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WORKING PAPER

GUIDING PRINCIPLES FOR STATES ON HUMAN RIGHTS AND THE RESPONSIBLE USE OF NEUROTECHNOLOGY

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INTRODUCTION

PURPOSE OF THESE GUIDELINES

1. Ongoing developments in neurotechnology present opportunities in a variety of societal domains. These technologies can innovate and improve medical research, diagnostics, treatment and care in relation to different types of diseases and conditions, including epilepsy, Parkinson's disease, depression, and locked-in syndrome. The clinical use of neurotechnologies will plausibly increase in the coming years, and some of these technologies have been, or may in the future be, used outside the medical context, such as in education, criminal justice, the workplace, the military, and direct-to-consumer applications, for example, for gaming or meditation. Economic projections indicate sustained growth in the neurotechnology market over the coming years.[1] Private companies are playing a growing role in this field, increasingly engaging in the development of technologies such as brain–computer interfaces and portable electroencephalography for diverse markets and applications.

2. Some neurotechnological applications raise challenges for the protection and promotion of different human rights. These challenges predominantly stem from neurotechnology's ability to monitor and modulate brain activity, which can enable others to draw inferences about a person's mental phenomena or to modify mental phenomena and, ultimately, behaviour (A/HRC/57/61).[2] This could also affect people's mental and physical health.

3. In October 2022, the United Nations Human Rights Council (HRC) adopted a resolution on neurotechnology and human rights, recognizing that some neurotechnological applications may pose a number of ethical, legal and societal questions that need to be addressed, including in human rights terms (A/HRC/RES/51/3). The HRC requested the Advisory Committee to prepare a study on the impact, opportunities and challenges of neurotechnology with regard to the protection and promotion of all human rights. This study, published in August 2024, highlights opportunities and challenges to different rights and freedoms, including those concerning privacy, personal integrity, freedom of thought, fair trial, the highest attainable standard of physical and mental health, and the prohibition of torture, cruel, inhuman or degrading treatment or punishment (A/HRC/57/61). In April 2025, The Human Rights Council has requested the Advisory Committee to draft a set of recommended guidelines for applying the existing human rights framework to the conception, design, development, testing, and use of neurotechnologies (A/HRC/RES/58/6).

4. Against this background, the general principles in the present document provide guidance to assist States to meet their obligations to respect, protect and fulfil human rights in the process of developing, using, implementing and regulating neurotechnology across diverse societal contexts. They clarify how the substance of existing human rights can apply to different types and applications of neurotechnology, serving as a normative baseline to guide States in their policy and legislative activities. In this way, they promote greater harmonization in policy and regulatory responses to neurotechnology.

5. In addition to providing guidance to States, these guidelines also aim to inform multilateral and supranational organizations on specifying the established framework of human rights in relation to neurotechnology in order to respect, protect and fulfil human rights in a way that is practical and effective.

6. The human rights implications of the development and use of different types of neurotechnology will vary across their application in different societal contexts.[3] To respect, protect and fulfil human rights in this area, States should adopt a context-specific approach, with specific rules and principles applying to the development, implementation, and use of different types of neurotechnologies for different purposes, and by different public and private actors (A/HRC/57/61, at 78(d)).

7. The guidelines provided in this document focus on regulating neurotechnology in (1) Criminal justice, (2) Education, (3) Consumer use, and (4) the Workplace, without unreasonably restricting invaluable research and clinical treatment with neurotechnology in (5) Research and healthcare. These guidelines do not consider the use of neurotechnology in warfare, as respecting, protecting, and fulfilling human rights in this context requires a unique legal approach, firmly rooted in the rules and principles of international humanitarian and criminal law.

LIMITATIONS

8. The obligation and the primary responsibility to respect, protect, and fulfil human rights in relation to neurotechnology lies with the individual States and is therefore dependent on national political contexts, legal traditions, and applicable enforcement mechanisms (A/HRC/RES/58/6; A/HRC/57/61, par. 58-60). Internationally oriented guidelines should take account of the relevant differences between individual States, including differences in legal tradition and available checks and balances across different States and, as far as economic, social and cultural rights are concerned, the available resources to progressively achieve the full realization of these rights.

