International Bioethics Committee (IBC)

Topic A: Strategies to address the ethical challenges of neurotechnology

Introduction:

Neurotechnology is the assembly of methods and instruments that enable a direct connection of technical components with the nervous system. Technical components can consist of electrodes: computers, or intelligent prostheses. By translating brain signals, machines transform them into technical commands. A set of devices understand the neural process and can facilitate the brain's ability to heal itself. The goal of neurotechnology is to develop tools that can help us understand, treat, and enhance human cognition, behavior, and health.[1]

Among the different most recent fields or types of neurotechnology, there are four common kinds that need to be acknowledged:

1. Brain-computer interfaces: direct communication pathway between the brain's electrical activity and an external device (computer). This technology has the potential to restore function to people with paralysis and other disabilities or cognitive or neurological impediments.
2. Neuromodulation: technology that directly acts on nerves. It is the alteration of nerve activity by attacking a targeted area with pharmaceutical agents.
3. Neurotrophinses: implanted devices that replace damaged neuronal tissue. This technology is used for hearing and vision aids for people who are affected by blindness and hearing loss.
4. Neuroimaging: technology that allows the visualization of brain activity to treat brain disorders.

Concepts and definitions:

- **Electrodes:** a conductor device designed for use in neurological studies. Used to read electrical signals from a brain's activity to detect information and perceive dysfunctional connections.
- **Intelligent prostheses:** innovative artificial limbs powered by sensors, artificial intelligence, and actuators. They deliver a far more intuitive and natural user experience

[1] (INS, n.d.)

compared to traditional, limited prostheses. This is because they can sense and adapt to changing situations, unlike their passive counterparts.

- **Neuro-devices:** medical tools designed for the nervous system, such as neurostimulators and neurosensors, which are crucial in neurology and neuro-engineering. They serve diagnostic and therapeutic purposes for neurological conditions by delivering impulses and measuring activity, offering innovative solutions for addressing disorders of the nervous system.
- **Technical commands:** specific instructions or orders given to a neurotechnological device or system to perform them.
- **Technical components:** the costs of the facility, equipment, supplies, and the person who conducts an examination (technologist or technician).

Current issue:

Neurotechnology has led to progress in medical treatments. Peoples' lives have been improved when affected by the loss of physical or cognitive abilities.[2] The field has the potential to revolutionize most of the aspects of human life. Being in constant development, neuroscience and technology can further understand how the nervous system functions. Although the impact in the medical industry has been beneficial, potential ethical issues must be addressed.

Neuroscience can access, manipulate, and modify the brain's structure, and information from the field can provide a deeper understanding of emotions and individual identity. The use of that information can be a threat to freedom of thought and privacy if not managed correctly (especially without consent or knowledge of its use by the patient). Invasive methods allowed by governments are already an issue in the ethical aspect of the field. Legal frameworks have not been implemented to address ethical concerns and prevent misuse, due to the exponential growth and development of the field.

The ethical concerns begin with the purpose of neuroscience of using machines to wire human brains to assist in sickness and further understand human thought. Some of the electrodes left behind in the surface, thus considered noninvasive. Methods used nowadays have proven effective with individuals who have lost most of (if not all) the control of their bodies. Having total or partial paralysis can be reduced in advance stages and even skills can be regained, although without complete recovery.

Invasive methods are contemplated when the electrodes are placed deeper in the brain, therefore penetrating brain tissue. Most of them are used for implementing a prosthetic limb, among others. Even when useful, the possibility of manipulating thoughts, emotions, and

[2] (IEEE, n.d)

memories arises from the ethical implications of digging deeper and providing more control to technology for treatment of a variety of illnesses. As of today, devices used in neurotechnology have processes that ensure safety. Device regulation consists of three categories (based on the Food and Drug Administration for the USA Government on Neurological Devices):

- Premarket notification for low and moderate risk devices is required when they are not comparable with existing devices.
- Permanent approval is required for moderately high to high-risk devices, requiring clinical data for safety insurance.
- Novo classification is required for low to moderate risk with no similar device compatibility (and requires independent investigations for safety insurance).

Moreover, interventions in the human brain can be an efficient treatment and assist in the rehabilitation for brain disorders, but it can also drastically change the personality, temperament and even character of the patient. The changes are usually irreversible, thus creating doubts and questioning the ethical dilemmas and implications of neurotechnology. "The brain is our identity; it tells us who we are. If someone has access to our brain information and our data, it could lead us to a lack of mental integrity, the risk of being manipulated, violating human dignity and freedom of thought."[3]

So, the following questions, among others, arise: "How far should we go when cognitive and emotional alterations of a person could result from an intervention? Which kinds of risks are acceptable? Does our "self" change into another one by these interventions? Are we the same person we were before the operation and before the stimulation? Does our notion of legal "responsibility" change if intelligent neuroprostheses autonomously interpret or even change our brain activity?"[4]

Information obtained from rehab treatments, for example, has been an issue of privacy and security. Pharmaceutical companies such as researchers consider the experiences of addicts fundamental on the development of neurology, although specialists in the topic agree that invasive methods are not the answer and human rights should not be put in risk.

There is not a strict limit on how far a session with neurotechnology can continue without any penalization. The policy is clear thought with companies that offer neurological treatment to keep all the information and personal data private. Even with regulation in countries like the USA, information obtained has been shared with outside parties because of its economic value. "While these data are enabling tremendous medical advances, they also create new risks should they be

[3] (Lopez,2023)
[4] (Müller and Rotter, 2017)

improperly disclosed, including discrimination, psychological, and social stress from unwanted revelations, and identification of third parties."[5]

In the social aspect, neurotechnology can also lead to conflicts. The usage of neurotechnology may lead to a further social gap, where unfairness and inequality is prone. Individuals with the financial means or access to such technology have quite some advantages. "If access to advanced neurotechnology is limited to the wealthy, it could further increase the gap between this social group and others, whether at the international, national or local level."[6]

International initiatives:

The United Nations Educational, Scientific and Cultural Organization (UNESCO) international conference is exploring prospectives in which neurotechnology can assist people in improving people's cognition, behavior, and health, while also considering actions to address the threats to human rights and freedom. UNESCO has the goal of understanding and informing the ethical issues that neurotechnology can arise, "similar to the way in which UNESCO established the global ethical frameworks on the human genome (1997), human genetic data (2003) and artificial intelligence (2021)"[7], with the help of the International Bioethics Committee and a study that proposes neurotechnology's view, advancements, influential figures, and significant patterns.

Also, several organizations have elaborated consideration to regulate neurotechnology because of the risks it implies to mental integrity, personal identity, and freedom of thought. For example, the Chilean Congress incorporated into its Constitution the protection of mental integrity and mental data. Likewise, a consultive organism of the Organization of American States, the Inter- American Juridical Committee, approved the "Declaration of Neuroscience, Neurotechnologies, and Human Rights: New Legal Challenges for the Americas" [8] in which important ethical and legal concerns are stated regarding the advancement of neuroscience and progress of neurotechnology.

In this regard, since neurotechnology and artificial intelligence have become increasingly intertwined, the Readiness Assessment Methodology (RAM) is a method promoted by UNESCO that will help countries understand where they stand on the scale of preparedness to implement artificial intelligence (AI) ethically and responsibly for all their citizens.[7] The recommendation on the ethics of artificial intelligence, signed by all UNESCO Member States, offers a practical guide

[5] (Field, 2023)
[6] (UNESCO, n.d.)
[7] (UNESCO.org, 2023)
[8] (Andorno, n.d.)
[7] (UNESCO.org, 2023)

for ethical AI. It covers the full spectrum of human rights considerations, focusing on every stage of the AI system's existence. Besides defining guiding principles, it entitles Member States through actionable steps, promoting effective regulation and offering policy recommendations in crucial areas like gender, environment, and communication.

In addition, the Ethical Impact Assessment is an initiative from UNESCO that will help actors involved in the development of AI systems to predict consequences, mitigate risks, and address social challenges. It ensures that AI developments align with the promotion and protection of human rights and human dignity. The two goals of this initiative are measuring ethical alignment of algorithms and promoting transparency through mandatory public access to AI development information addressing the existing secrecy surrounding even basic safety data.

The development of these main tools (the Readiness Assessment Methodology (RAM) and the Ethical Impact Assessment (EIA)) form the base of the implementation. These tools work together to strengthen a country´s readiness for AI. One assesses the resilience of existing laws, policies, and institutions to adapt AI implementation, while the other ensures AI systems align with the ethical values and principles enshrined in the UNESCO recommendation. The document dives into the Readiness Assessment Methodology (RAM), while providing a detailed pathway for countries seeking to implement it. It specifies the types of entities involved, their responsibilities, and the collaborative tasks shared by UNESCO and participating countries.

Guiding questions:

- Does the recollection of information on neurotechnology through artificial intelligence have any substantial number of ethical problems in your field of study?
- In your experience and opinion, is there any government that has implemented effective public participation regarding ethical issues in neurotechnology?
- What regulatory strategies that currently exist can help address the ethical concerns regarding neurotechnology?
- Which type of repercussions in your field of study has had or may have the lack of regulation regarding neurotechnology in your field of study?

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