



**Euregio Summer School, 2026**  
**Neuroethics and Empowerment: Shaping Minds,**  
**Shaping the Future Responsibility in the Age of**  
**Neurotechnology**

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# Presentation Outline

- History of Neuroethics
- Concept of empowerment with Neurotechnology
- Common neuroethical issues arising
- Fishbowl role play
- Design a hypothetical neurotech device

# Which of these have you used this week?

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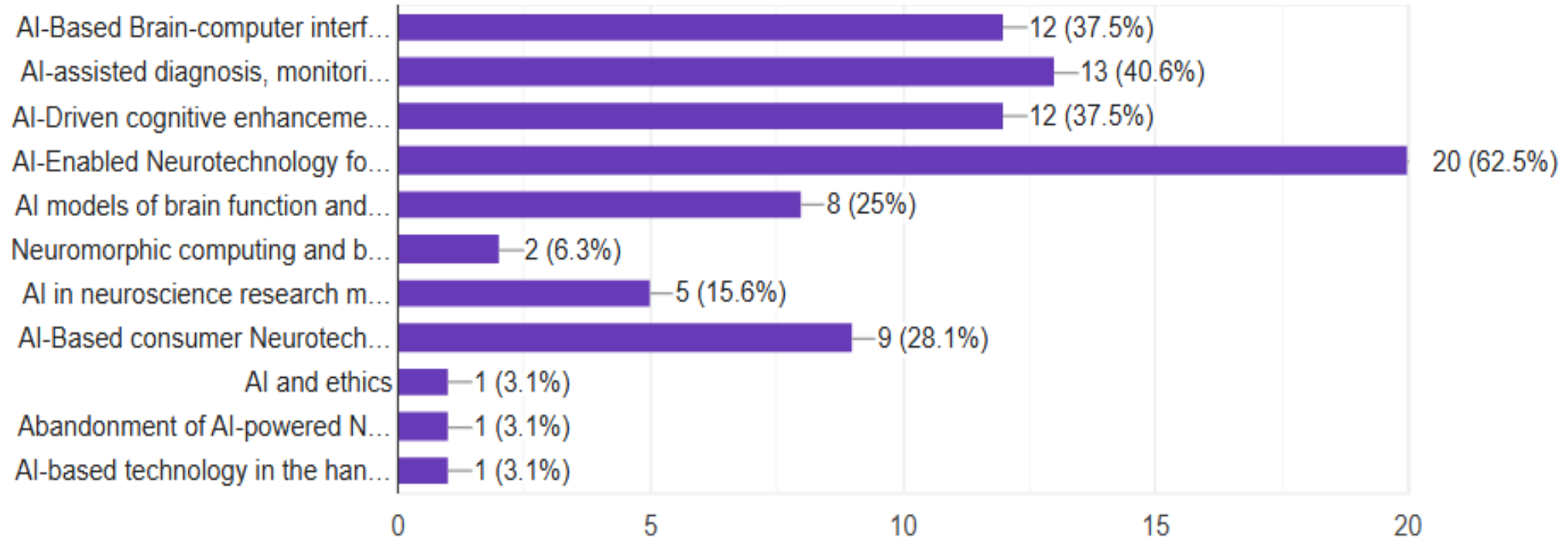


**For all you know about Neurotechnology, what excites or worries you most?**

<https://www.menti.com/al3ivievqgei>



# Concern for Neurotechnology among experts in Germany



## German Neurology and the ‘Third Reich’

Michael Martin<sup>a</sup> Heiner Fangerau<sup>a</sup> Axel Karenberg<sup>b</sup>

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# History of Neuroethics

Biomedical ethics is strongly shaped by neuroscience

- Third Reich’s “medical science” concerned neuroscience research, EEG experiments
- Leo Alexander, was a neurologist and psychiatrist was a key contributor to the Nuremberg Code, for research ethics
- Belmont report in 1978, a result was the unhappy legacy of thousands of psychosurgeries conducted in the USA

# Neuroethics cases in history

## CASE 01

### Karen Ann Quinlan

1975 • New Jersey, USA

Karen, 21, was found in a coma after alcohol and drug ingestion. She was placed on a respirator but never regained consciousness.

Her father asked that the ventilator be turned off. The hospital refused. The NJ Supreme Court ruled that a person has **the right to refuse medical care**, exercisable through a guardian.

Karen then breathed on her own — living 10 more years, never recovering.