9. It is important to note that private companies are increasingly driving the development and deployment of neurotechnology. To ensure effective and comprehensive protection of all individuals' enjoyment of human rights, States should regulate the use of neurotechnology by private companies, and businesses themselves should take responsibility for ensuring their activities within the neurotechnology lifecycle to comply with human rights standards, in line with the UN Guiding Principles on Business and Human Rights. While States bear the primary duty under human rights law to respect, protect, and fulfil human rights in the neurotechnology sphere, such as by regulating the design, development, testing and deployment of both medical and non-medical neurotechnology, private actors also have responsibilities to respect human rights.[4]

10. These guidelines provide general principles for the design, development, testing and use of neurotechnology which are derived from generally accepted human rights standards. Some of the relevant human rights are in earlier stages of development compared to others. This complicates the derivation of general rules and principles from those less fully developed rights, as their general meaning, scope and permissible limitations are less clear. Clarifying the meaning, scope, and permissible limitations of these rights, including the right to freedom of thought and the right to mental integrity (e.g. by the UN Special Rapporteurs on these rights or by the Human Rights Committee through updated general comments), would benefit the regulation of neurotechnologies.

11. These guidelines focus on the United Nations framework for human rights, including, but not limited to, the International Covenant on Civil and Political Rights (ICCPR), the International Covenant on Economic, Social and Cultural Rights (ICESCR), the Convention on the Rights of Persons with Disabilities (CRPD), the Convention on the Rights of the Child (CRC), and the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT).

DEFINITIONS

12. **Neurotechnology** encompasses any device, system, and procedure that directly measure, access, monitor, analyse or modulate the nervous system (A/HRC/57/61).

13. **Neural measurement** refers to neurotechnology that measure and analyze physical, electrical, chemical and/or biological signals associated with the structure of, and functional signals from, the nervous system. They may be used to identify, record, and/or monitor properties of nervous system activity, understand how the nervous system works, diagnose pathological conditions, or control devices. Examples include but are not limited to computed tomography (CT), magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), positron emission tomography (PET), magnetoencephalography (MEG), functional near-infrared spectroscopy (fNIRS), electroencephalography (EEG) and electrocorticography (ECoG).

14. **Neural modulation** refers to neurotechnology that modulates the activity and/or functioning of the nervous system, by applying stimulation (such as physical, electrical, or chemical) directly to the nervous system. Examples include but are not limited to electricalcortical stimulation (ECS), deep brain stimulation (DBS), transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), transcutaneous aircar vagus nerve stimulation (taVNS), focused ultrasound stimulation (FUS) and optogenetic stimulation.

15. **Neural data** refers to information obtained from a person's nervous system, including the information that results from subsequent analyses of these data.

16. **Mental state** refers to a person's state of mind, including but not limited to thought, perception, belief, desire, intention, inclination, emotion, memory, and pain or pleasure experience.

OVERVIEW OF HUMAN RIGHTS CENTRAL TO THESE GUIDELINES

17. Different human rights are potentially impacted by the development, use and regulation of neurotechnology in different social contexts. These guidelines focus on seven, partly overlapping, clusters of rights that are most relevant in relation to neurotechnology, that is: (1) physical and mental integrity, (2) physical and mental health, (3) privacy, (4) equality, (5) autonomy and self-determination, (6) democracy, and (7) rights of fair trial and criminal sanctioning.[5] The interpretation and adjudication of all human rights should respect, protect and fulfil human dignity.

18. **Physical and mental integrity** are protected by the right to security of person and the right to privacy (Articles 9 and 17 ICCPR). This entails protection against non-consensual and serious interferences with the body and mind. Grave interferences can violate the absolute prohibition of torture and other cruel, inhuman or degrading treatment or punishment (Article 7 ICCPR).

