What is a responsible non-invasive neurotechnology in light of neuroethics and philosophy?

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Abstract, Aim

The acceleration of innovations makes it essential to reflect on the societal, ethical and legal issues at stake, on the concept of responsibility.

Several European and international projects aiming at advancing the knowledge of the brain by combining the expertise of neuroscience research with that of computer science research are making it possible to miniaturize, make more efficient and more effective invasive and non-invasive neurotechnologies, even though the latter are intrusive.

Developed in research laboratories as well as in private companies, and already marketed to the public in good health, the boundary between medical and non-medical uses, between civil and military, is becoming very porous, with different objectives and investments.

Thinking about this concept in the light of ethics, neuroethics and philosophy will provide a significant enlightenment to approach it. And philosophers such as Hans Jonas or Hannah Arendt and Heather Douglas can help us understand the issues underlying responsibility.

Moreover, the design of interdisciplinary safeguards, evaluation and monitoring systems, and the definition of governance adapted to the sociological, ethical, and legal values of France, Europe and each country are currently emerging worldwide. It is around the need to agree on the notion of social responsibility that neuroethics and neurolaw agree, called for by the OECD Council through its recommendation n°0457 of 2019 on responsible innovation in neurotechnologies.
But also, by the "*Report of the International Bioethics Committee of UNESCO on the ethical issues of neurotechnology*" of the UNESCO ethic committee in 2021.

Neuroethics and neurolaw, existing laws and recommendations, allow to deepen by embodying this social responsibility concerning neurotechnologies in the everyday life of neuroscientists and research communities in all fields.

Key words: Neuroethics, Neurotechnologies, Neurosciences, Brain-Machine Interface, Data Protection, Neurolaw, Responsible Research and Innovation, Research Ethics, Research Integrity.

What kind of world do we want? How far can and should we go?

How will the use of neurotechnologies, by modifying the structure and the functioning of brain networks and processes, influence the human person? What ethical issues underlie the use of non-invasive neurotechnologies?“

What specific rules, along with evaluation mechanisms and discussion forums, would ensure the ethical character and integrity of neuroscience research and neurotechnologies?

One of the objectives would be to propose to the research community and society a constructive warning, calling on them to adopt a more thoughtful neuroscientific practice, so that science remains at the service of human dignity and promotes the development of responsible neurotechnologies.

Neurotechnologies in international context

Neuroscience research, through the convergence of molecular and cellular approaches with more integrated neurophysiological and cognitive research and computer science:

- Enables many advances and **better understanding of the brain**.
- Are used **to study and to treat** many physiological function and pathologies
- Drive very fast development in **the global market**
- More **miniaturized, more efficient and more powerful BCIs**.

The internationalization of research, projects and collaborations between university and private laboratories, for medical applications can be used to treat pathologies :

- Promote the development of collaborative platforms such as **EBrains, Cati, FLI-IAM …**
- Set up **Health Data Clouds**

Neurotechnologies that are **now commercialized** are mainly **related to BCI using EEG and neurofeedback.**

There are concerns about the consequences of interest and investment in neuroscience.
Development of applications and recording and intervention devices used for the most part in the field of wellness :

- Non-invasive, wearable, imaginable in headphones or earphones
- Connected by Wi-Fi and Bluetooth
- For the general public.
- **These devices focus on detecting:** Stress, Vigilance at work, Anxiety, Concentration, Emotions, check and control attention, Motivation

Their ambition is to help users to

- Effectively modify their behavior, make decisions, influence their emotions, motivations and decisions.
- Improve cognitive performance by modifying brain activity and characterizing the dynamics of the brain's response to these modifications.
- Correct behavioral errors, evaluate performance in real time and modify brain activity.
- Military use, for soldiers in combat, intelligence, cyber security

The ethical challenges this raises

Neuroscience is moving towards preventive and predictive medicine

Will open the possibility of drifts to control and manipulate the behavior of an individual, a population, a country, an armed group → raises the question of the **use of nudging.**
Risk of data piracy, hacking

This can lead to attempts To a loss of freedom to be and to decide, Incentives to consume, Surveillance, stigmatization or exclusion of some individuals.

Their ability to record and modulate brain activity by intervening on neuronal functioning calls into question the principles :

- ✓ Identity, of individual freedom, autonomy of the human being, integrity,
- ✓ The conception that we have of ourselves as free and responsible persons
- ✓ Have profound consequences on human identity and integrity and society.

AI, algorithmes and neurosciences Convergence
This convergence are powerful tools for medicine and human health.

- Questions related to the information generated by algorithm about brain activity.
- How to create **transparency**?
- **What responsibility** for inventors, coders, researchers, users?

Brain data
Brain privacy and freedom of thought, private spaces and individual identity must be integrated in our conception of human rights.

- **When combined with other data**, provide very precise information about our behavior and can become sensitive data.
- Shouldn’t be exploited **without informed consent** risk being a manipulation of the user, (nudging).

How can ethics and philosophy enlighten us on the concept of responsibility?

Research is progressing at a dizzying pace, opening the door to unprecedented philosophical, ethical, sociological, legal and epistemological questions.
In a society where urgency and economic necessity dominate:

- ➢ How to define neuroscience under the prism of research ethics and scientific integrity?
- ➢ What are the ethical and legal issues underlying neuroscience, its technological development and its use in society?
- ➢ What responsibilities do neuroscientists have?
- ➢ What is a responsible BCI for society?
- ➢ What can neurotechnologies ask of moral and political philosophy?

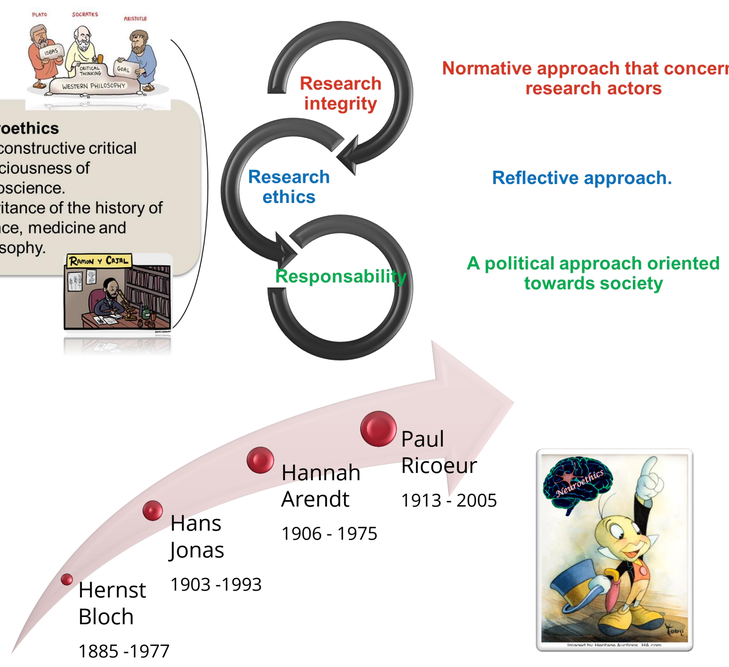
By reaching the market very quickly, some neurotechnologies developed

- Disrupt the research process,
- Short-circuit the time for questioning the ethical and legal issues, their uses, risks and benefits.

The development of neurotechnologies **calls for specific ethical vigilance in the face of the risk of infringing on psychic integrity and hindering freedom of thought.**
Requiring

- To reflect on the reliability of this research, i.e. its robustness and its relevance for society.
- To evaluate the scientific validity of their implications
- To examine their consequences on the life in society and the conception that we have of an autonomous human being and responsible for his acts.

It is therefore a challenge for research and society to be transparent and to protect users.



Normative approach that concerns research actors

Reflective approach.

A political approach oriented towards society

***Respondere* (latin)**

- To respond for one's intentions and actions before others and oneself, to vouch for,
- To respond to

For **Hans Jonas** (*Principle of responsibility*) man has now the capacity to destroy himself by the perfection of technology. Man must reflect on the **consequences for future generations**. He react against to **Hernst Bloch,** (*Principle of Hope*), who has a communist utopian thought of the technique.

→Is it with an optimistic and utopian vision or with a darker vision that we must approach the BCI?
→What are the consequences for future generations?

Hannah Arendt will define **responsibility** in the face of technology in her books with a political angle (*Responsibility and Judgments and the Human Condition*).

- ✓ Denounces the loss of meaning linked to technical developments and the automation of work.
- ✓ It is a mutation of the concept of social responsibility.

As for **Paul Ricoeur,** makes intelligible by a semantic work

- ✓ Defends the idea that we are responsible first of all for the fragile.
- ✓ Spoke of responsibility in the light of history and memory with that more legal.

Neuroethical and Neurolaw challenges for research and neuroscientists

Neuroethics examine the potential and limitations of neuroscientific questions and methodologies and their impact on research and society.
"Do current rights sufficiently protect individuals from the potential intrusions of neurotechnologies on brain activity? ". If neurotechnology interferes with free will, who is responsible for actions?

Neuroscience are changing **our traditional philosophical and ethical views by providing information about the biological basis of our moral behavior. They challenge** the legal concept of free will, and thus the basis of legal responsibility.
Advances in neuroscience open new dilemmas for human rights → the right to keep one's thoughts private, the right to freedom of thought :

- **The challenge would be to respect human rights,** to preserve autonomy and freedom of thought through a legal framework:
- It provides a set of ethical, legal and philosophical **tools for responsible research .**

- ➢ **The Brecht report** of December 14, 2020, recommends the creation and legal protection of new "neuro-rights".
- ➢ **The Bioethics law** revised in 2020 / 2021, adopted on August 2, 2021.
- ➢ **The OECD recommendation** n°0457 on neurotechnologies published of 2019 and the n°0449 on AI
- ➢ Report of the **International Bioethics Committee of UNESCO** on the ethical issues of neurotechnology" in 2021
- ➢ And their implementation by a **task force** formed since 2021 → a charter is under development ...
- ➢ **Chile** becomes the first country in the world to establish "neuro-rights" in its Constitution, and thus to set them up as fundamental rights. https://nri.ntc.columbia.edu/
- ➢ Goering et al. 2021. Rommelfanger KS, Jeong SJ, et al, 2019. Ienca et al, 2021; 2022. Pfotenhauer et al, 2021.

Formulating legislation in response to the challenges imposed by neuroscience and neurotechnology would:

- ✓ **Calling for a more reflective neuroscientific practice, supported by the social sciences**
- ✓ Limit the potential abuses of brain data mining
- ✓ To integrate the development and use of these technologies with our fundamental societal and human values
- ✓ refer to recommendations for neuroscientists,
- ✓ call on startups, investors and researchers to take responsibility.

4 new rights in the face of neurotechnologies
(Ienca and Andorno)

1. the right to cognitive freedom
2. the right to privacy
3. the right to mental integrity
4. the right to psychological continuity

Topics in these recommendations

- The benefit/risk balance of neurotechnologies
- The values of personality, humanity, being a human
- The concepts of normality and pathology
- The principles of personal autonomy
- The principles of moral and legal responsibility
- The notions of mental intimacy
- The notion of informed consent

The challenge for neuroscientists and researchers, who are the custodians of their research, is to build with society.
Researchers and neurosciences research must:

- ✓ Anticipate and consider the potential impact and consequences of using their research and neurotechnologies in societal contexts and assess the benefits and risks.
- ✓ Be accountable for their research and concerned about these issues so that the public can in turn have confidence in and ownership of these neurotechnologies.

For if the users of these neurotechnologies do not trust our science, we will lose this unique opportunity to understand:

- **How these neurotechnologies and neurosciences will affect the future,** their impacts on humans, relationships, the job market, cybersecurity, the defense of our countries.
- And what potential they may bring to the lives of our citizens.

Citizen participation is essential in the development of neuroscience and neurotechnology public policies. It is therefore a challenge to encourage societal debate.
Society's acceptance or rejection of neurotechnologies is at stake, and thus the access or loss of knowledge in the market.