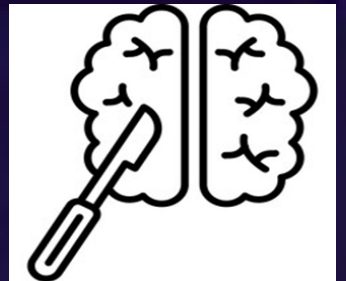
## CASE 02

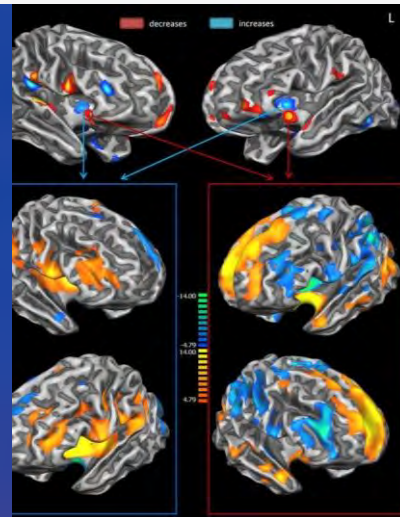
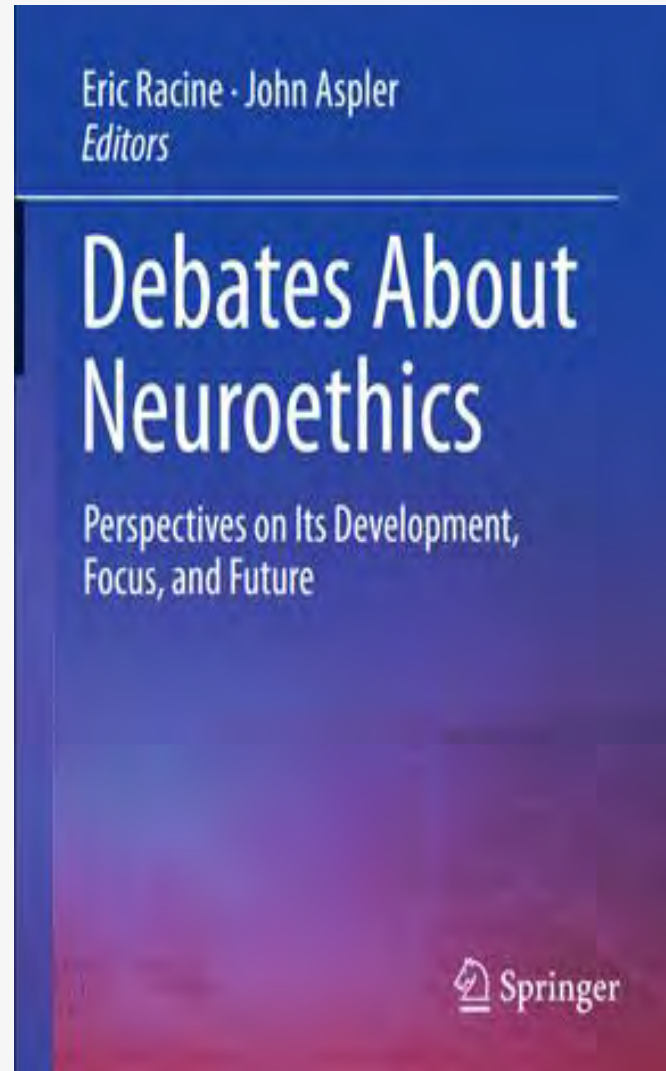
### The Lobotomy Epidemic

1930s-1950s • Global

In the 1930s, Egas Moniz proposed severing fibres between the frontal lobes to treat depression and anxiety.

Lobotomies became extraordinarily popular — Moniz won a Nobel Prize in 1949. An estimated 40,000 patients in the USA alone underwent the procedure, largely without scientific evidence of efficacy.





## Neuroethics Today

- Established in 2002, at a conference in San Francisco
- Following Neurotech developments FMRI, PET, CAT
- Neuroethics is a field that explores concerns tied to significant developments in Neuroscience, Neurology and Neurotechnology



## **But why not simply bioethics?**

Bioethics does not explicitly address questions of Neuroscience of ethics

- Responsibility for actions under modulation

Neuro data is not simply descriptive but inferential, disclosing what you are doing right now not simply what you are

- Intention
- Memory
- Perception
- Valuation
- Motor preparation
- Decision making

# What Are Neurotechnologies?

NEUROETHICS · MODULE 1

## DEFINITION

Devices and procedures used to ACCESS, MONITOR, INVESTIGATE, ASSESS, MANIPULATE, and/or EMULATE the structure and function of the neural system of natural persons.

## 6 KEY ACTIONS

Access

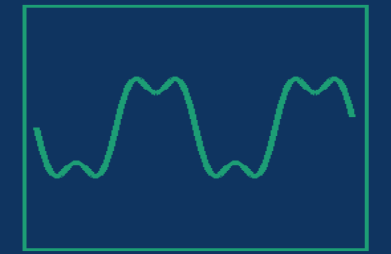
Monitor

Investigate

Assess

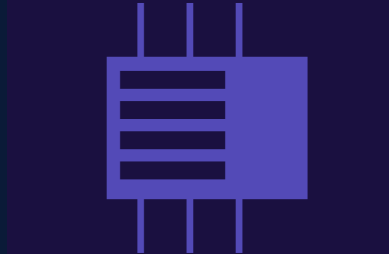
Manipulate

Emulate



## ACCESS & MONITOR

Reading brain signals — EEG headsets, wearable sleep & stress monitors



## ASSESS & INVESTIGATE

Clinical diagnostics — fMRI, PET scans, implanted electrode data

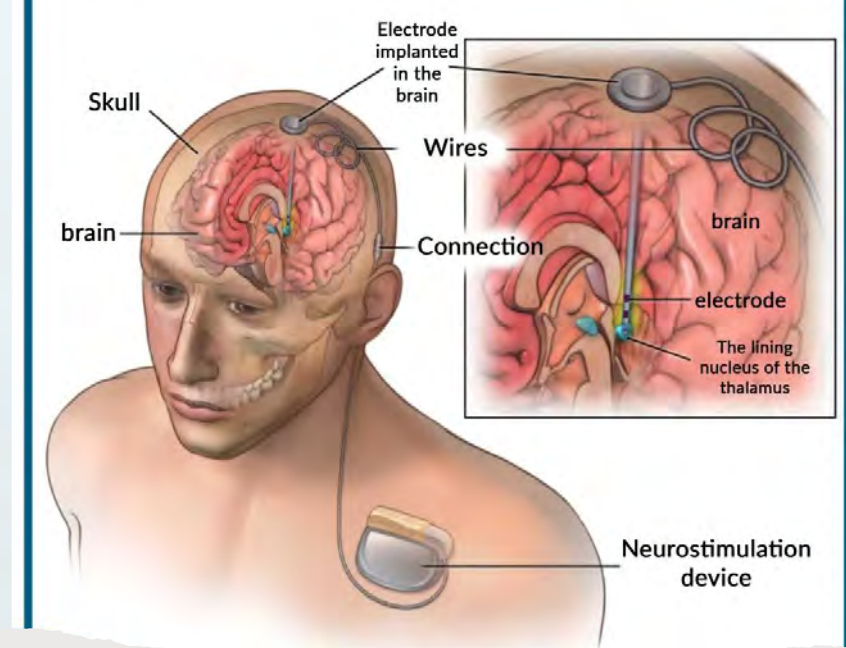


## MANIPULATE & EMULATE

Changing brain function — deep brain stimulation, TMS, BCIs

# Classification of Neurotechnology

Type of Neurotechnology	Non-Invasive	Invasive
Type 1: Measuring brain structure or function	Extracranial electroencephalography (EEG), functional magnetic resonance imaging (fMRI) can be connected to BCI	EEG/electrocorticography (ECoG), measures brain activity from the brain surface; stereo-electroencephalography (sEEG), implanted in specific brain regions
Type 2: Intervening in brain structure or function	Transcranial direct current stimulation (tDCS),ECT; repetitive transcranial magnetic stimulation (rTMS).	Deep-brain stimulation (DBS); sEEG, grid electrodes for epidural stimulation; vagal nerve stimulation (VNS)
Type 3: Measuring and intervening in brain structure or function	A BCI consisting of an extracranial EEG and extracranial stimulation in a closed-loop	Setup An implantable ECoG grid electrode that can both measure brain activity and deliver brain stimulation in a closed-loop setup



## EEG,TMS,DBS

DBS entails implanting electrodes into the patient's brain and a neurostimulator underneath their skin

## Other areas of Application

- Consumer market (e.g., BCIs for gaming, education, or meditation)
- Criminal justice (e.g., potentially as tools for lie detection)
- Military (e.g., potentially for cognitive enhancement or covert brain-to-brain communication)



# Creating Capabilities

THE HUMAN DEVELOPMENT APPROACH

MARTHA C. NUSSBAUM

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## Empowerment with Neurotechnology

Empowerment means providing the concrete opportunities to achieve fundamental functional capabilities, including: Life, bodily health, bodily Integrity, senses, affiliation etc

Martha Nussbaum

# Capability and Functionality

Capability	Functionality	Example of how neurotech can empower you to gain functionality?
Play	Being able to enjoy recreation, leisure, and fun	
Senses, Imagination, and Thought	Being able to think, learn, imagine, and express oneself freely	
Bodily Integrity	Freedom of movement and protection from violence or coercion	
Life	Being able to live a normal lifespan without premature death	

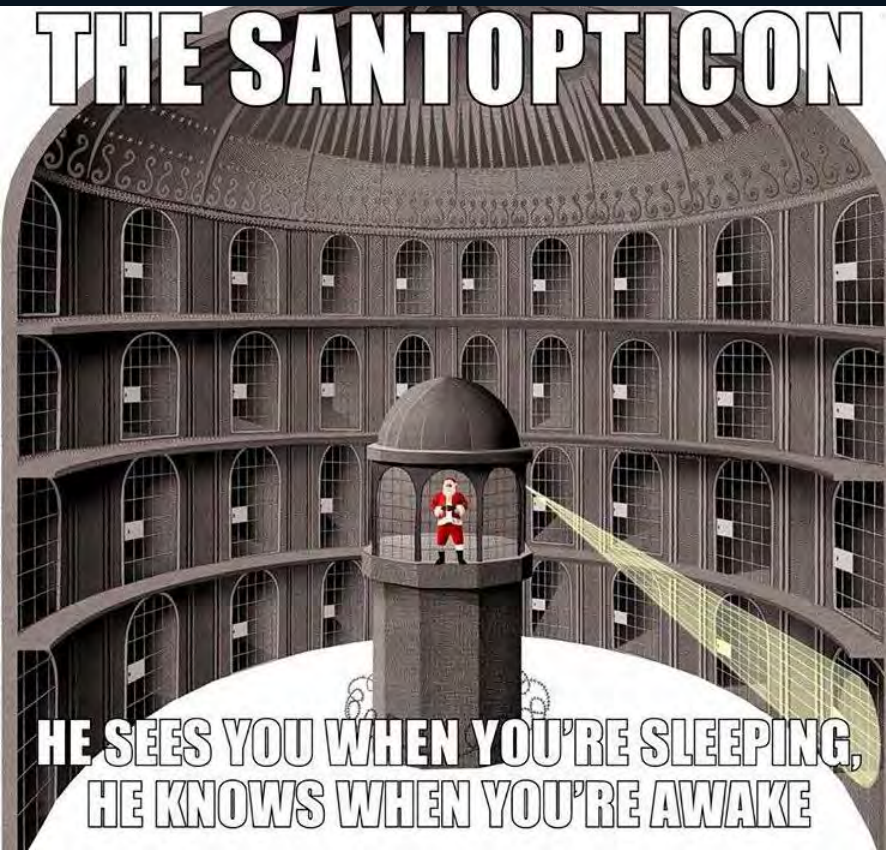
# Empowerment VS control

Empowerment through feedback

- Promotes autonomy, cognitive liberty, self awareness

Control through feedback

- Epistemic ethical issues
- Pressure, discrimination, coercion, manipulation and loss of privacy



# Empowerment Vs Control

Empowerment through neuromodulation both therapeutic and enhancement enables functionality

- Cognition, Perception, Attention, Memory and motor functions

The same technology could lead to:

- Identity loss, coercion, behavioural control and discrimination



## Other forms of empowerment

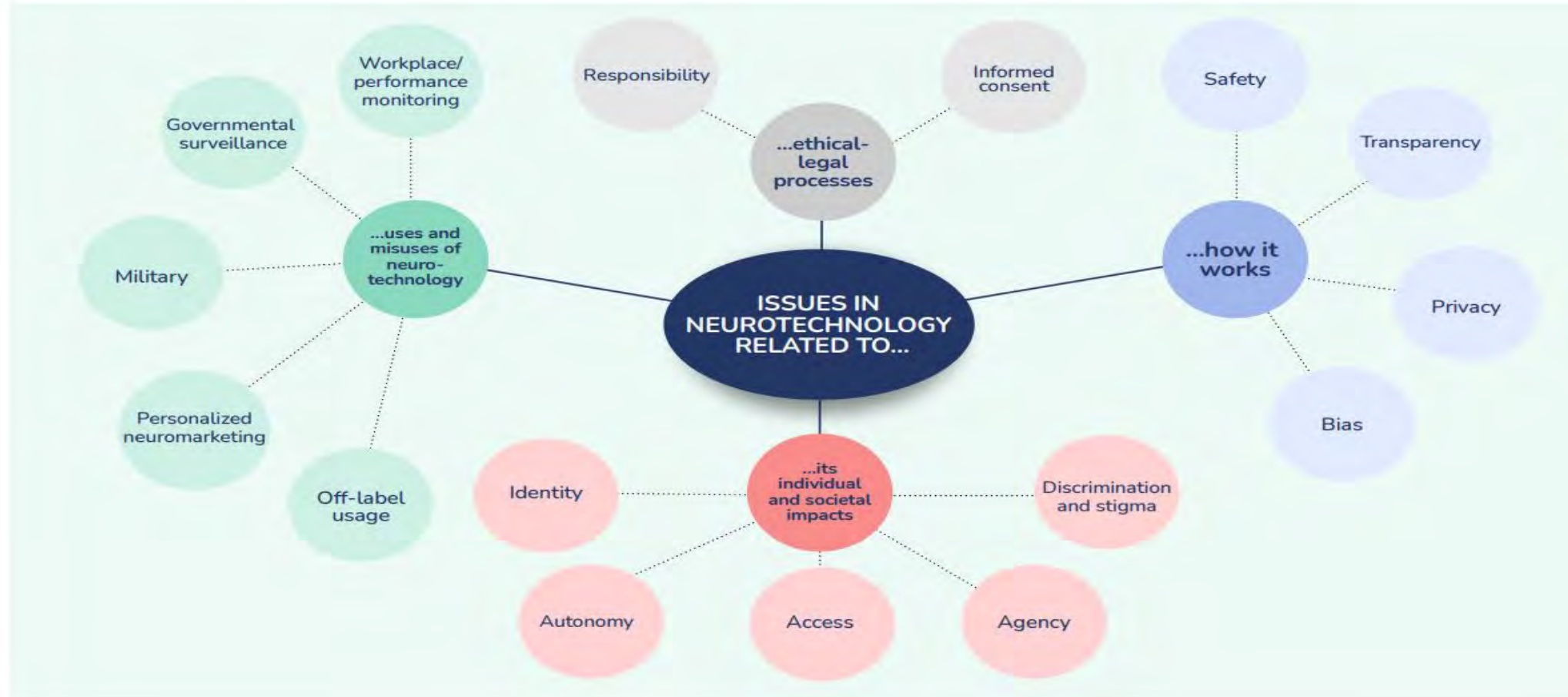
- DIY neurotechnology assembled at home framed as optimisation
- Biohacking groups without clear oversight
  - Cyber security
  - Validity of data
  - Responsibility and vulnerability
  - Harm on the skin

# Neuro-Artifact" Gallery

There are images and short descriptions of current neuro technology, each group should:

- Describe the empowerment such a tool promises and to which stakeholders
- Who benefits and who is at risk?
- Moral duty of developers, clinicians and institutes?
- Ethical tensions?

# Common ethical challenges related to neurotechnology



# Ethical Issues in How Neurotechnology Works



## Safety

Direct interaction with the brain creates unique physical & psychological risks.



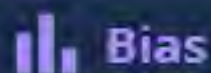
## Transparency

Complex data flows between devices, algorithms & institutions are hard to audit.



## Privacy

AI amplifies risk of data exposure and non-consensual use of neural data.



## Bias

Exclusion and misrepresentation of individuals and societies in training data.

## DID YOU KNOW?

- A preliminary fMRI study (n=7) found that non-invasive neurotechnology can decode imagined images and words, producing intelligible word sequences capturing the meaning of perceived and imagined speech and silent videos.
- A Meta AI study using EEG on 175 volunteers showed that neurotechnology in lab settings can decode which words and sentences participants are currently listening to — raising deep concerns about access to thoughts, perceptions, and emotions.

# Ethical Issues in the Individual & Societal Impacts of Neurotechnologies



## Access

Neurotechnologies remain unevenly distributed — access depends on wealth, geography, and healthcare infrastructure, deepening existing inequalities.



## Discrimination & Stigma

Biased data and biased interpretation of data risk reinforcing discrimination — and bias can emerge even from seemingly unbiased datasets.



## Loss of Identity

Enhancement alters cognition, personality and self. Forecasting autism or other conditions may also reshape how individuals understand their own identity.



## Autonomy & Agency

Neurotechnologies can subtly erode autonomy — altering decision-making, reducing self-determination, or enabling external influence over mental states.

# Ethical issues related to ethical-legal processes

## