MacMillan Cham. [Online]. Available at: <u>https://doi.org/10.1007/978-3-030-69277-3</u> 8, p. 190.
 ⁴⁰³ Ienca and Andorno, supra note 127, p. 20; Klaming L. and Haselager P. (2013) 'Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence, *Neuroethics*, 6 [online]. Available at <u>https://doi.org/10.1007/s12152-010-9093-1</u>.

⁴⁰⁵ UDHR, Articles 22 and 29.

⁴⁰⁶ ECHR, Article 8 ECHR; *Goodwin v United Kingdom*, supra note 134, at para. 90; Ienca and Andorno, supra note 127, p. 21.

⁴⁰⁷ Ienca and Andorno, supra note 127, p. 21-22.

⁴⁰⁸ Ibid, p. 20.

⁴⁰⁹ Ibid, p. 22.

⁴¹⁰ Ibid, p. 21.

trigger the right to mental integrity. An example in which the right to psychological continuity could be threatened is the use of unconscious neural advertising in neuromarketing.⁴¹² The ability of marketing companies to influence people's preferences through invasive yet undetectable advertising techniques calls for the protection of psychological continuity in order to adequately protect the right to identity. Yet, there is currently no consensus as to the exact meaning of the right to identity or psychological continuity in the context of neurorights. Yuste et al., for one, argue that the individual identify relates to one's physical and mental integrity,⁴¹³ whereas lenca and Andorno make a clear distinction between mental integrity and psychological continuity.⁴¹⁴ The right to psychological continuity and the right to personal identity seek to promote freedom of the mind and protect against external manipulation.⁴¹⁵ The right to cognitive liberty and freedom of thought arguably seek to do the same thing, meaning that these neurorights may constitute one and the same family of neurorights, sitting next to the right to mental privacy and the right to mental integrity.⁴¹⁶

4.2 Privacy and Data Protection

Neurotechnologies offer the opportunity to gain unique insights into the workings of the human brain. Whilst initially intended for clinical and research purposes, increased commercialisation had led to various market-led efforts to develop consumer-grade neurotechnologies, from Neuralink seeking to produce "a scalable high-bandwidth brain-machine interface system",⁴¹⁷ to Facebook only recently discontinuing its development of a brain computer interface (BCI) that could be combined with virtual reality (VR).⁴¹⁸ Such consumer-based neurotechnologies are, moreover, being used in conjunction with big data and advanced machine learning techniques for the purposes of, inter alia, developing "more effective assistive neurotechnologies",⁴¹⁹ and the prediction and analysis of neural recording data.⁴²⁰ The convergence of these "technological macrotrends" may, however, also lead to the collection and storage of personal brain data on a vast scale, thereby potentially exacerbating the risk of interference with the rights to privacy and data protection of users.⁴²¹ Against this background, this section analyses the key issue of the status of brain data obtained through the use of neurotechnologies, specifically assessing whether, and if so how, such data is protected under the relevant international and EU law.

⁴¹² Ibid, p. 22.

⁴¹³ Ienca, supra note 375, p. 8; Yuste, et al., supra note 145, p. 162.

- ⁴¹⁴ Ienca and Andorno, supra note 127, p. 22.
- ⁴¹⁵ lenca, supra note 375, p. 9.

⁴¹⁹ Ienca M. and Ignatiadis K. (2020) 'Artificial Intelligence in Clinical Neuroscience: Methodological and Ethical Challenges', *AJOB Neuroscience*. DOI: <u>https://doi.org/10.1080/21507740.2020.1740352</u>.

⁴²⁰ Rainey S. and Erden Y.J. (2020) 'Correcting the Brain? The Convergence of Neuroscience, Neurotechnology, Psychiatry, and Artificial Intelligence', *Science and Engineering Ethics*, 26, pp. 2439-2454. DOI: <u>https://doi.org/10.1007/s11948-020-00240-2</u>.

⁴²¹ Kellmeyer P. (2021) 'Big Brain Data: On the Responsible Use of Brain Data from Clinic and Consumer-Directed Neurotechnological Devices', *Neuroethics*, 14, pp. 83-98. DOI: <u>https://doi.org/10.1007/s12152-018-9371-x</u>.



⁴¹⁶ Ibid, p. 9.

⁴¹⁷ Musk E and Neuralink. (2019) 'An Integrated Brain-Machine Interface Platform With Thousands of Channels', *Journal of Medical Internet Research*, 21 (10). DOI: <u>https://doi.org/10.2196/16194</u>.

⁴¹⁸ Regaldo A. (2021) Facebook is ditching plans to make an interface that reads the brain / MIT Technology Review [Online]. Available at: <u>https://www.technologyreview.com/2021/07/14/1028447/facebook-brain-reading-interface-stops-funding/</u>. ⁴¹⁹ Jenca M. and Japatiadis K. (2020) 'Artificial Intelligence in Clinical Neuroscience: Mathedalaciastics of Ethics'.

4.2.1 International and EU law and policies

International law and policy

The right to privacy is applicable to everyone under international law.⁴²² Whilst legal doctrine recognising the right does not expressly refer to neurotechnologies, in its non-binding recommendations relating to responsible innovation in neurotechnology, the OECD has identified the right to privacy as a relevant consideration in relation to the promotion of "responsible innovation in neurotechnology to address health challenges",⁴²³ the safeguarding of "personal brain data and other information gained through neurotechnology",⁴²⁴ and the anticipation and monitoring of "the potential unintended use and/or misuse of neurotechnology."

The right to privacy is, moreover, recognised in regional organisations, including the Council of Europe. The European Convention on Human Rights (ECHR), for instance, provides that "Everyone has the right to respect for his private and family life and his correspondence."⁴²⁶ Alongside this, the Council of Europe's *Strategic Action Plan on Human Rights and Technologies in Biomedicine* (2020-2025) explains how the organisation will address emerging challenges posed by new technologies, including neurotechnologies, and highlights privacy and data protection as relevant considerations in relation to, inter alia, the governance of emerging technologies is the *Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine* (Oviedo Convention), according to which "Everyone has the right to respect for private life in relation to information about his or her health."⁴²⁸ The Oviedo Convention additionally provides that "Everyone is entitled to know any information collected about his or her health."⁴²⁹

In contrast to the right to privacy, the right to data protection is not expressly protected under international law. The United Nations Human Rights Committee has nonetheless indicated that the protection of personal data is an integral aspect of the right to privacy, as evidenced by the explanation that "[i]n order to have the most effective protection of his private life, every individual should have the right to ascertain in an intelligible form, whether, and if so, what personal data is stored in automatic data files, and for what purposes."⁴³⁰

EU law and policy

The are several EU laws applicable to privacy and data protection in neurotechnologies, including the Charter of Fundamental Rights of the European Union (CFREU) and the General Data Protection Regulation (GDPR), alongside legislative proposals such as the Artificial Intelligence Act, the Data

⁴³⁰ CCPR General Comment No.16: Article 17 (Right to Privacy) The Right to Respect of Privacy, Family, Home and Correspondence, and Protection of Honour and Reputation (8th April 1988), para.10.



⁴²² UDHR, Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14; CRPD, Article 22.

⁴²³ OECD (2019). *Recommendation of the Council on Responsible Innovation in Neurotechnology*, OECD/LEGAL/0457, principle 1(d).

⁴²⁴ Ibid, principle 7(f).

⁴²⁵ Ibid, principle 9(b).

⁴²⁶ ECHR, Article 8.

⁴²⁷ Council of Europe. (2019) 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)'. Available at: <u>https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2</u>.

⁴²⁸ Oviedo Convention, supra note 103, Article 10(1).

⁴²⁹ Ibid, Article 10(2).

Governance Act and the Data Act. For a detailed discussion of the EU laws and draft legislation on privacy and data protection with application to neurotechnologies, see Section 3 above.

4.2.2 Privacy

The right to privacy is a core right within the international human rights law framework, pursuant to which it is conditionally guaranteed that no one shall be subjected to arbitrary interference with their "privacy, family, home, or correspondence nor to unlawful attacks on his or her reputation" and, moreover, that everyone shall be protected by law against such interference or attack.⁴³¹ As indicated, the right to privacy is not absolute and may be restricted in certain specified circumstances, the threshold for which is tightly constrained. According to the ECHR, for instance, interferences with the right to privacy must be in accordance with the law and be "necessary in a democratic society in the interests of national security, public safety or the economic wellbeing of the country, for the prevention of crime or disorder, for the protection of health or morals, or for the protection of the rights and freedoms of others."⁴³² Similarly, though slightly revised to account for technological developments,⁴³³ the CFREU provides that "[e]veryone has the right to respect for his or her private and family life, home, and communications."⁴³⁴ The explanatory notes to the Charter make clear that the meaning and scope of the right under Article 7 CFREU is, in accordance with Article 52(3), the same as the corresponding article of the ECHR,⁴³⁵ namely Article 8, pursuant to which it is instructive to consider the interpretation of this provision by the European Court of Human Rights (ECtHR). The Grand Chamber of the ECtHR has interpreted the meaning of "private life" within Article 8 ECHR as "a broad concept" encompassing, inter alia, the physical and psychological aspects of the personal autonomy, integrity, identity, and development of individuals.⁴³⁶

In the light of this interpretation of the right to privacy, a central question is whether brain data obtained through the use of neurotechnologies would be protected against intrusion, or whether a new "right to mental privacy" is required to offer protection against more specific interferences,⁴³⁷ such as instances of so-called "brain-hacking".⁴³⁸ On this, some scholars have cited the link to notions of personhood to highlight "the special nature of brain data", suggesting that "[t]he particularity of brain data is that the information to be protected is not easily distinguishable from the source itself that produced the data: the individual's neural processing."⁴³⁹ Whilst this forms the basis of an argument in favour of a novel right to mental privacy, this potentially overlooks the possibility that brain data may be protected within the existing human rights law framework on the right to privacy. The European Court of Human Rights (ECtHR), for instance, has interpreted the right to privacy under Article 8 of the ECHR as including dactyloscopic (fingerprint) data, DNA profiles and cellular samples, amongst other "means of personal identification", on the basis that "[i]nformation about [a] person's health is an important element of private life."⁴⁴⁰ Since neurotechnologies, including neuroimaging,

⁴⁴⁰ European Court of Human Rights. (2008) *S. and Marper v. The United Kingdom*, 4 December 2008, Nos.30562/04 and 30566/04, CE:ECHR:2008:1204JUD003056204, para. 66.



⁴³¹ UDHR, Article 12; ICCPR, Article 17; CRC, Article 16; CPRMW, Article 14; CRPD, Article 22.

⁴³² ECHR, Article 8(2).

⁴³³ Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).

⁴³⁴ CFREU, Article 7.

⁴³⁵ Explanations Relating to the Charter of Fundamental Rights (2007/C 303/02).

⁴³⁶ European Court of Human Rights. (2010) A, B and C v Ireland, 16 December 2010, No.25579/05,

CE:ECHR:2010:1216JUD002557905, para. 212.

⁴³⁷ See, e.g., lenca and Andorno, supra note 127; Paz, supra note 163.

⁴³⁸ lenca, supra note 235.

⁴³⁹ Ienca and Andorno, supra note 127.

neurostimulation and brain computer interfaces (BCIs), engage directly with the brain, obtaining information directly applicable to the physical and mental health of natural persons,⁴⁴¹ this may mean that brain data is, in principle, within the purview of the right to privacy, pursuant to Article 8 ECHR, alongside Article 7 CFREU, in accordance with Article 52(3) CFREU.

This notwithstanding, some scholars have questioned the suitability of the existing human rights law framework to provide adequate protection against the specific threats posed by intrusive applications of neurotechnologies, such as "brain-hacking",⁴⁴² accordingly advocating the adoption of various socalled "neurorights", included within which is a right to so-called mental privacy.⁴⁴³ The putative right to mental privacy expresses "the idea that we should have control over access to our neural data and to the information about our mental processes and states that can be obtained by analysing it", ⁴⁴⁴ and therefore, more substantively, refers to "people's right against the uncontested intrusion by third parties into their brain data as well as against the unauthorized collection of those data."445 For a more detailed discussion of the possibility that a new set of human rights is required to protect against possible interferences by neurotechnologies, including whether a specific right to mental privacy would provide additional safeguards, see Section 4.1.13.

4.2.3 Classification of data

The right of everyone to the protection of personal data concerning him or her is guaranteed under Article 8 CFREU.⁴⁴⁶ The right entails that everyone shall have "the right of access to data which has been collected concerning him or her, and the right to have it rectified", and moreover, that "data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law."⁴⁴⁷ Further strengthening the right to data protection under EU law, as well as the right to privacy, the GDPR is applicable "to the processing of personal data wholly or partly by automated means".⁴⁴⁸ Expanding on the first of these two elements, data "processing" is defined as "any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means".⁴⁴⁹ The definition of personal data is similarly wide-ranging, specifically "any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural, or social identity of that natural person".450

As the CJEU has observed, the use of the phrase "any information" reflects the aim of the EU legislature to assign a broad scope of meaning to the concept of personal data, "which is not restricted to information that is sensitive or private, but potentially encompasses all kinds of information, not only objective, but also subjective, in the form of opinions and assessments, provided

⁴⁴³ See, *e.g.*, lenca and Andorno, supra note 127.

⁴⁵⁰ Ibid Article 4 (1),



⁴⁴¹ lenca, supra note 193.

⁴⁴² See, *e.g.*, Ienca M., Haselager P., and Emanuel E.J. (2018) 'Brain leaks and consumer neurotechnology', *Nature* Biotechnology, 36 (9), pp. 805-811. DOI: https://doi.org/10.1038/nbt.4240.

⁴⁴⁴ Paz, supra note 163.

⁴⁴⁵ Ienca M. (2017) *Preserving the Right to Cognitive Liberty* / Scientific American [Online]. Available at: https://www.scientificamerican.com/article/preserving-the-right-to-cognitive-liberty/.

¹⁶ CFREU, Article 8(1). ⁴⁴⁷ Ibid, Article 8(2).

⁴⁴⁸ Regulation (EU) 2016/679 (General Data Protection Regulation) COM/2012/010 final (EU GDPR), Article 2(1).

⁴⁴⁹ Ibid, Article 4(2).

that it 'relates' to the data subject."⁴⁵¹ The condition of information relating to a data subject is "satisfied where the information, by reason of its content, purpose or effect, is linked to a particular person."⁴⁵² Pursuant to this criterion of linking to a particular person, the CJEU has interpreted both dynamic IP addresses,⁴⁵³ specifically when combined with additional information "likely reasonably to be used to identify the data subject",⁴⁵⁴ and written examination answers to constitute personal data.⁴⁵⁵ This highlights the overall expansiveness of the categories of "personal data" included within the remit of the GDPR.

That the type of data processed by neurotechnologies may primarily be "personal" in nature is largely uncontested, not least because the core functionality of neurotechnologies typically requires responsiveness to the specific brain data of users,⁴⁵⁶ thereby effectively rendering useless "anonymous data", understood as "information which does not relate to an identified or an identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable."⁴⁵⁷ The clinical application of BCIs, for instance, particularly those which use sensorimotor rhythms (SMRs), involves an iterative process whereby the user encodes intent in brain signals and the BCI recognises these signals and translates them into output commands, one effect of which may be to establish an inextricable link between the brain data and the data subject that cannot be anonymised.⁴⁵⁸ The more pertinent issue, therefore, is whether for the purposes of the GDPR brain data processed in neurotechnologies constitutes personal data or special category sensitive data, the distinction between which determines the applicable rules of processing.

On this, whereas the processing of general category personal data is in principle permitted provided the conditions for lawfulness of processing are complied with,⁴⁵⁹ the processing of data classified as special category or sensitive data is in principle prohibited, unless, alongside the aforementioned conditions for lawful processing, one of the exhaustively listed exceptions to the rule is applicable,⁴⁶⁰, for instance "the data subject has given explicit consent"⁴⁶¹ or "processing is necessary for reasons of substantial public interest".⁴⁶² The types of data classified as special category and therefore subject to the more restricted conditions for processing are listed as "personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation".⁴⁶³ There are various applications of neurotechnologies that may involve the processing of personal data properly classified as special category sensitive data according to the GDPR, from using electroencephalogram neurotechnologies (EEG) to make predictions about an individual's identity,

- ⁴⁵⁵ Case of *Peter Nowak v. Data Protection Commissioner*, supra note 451, para.62.
- ⁴⁵⁶ Rainey S et al., (2020) 'Is the European Data Protection Regulation sufficient to deal with emerging data concerns relating to neurotechnology?', *Journal of Law and the Biosciences*, 7 (1). DOI: <u>https://doi.org/10.1093/jlb/lsaa051</u>.
 ⁴⁵⁷ EU GDPR, Recital 26.
- ⁴⁵⁸ See generally, Macfarland D.J. and Wolpaw J.R. (2018) 'Brain-computer interface use is a skill that user and system acquire together', *PLOS Biology*, 16 (7). DOI: <u>https://doi.org/10.1371/journal.pbio.2006719</u>.
- ⁴⁵⁹ EU GDPR, Article 6.
- ⁴⁶⁰ Ibid, Article 9(2)(a)-(j).
- ⁴⁶¹ Ibid, Article 9(2)(a).
- ⁴⁶² Ibid, Article 9(2)(g).
- ⁴⁶³ Ibid, Article 9(1).



 ⁴⁵¹ Judgement of 20 December 2017, *Peter Nowak v. Data Protection Commissioner* C-434/16 EU:C: 2016:779, para.34.
 ⁴⁵² Ibid, para.35.

 ⁴⁵³ Judgement of 19 October 2016, *Patrick Breyer v. Bundesrepublik Deutschland* C-582/14 EU:C: 2017:994, para.49.
 ⁴⁵⁴ Ibid, para.45.

including age⁴⁶⁴ and sexuality,⁴⁶⁵ to the emerging trend towards EEG-based biometric recognition.⁴⁶⁶ Yet, perhaps most likely to process data considered special category sensitive data for the purposes of the GDPR are the various clinical applications of neurotechnologies, from speech BCI technologies used to treat verbal communication impairments,⁴⁶⁷ to neurostimulation and neuromodulation techniques, such as deep brain stimulation (DBS), used to treat neurological disorders such as Alzheimer's,⁴⁶⁸ movement disorders such as Parkinson's disease,⁴⁶⁹ and neuropsychiatric disorders such as schizophrenia.⁴⁷⁰

However, a central theme in the scholarly debate is the suggestion that the current definition of special category sensitive data provides insufficient protection for users of neurotechnologies. On this, some scholars have argued that the definition of special category sensitive data "in terms of a recording purpose appears to be inadequate for brain recordings, especially in a consumer context", citing the possibility that the processing of brain data in consumer devices may not be required to comply with the more stringent conditions for data processing under the GDPR on the basis that the initial purpose of the application is non-health related.⁴⁷¹ Others, meanwhile, have suggested that the lack of protection in the GDPR "stems from the fact that the list of sensitive data categories in the GDPR (health, biometric, genetic, political opinions, sexual orientations, etc.) is not comprehensive enough to include, e.g., 'emotions' or other 'thoughts' not related to health status, sexuality or political/religious beliefs."⁴⁷² Overall, this indicates that the GDPR may require adapting to more comprehensively protect the rights to privacy and data protection of users of neurotechnologies.

4.2.4 Potential developments and future trends

This section has explored the relationship between privacy and data protection in relation to neurotechnologies, situating this analysis in the context of the relevant international and EU laws and draft legislation. Whilst it has been suggested that the call from some scholars for a novel "right to mental privacy" may overlook the protection supplied by the existing international and EU law framework, further guidance may be required to clarify the status of brain data, specifically whether such data is analogous to other forms of health-related data and therefore included within the right to privacy under the ECHR and CFREU, and moreover, whether such data should be characterised as special category sensitive data for the purposes of the GDPR, even if processed in consumer-grade devices, the primary application of which is non-clinical.

⁴⁷² Ienca M. and Malgieri G. (2022) 'Mental data protection and the GDPR', *Journal of Law and the Biosciences*, 9 (1), pp.1-19 [Online]. Available at: <u>https://doi.org/10.1093/jlb/lsac006</u>.



 ⁴⁶⁴ Carrier J. et al. (2001) 'The effects of age and gender on sleep EEG power spectral density in the middle years of life (ages 20-60 years old), *Psychophysiology*, 38 (2), pp. 232-242. DOI: <u>https://doi.org/10.1111/1469-8986.3820232</u>.
 ⁴⁶⁵ Alexander J.E. and Sufka K.J. (1993) 'Cerebral lateralization in homosexual males: a preliminary EEG investigation', *International Journal of Psychophysiology*, 15 (3), pp. 269-274. DOI: <u>https://doi.org/10.1016/0167-8760(93)90011-D</u>.
 ⁴⁶⁶ Campisi P. La Rocca D. and Scarano G. (2012) 'EEG for automatic person recognition', *Computer*, 45 (7). DOI: <u>https://doi.org/10.1109/MC.2012.233</u>.

⁴⁶⁷ See, *e.g.*, Bocquelet F. et al. (2016) 'Key considerations in designing a speech brain-computer interface', *Journal of Physiology-Paris*, 110 (4), pp. 392-401. DOI: <u>https://doi.org/10.1016/j.jphysparis.2017.07.002</u>.

⁴⁶⁸ See, *e.g.*, Ning, et al. supra note 352.

⁴⁶⁹ See, *e.g.*, Spagna, et al., supra note 353.

⁴⁷⁰ See, *e.g.*, Sui Y. et al. (2021) 'Deep Brain Stimulation Initiative: Toward Innovative Technology, New Disease Indications, and Approaches to Current and Future Clinical Challenges in Neuromodulation Therapy', *Frontiers in Neurology*, 11. DOI: <u>https://doi.org/10.3389/fneur.2020.597451</u>.

⁴⁷¹ Rainey S et al., supra note 456.

5. Conclusions and future outlook

As outlined in Section 4, neurotechnologies present multiple and complex legal issues and challenges with wide-ranging socio-economic and human rights implications. A survey of the legal landscape, specifically the applicable international and EU law, has shown that there is no dedicated legislation with direct application to neurotechnologies. Such technologies are nonetheless subject to various domain-specific legal frameworks, including human rights law (see Section 4.1) and privacy and data protection law (see Section 4.2), and further regulatory measures with potential application to neurotechnologies are expected, particularly under EU law.

In the absence of more targeted regulatory measures, human rights-based frameworks are designed to be adaptable to the issues raised by new and emerging technologies in order to better protect the rights of individuals against interference. The "living instrument" doctrine applicable to the ECHR and the CFREU,⁴⁷³ for instance, ensures that the relevant human rights law can be updated to address new challenges, whether it be through expanded interpretations of existing rights or through the introduction of new rights. The introduction of so-called "neurorights" to supplement the existing international and EU human rights frameworks would impact States' obligations vis-à-vis neurotechnologies, potentially requiring that States strengthen the protection of individuals against intrusions by neurotechnologies into, inter alia, notions of mental privacy, cognitive liberty, mental integrity and psychological continuity (see Section 4.1.13). The necessity of such additional rights may depend on the effectiveness of existing human rights law to respond to the specific challenges posed by neurotechnologies, which include, inter alia, neurodiscrimination, instances of so-called "brainhacking" and the status of brain data for the purposes of privacy and data protection. The latter is a key challenge in relation to neurotechnologies, with ambiguity surrounding the applicable regulatory basis for the processing of brain data and the comprehensiveness of such regulation, particularly in the light of the emergence of consumer-based neurotechnologies, in addition to the ongoing debate regarding whether brain data is adequately protected by the existing right to privacy or whether a novel right to mental privacy would better protect against potential interferences (see Section 4.1.13). In practice, these unresolved issues may lead to a gap in the protection of the human rights of users.

Overall, this analysis of international and EU law and policy in relation to neurotechnologies has highlighted how the relevant legal and policy developments have focused on *how* such technologies should be regulated, not *whether* such technologies should be permitted. However, without clear initiative to regulate at the international or EU level, it is possible that further governance of this technology family will occur at the national level, the possibility for which will be analysed in a forthcoming TechEthos report on legal frameworks at the national level (Deliverable 4.2).

⁴⁷³ See, e.g., European Court of Human Rights. (1978) *Tyrer v. The United Kingdom*, 25 April 1978, No.5856/72, CE:ECHR:1978:0425JUD000585672, para.31: "The Court must also recall that the Convention is a living instrument which, as the Commission rightly stressed, must be interpreted in the light of present-day conditions."



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