19. **Physical and mental health** are protected by the right to the enjoyment of the highest attainable standard of physical and mental health (Article 12 ICESCR). This right entails the freedom to control one's health and the right against interference, including the right to be free from non-consensual medical treatment and experimentation. Within their available resources, States should furthermore provide, without discrimination, available, accessible and acceptable health facilities, goods and services, which are scientifically and medically appropriate and of good quality (CESCR/GC/14). Relatedly, it follows from the right to enjoy the benefits of scientific progress and its applications (Article 15 ICESCR) that States

have a duty to make available and accessible to all persons, without discrimination, all the best available applications and technologies of scientific progress necessary to enjoy the highest attainable standard of health (A/HRC/57/61, at 32, 39).

20. **Privacy** is protected by the right to privacy (Article 17 ICCPR). This entails the protection of mental privacy, including the protection of individuals' control over neural data and information about their unexpressed mental states. Some aspects of mental privacy are furthermore protected by the right to freedom of thought, conscience and religion (Article 18 ICCPR), which prohibits the use of force to reveal unexpressed thoughts or adherence to a religion or belief (A/76/380). The freedom not to reveal unexpressed opinions or any other information is furthermore protected by the right to freedom of opinion and expression (Article 19 ICCPR; CCPR/GC/34).

21. **Equality** before the law and non-discrimination are fundamental components of human rights law, which prohibit discrimination on the basis of disability, race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status (Article 26 ICCPR; Article 5 CRPD).

22. **Autonomy and self-determination**, understood as the ability to, and interest in, making free decisions about one's own lives, are central values protected by the system of human rights. In particular, the protection of autonomy and self-determination is implicit in the right to privacy and personal integrity (Article 17 ICCPR), the right to freedom of thought conscience and religion (Article 18 ICCPR), and the right to freedom of opinion and expression (Article 19 ICCPR).

23. **Democracy**, the rule of law, and humans rights are interdependent and mutually reinforcing. Democracy is based on the freely expressed will of people to determine their own political, economic, social and cultural systems and their full participation in all aspects of their lives (A/RES/55/96; A/HRC/RES/28/1). Promoting and consolidating democracy entails promoting pluralism and protecting all human rights and fundamental freedoms, including, in particular, freedom of thought, conscience, and religion and the freedom of opinion, expression, and free, independent and pluralistic media (A/RES/55/96).

24. **Rights of fair trial and criminal sanctioning** include due process rules and minimum guarantees of accused persons in criminal proceedings, such as a right against self-incrimination, a right to examine witnesses (Article 14 ICCPR), and an obligation on States to treat all persons deprived of their liberty with humanity and respect for human dignity. Penitentiary systems shall comprise treatment of prisoners the essential aim of which shall be their reformation and social rehabilitation (Article 10 ICCPR).

25. **Human dignity** affirms the equal inherent worth of all persons as autonomous human beings able to pursue a meaningful life in relation with others. This inherent worth must be respected in interactions with others, including, in particular, the State. Human dignity is a fundamental guiding principle underlying international human rights law. Examples of human rights emanating directly from the commitment to the protection of human dignity include, but are not limited to, the prohibition of torture and other cruel, inhuman or degrading treatment, the right to personal integrity, the right to equality before the law, the right to equal healthcare of persons with disabilities, and the obligation on States to treat all persons deprived of their liberty with humanity and with respect for their inherent dignity.

26. States must respect civil and political rights and must thus refrain from violating their negative obligations under these rights. Any restrictions on any of those rights must be permissible under the relevant provisions (Articles 2 ICCPR). Where such restrictions are made, States must demonstrate the necessity and only take such measures as are necessary and proportionate to the pursuance of legitimate aims to ensure continuous and effective protection of human rights. In no case may restrictions be applied or invoked in a manner that would impair the very essence of human rights (CCPR/GC/31).

27. States must ensure civil and political rights to all individuals (Article 2 ICCPR). States have positive obligations to protect individuals not just against human rights violations by its agents, but also against acts committed by private persons or entities that would impair the enjoyment of human rights in so far as they are amenable to application between private persons or entities. There can be circumstances in which a State's failure to ensure human rights constitutes a violation of those rights, because of States failing to take appropriate measures or to exercise due diligence to prevent, punish, investigate or redress the harm caused by such acts by private persons or entities (CCPR/GC/31).

28. States have the obligation to take steps, individually and through international assistance and co-operation, especially economic and technical, to the maximum of their available resources, with a view to achieving progressively the full realization of economic, social and cultural rights by all appropriate means, including particularly the adoption of legislative measures (Article 2 ICESCR).

29. Under the United Nations Guiding Principles on Business and Human Rights, States have a duty to protect against business-related human rights abuse by taking measures to prevent, investigate, sanction and redress human rights violations. They should set clear expectations that enterprises respect human rights throughout their operations and value chains, exercise heightened oversight where the State owns, controls or substantially supports enterprises, integrate human rights in public procurement and outsourced services, adopt additional safeguards in conflict-affected areas, ensure domestic and international policy coherence, and preserve regulatory space in trade and investment arrangements.

30. Human rights only provide a minimum level of protection of fundamental rights and freedoms. States are free and encouraged to exceed minimum standards by guaranteeing stronger protection of fundamental rights in their national jurisdictions.

GUIDING PRINCIPLES

CRIMINAL JUSTICE

31. Neurotechnology shall not be used to punish, humiliate or debase suspects, accused or convicted persons. Penitentiary systems shall comprise treatment of prisoners the essential aim of which shall be their reformation and social rehabilitation (Article 10(3) ICCPR).

32. States must ensure that any use of neurotechnology in criminal justice has an accessible, foreseeable, clear and unarbitrary basis in domestic law. Any such domestic laws must be compliant with the State's obligations under international human rights law as set out in these guidelines.

33. Neurotechnology shall only be used in criminal justice if it complies with applicable safety, efficacy and security standards. Any medical treatment in a forensic context that includes neurotechnology must comply with applicable medical standards and should be in the best interest of the patient.

34. The use of neurotechnology in criminal justice requires, in principle, free, informed and express consent of a competent person to whom the technology is applied. The coercive context of criminal justice and the inherent power imbalance between individual citizens and law enforcement officials – in particular in the context of incarceration – requires a very strict scrutiny of the validity of consent.

35. Non-consensual use of neurotechnology in criminal justice entails a serious risk of violating human rights.

36. When employing neurotechnology in criminal justice, States should respect, protect and fulfil all relevant human rights.

37. It follows from the prohibition of torture and other cruel, inhuman or degrading treatment or punishment, the right to security of person, the right to personal integrity, and the obligation of States to treat persons deprived of their liberty with humanity and with respect for their inherent dignity, that (incarcerated) persons shall not be subjected to physically invasive brain modulation, such as deep brain stimulation, without their valid, free, informed and express, consent. Physically non-invasive neural modulation without valid, free, informed and express, consent entails a serious risk of violating these rights too. Strict exceptions in cases of medical necessity can apply.

38. It follows from the right to freedom of opinion and the right to freedom of thought, conscience and religion, that neural modulation shall not be used to compel individuals to form or change a particular opinion, thought, conviction or belief (A/73/348, at 23; A/76/380, at 32).

39. It follows from the right not to be compelled to incriminate oneself, such as through testimony or confession, that suspects shall not be compelled to participate in measurements of neural responses aiming to infer information about their knowledge of the crime they are suspected of, including, but not limited to, brain electrical oscillation signature, brain fingerprinting, and concealed information tests. The same applies to neural measurements for lie detection.

40. To ensure fair trials, States should guarantee that information obtained through consensual neural measurements may only be used as evidence at trial if they meet applicable accuracy and validity standards.

41. It follows from the right to privacy that the gathering and holding of neural data, whether by public authorities, private bodies or individuals, must be regulated by law. Measures must be taken by States to ensure that neural data do not reach the hands of persons who are not authorized by law to receive, process and use these data, and are never used for purposes incompatible with human rights.

42. The use at trial of evidence obtained through neural measurements in violation of human rights undermines the integrity of the judicial process and risks rendering the criminal proceedings as a whole unfair. States must prohibit, by law, the admissibility in judicial proceedings of neural information that is obtained through torture or other cruel, inhuman or degrading treatment (A/HRC/57/61, at 35; CCPR/GC/20; Article 15 CAT). To protect human rights, prevent rights violations and to safeguard the integrity of criminal proceedings in accordance with the rule of law, States should prohibit the use as evidence at trial of neural information when obtained in violation of other human rights too, including the absolute right to freedom of thought and the absolute right to the freedom of opinion.

43. Information obtained through neural measurement for assessing a person's risk of recidivism shall not be used in isolation, without considering biological, psychological, social, and other relevant factors. Brain-

based risk assessment should meet applicable accuracy and validity standards. States shall guarantee to all persons equal and effective protection against discrimination on any ground, including on neurobiological characteristics.

44. In all actions concerning children and adolescents,[6] the best interests of the child shall be a primary consideration (Article 3 CRC). Brain modulation shall not be applied for other reasons than the necessary treatment of medical conditions and in accordance with applicable medical standards.[7] Every child deprived of their liberty shall be treated with humanity and respect for the inherent dignity of the human person, and in a manner that promotes their rehabilitation (Articles 37 CRC, 14 ICCPR). Children and adolescents need special protection, which takes account of their age and their neural and mental immaturity (CCPR/GC/32, at VI).

45. It follows from the right to the highest attainable standard of physical and mental health, that health facilities, goods and services are accessible to everyone without discrimination. Vulnerable or marginalised groups, including incarcerated persons and persons with disabilities, should not be deprived of access to health services that are enjoyed by other sections of the population, including neurotechnology to diagnose and treat medical conditions. It follows from the right to have access to scientific applications and technologies that innovations essential for a life with dignity should be accessible to everyone, in particular to marginalized populations (A/HRC/20/26, at 29).

EDUCATION

46. States shall ensure, such as by adopting national policies and regulations, that neurotechnologies in education will never be used on children or adolescents without their valid, free, informed and express consent or, when the child or adolescent lacks legal capacity, without valid, free, informed, and express parental or legal guardian consent. If parents or legal guardians have given consent, but the child or adolescent opposes or resists, the use of the neurotechnology will be halted.

47. The use of neurotechnology for education by children and adolescents shall always be in their best interest and shall directly correspond to the purpose of education in the meaning of Article 29 CPR. Such use must, obviously, comply with applicable safety, efficacy and security standards and failure to do so would be an impermissible use of neurotechnology. Educational use of neurotechnology must be grounded in sound scientific research, subject to rigorous evidence-based assessment. The validity of consent should be subject to strict scrutiny, especially in contexts of power imbalance, such as in a teacher–student relationship.

48. Surveillance with neurotechnology risks self-censorship of thinking and expression. To prevent self-censorship and to respect, protect and fulfil the right to privacy, the right to freedom of thought, conscience and religion, the right to freedom of opinion and expression, and the right to the highest attainable standard of health, neural measurements in education shall never be used for the purpose of real-time monitoring of children's and adolescents' mental and brain activity by parties other than the child or adolescent themselves. For the same reasons, States must take measures to delimit a posteriori access by third parties to neural data of children or adolescents recorded during learning.

49. In no case shall neurotechnology be used as a reason or justification for applying any form of sanction, punishment, discrimination or less-favourable treatment of children or adolescents, for example, for not paying enough attention in class. Insight into children's learning at a cognitive level must not lead to discrimination against neuro-diversity.

50. States are entitled to monitor the impact of available neurotechnology in education, such as for neuroenhancement, and to take appropriate measures to protect and fulfil equality rights.

51. Children and adolescents have the right to the protection of the law against arbitrary or unlawful interferences with their privacy, including their neural data (Article 17 ICCPR, Article 16 CPR). Neural data are sensitive data. The gathering and holding of neural data, whether by public authorities, private bodies or individuals, must be regulated by law. Measures must be taken by States to ensure that neural data do not reach the hands of persons who are not authorized by law to receive, process and use these data, and are never used for purposes incompatible with human rights – the CPR in particular – or for other purposes that are not in the best interest of children and adolescents (A/HRC/58/58; A/HRC/46/37; CCPR GC 16).

CONSUMER USE

52. People have the freedom to purchase and use neurotechnologies for semi-medical, non-medical and recreational purposes within the reasonable limits and constraints following from the human rights protection of human dignity, democracy, equality, health, privacy, and personal integrity.

53. States are entitled to monitor the impact of available consumer neurotechnology, such as for neuroenhancement, and they should take appropriate measures to protect and fulfil equality rights, as well as to ensure the protection of consumers rights.

54. States must protect against human rights abuse within their territory and/or jurisdiction by third parties, including business enterprises that produce and sell neurotechnologies directly to consumers, including for private, business, or educational purposes. This requires taking appropriate steps to prevent, investigate, sanction and redress human rights abuse through effective policies, legislation, regulations and adjudication. States must enforce laws that are aimed at, or have the effect of, requiring business enterprises to respect human rights, and periodically to assess the adequacy of such laws and address any gaps.[8]

55. States should proactively establish a regulatory framework that balances innovation in direct-to-consumer neurotechnology with protecting individuals' human rights and well-being, taking into account the United Nations Guiding principles on business and human rights (2011) and applicable consumer protection law and guidelines, including the United Nations Guidelines for consumer protection (2015).

56. It follows from the right to personal integrity that States must take legislative, administrative, judicial and other measures to prevent and sanction the infliction of physical and psychological harm. This includes the taking of measures in the sphere of criminal law, including the criminalization of severe harmful acts and the prosecution of those found responsible for those acts (CCPR/GC 13, at 13; CCPR/GC/31, at 8, 18; CCPR/GC/35, at 9). States must take measures to prohibit and prevent uses of neurotechnologies incompatible with the right to personal integrity. This includes, for example, prohibiting and prosecuting the non-consensual use of neural modulation or neural measurement on others that causes serious mental or physical harm and prohibiting and prosecuting the selling of unsafe and harmful neurotechnologies to consumers. This applies in particular in relation to vulnerable persons, including children and persons with disabilities.

57. It follows from the right to freedom of opinion and the right to freedom of thought, conscience, and religion, that States are required to ensure these rights in domestic laws, including laws regulating the development and use of neurotechnologies. States are required to ensure that persons are protected from any act by private persons or entities that would impair the enjoyment of the freedom of opinion and the freedom of thought, conscience and religion to the extent that these rights are amenable to application between private persons or entities (CCPR/GC/34, at 7; A/76/380, at 40; CCPR/GC/31, at 8). The right to freedom of opinion prohibits involuntary disclosure of opinions and any effort to coerce the holding or not holding of any opinion (CCPR/GC/34, at 10; A/HRC/47/25, at 35). The right to freedom of thought, conscience and religion prohibits involuntary disclosure of thought, conscience and religion as well as non-consensually changing an individual's thought, conscience, and religion, such as through the direct alteration of brain function (A/76/380, at 32). States must take measures to prohibit and prevent uses of neurotechnologies incompatible with the right to freedom of opinion and the right to freedom of thought, conscience, and religion. This includes, for example, prohibiting the non-consensual use of neurotechnology to disclose or change another person's opinion.

58. States should prohibit by law the profiling or targeting of children for commercial purposes on the basis of a digital record of their actual or inferred characteristics or mental states, including group or collective (neural) data, targeting by association or affinity profiling. Practices that rely on neuromarketing, emotional analytics, immersive advertising and advertising in virtual and augmented reality environments to promote products, applications and services should also be prohibited from engagement directly or indirectly with children (CRC/GC/25, at 42).

59. Everyone has the right to the protection of the law against arbitrary or unlawful interference with their privacy, including their neural data. Neural data are sensitive data. Persons have the right to the protection of the law against arbitrary or unlawful interferences with their privacy, including their neural data (Article 17 ICCPR). The gathering, holding and transferring of neural data, whether by public authorities or private bodies or individuals, must be regulated by law. Measures must be taken by States to ensure that neural data do not reach the hands of persons who are not authorized by law to receive, process and use these data, and are never used for purposes incompatible with human rights (A/HRC/58/58; CCPR/GC/16).

WORKPLACE

60. Everyone has the right to the enjoyment of just and favourable conditions of work (Article 7 ICESCR), which is a prerequisite for, and result of, the enjoyment of other human rights, including the right to the highest attainable standard of physical and mental health (CESCR/GC/23).

61. States should adopt national policies and regulations for the prevention of accidents and work-related health injuries, including mental health conditions, by minimizing hazards in the working environment and promoting workers well-being (CESCR/GC/23, at 25; CESCR/GC/14, at 4). This includes adopting policies about the use of neurotechnologies that are safe, effective, evidence-based, and which are only used when necessary and proportionate to a legitimate aim, such as protecting safety, health and well-being, and which are compliant with human rights and data protection law.[9] Labour organisations, such as the International Labour Organisation, are encouraged to contribute to develop and harmonise such regulations.

62. Surveillance with neurotechnology risks self-censorship of thinking and expression. To prevent self-censorship and to protect and fulfil the right to privacy, the right to freedom of thought, conscience and religion, the right to freedom of opinion and expression, and the right to the highest attainable standard of health, States should ensure that neural measurements will not be used for the purpose of real-time monitoring employees' mental and brain activity by employers and other third parties. For the same reasons, States should take measures to delimit a posteriori access by third parties to neural data of employees.

63. Effective safeguards should be in place to ensure that the consensual use of neurotechnologies in work-related contexts is based on valid, free, informed and express consent, recognising the serious risk of coercion and abuse arising from power imbalances.

64. States must adopt measures, which should include legislation, to ensure that individuals and entities in the private sphere, including employers, do not discriminate on prohibited grounds (CESCR/GC/20, at 11). This includes taking measures to prevent private businesses using neural data to profile individuals as basis for discriminatory decisions, such as in employment or insurance. Labour organisations, such as the International Labour Organisation, are encouraged to contribute to develop and harmonise such regulations.

65. As in other contexts, States must take measures to ensure that neural data do not reach the hands of persons who are not authorized by law to receive, process and use these data, and are never used for purposes incompatible with human rights (A/HRC/58/58; CCPR/GC/16).

66. In their role as a direct employer of public sector workers, such as in the military and law enforcement, States must respect and ensure the human rights of their employers, including, but not limited to, the right to privacy and personal integrity, the right to freedom of thought, conscience and religion, and the right to freedom of opinion and expression. The use of neurotechnology in this context requires free, informed and express consent of a competent person to whom the technology is applied. States must ensure that the use of neurotechnology in this context has an accessible, foreseeable, clear and unarbitrary basis in domestic law.

RESEARCH AND HEALTHCARE

67. The use of neurotechnology in research and healthcare requires, in principle, free, informed and express consent of a competent person to whom the technology is applied.

68. No one shall under any circumstances be submitted to medical or scientific experimentation with neurotechnologies without their valid, free, informed and express consent (Article 15 CRPD; Article 7 ICCPR; CCPR/GC/20, at 7; CESCR/GC/14, at 8; A/HRC/57/61, at 39). States must take measures to prohibit and prevent non-consensual experiments with neurotechnology.

69. It follows from the human rights protection of physical and mental integrity and of physical and mental health, that States shall ensure that rules and principles governing the use of neurotechnology in medical research and clinical practice take into account both the physical and mental effects neurotechnologies can have on patients.

70. States must ensure that rules and principles governing the use of neurotechnology in different contexts shall not unreasonably restrict the lawful use of neurotechnologies in medical research and clinical practice.

71. It follows from the right to the highest attainable standard of physical and mental health that States shall provide, without discrimination, available, accessible and acceptable neurotechnologies, which are scientifically and medically appropriate, safe, effective, and of good quality (CESCR/GC/14). These include, in accordance with the right to enjoy the benefits of scientific progress and its applications and technologies (Article 15 ICESCR), all the best available applications of scientific progress necessary to enjoy the highest attainable standard of health and to live a life in dignity (CESCR/GC/25, at 70; A/HRC/57/61, at 32, 55, A/HRC/20/26, at 29).

72. Persons with disabilities have the right to the enjoyment of the highest attainable standard of physical and mental health without discrimination on the basis of disability. States must prevent discriminatory denial of health care on the basis of disability (Article 25 CRPD). States should ensure that regulations are in place regarding the possibility of legal guardian consent in a way that protects patients, ensures that they can benefit from neurotechnological advancements and provides for appropriate and effective safeguards to prevent abuse in accordance with international human rights law (Article 12 CRPD).

73. States shall take measures to the maximum of their available resources to promote research, development, and the availability and use of innovative neurotechnologies suitable for persons with disabilities (Article 4(g) CRPD). This applies, in particular, to neurotechnologies that assist or afford elementary capacities and enable personal autonomy and human dignity of patients, such as devices that enable communication and access to digital technologies (A/HRC/20/26, at 29). States must take measures to ensure vulnerable groups, including persons with disabilities, non-discriminatory access to scientific information, processes and products (A/HRC/20/26, at 31).

74. When implantable neurotechnologies are used in humans for medical research or clinical treatment, States should regulate by law the ownership of these devices and adopt rules about who is responsible for the continuation and discontinuation of treatment and the explantation of the neurotechnology. Given the global nature of the neurotechnology industry, States are strongly encouraged to harmonize these regulations, for example by adopting rules and principles at the international level. States should ensure that these rules and principles will respect, protect and fulfil, without discrimination, each patient's human dignity, autonomy, and their right to the highest attainable standard of mental and physical health.

CONCLUSION

The emergence of new technologies often raises new legal questions, including questions about human rights and regulation. In the context of neurotechnologies, these questions are foundational and complex. They are foundational because they have direct impact on the legal protection of two elements central to being human: our body and mind. They are complex because, first much of the human mind is still unknown and, second, human rights protection pertaining to the mind is still underdeveloped, both in theory and practice.

The guidelines provided in this document clarified the implications of established human rights for the design, development, testing, and use of neurotechnology in different societal contexts. They aim to stimulate the application and integration of these rights and principles when States, multilateral and/or supranational organizations will regulate neurotechnologies, and when courts need to decide upon claims of alleged human rights violations in relation to neurotechnology.

The guiding principles in this document are general and basic. To become more concrete, they require interpretation and application by courts and legislators. The guiding principles are also dynamic. They will evolve over time, depending on social, scientific and moral developments. With the emergence of neurotechnology and the growing body of legal and ethical scholarship, further guidance from human rights bodies, such as the Human Rights Council, on the interpretation of the relevant human rights is desirable. This applies in particular to human rights that are currently underdeveloped, such as the right to freedom of thought, the right to mental integrity, and the right to the highest attainable standard of mental health.

END NOTES

1 UNESCO, Unveiling the Neurotechnology Landscape Scientific Advancements Innovations and Major Trends 2023

2 Geneva Academy, Neurotechnology and Human Rights: An Audit of Risks, Regulatory Challenges, and Opportunities (December 2024)

3 Geneva Academy, Research Brief. Neurotechnology and Human Rights: An Audit of Risks, Regulatory Challenges, and Opportunities, December 2024; UNESCO, Draft text of the Recommendation on the Ethics of Neurotechnology, 9 April 2025 (SHS/IGM-NEURO/2025/MAY/3).

4 For a comprehensive set of guiding principles on neurotechnology and human rights for businesses, see T. Istace & S. Ligthart, Guiding principles for businesses on protecting human rights throughout the neurotechnology lifecycle, December 2025.

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6 Children are understood as persons under 18 years old.

7 UNESCO, Recommendation on the Ethics of Neurotechnology, 2025, par. 64.

8 UN Guiding principles on business and human rights 2011.

9 UNESCO, Recommendation on the Ethics of Neurotechnology, 2025, IV.9.

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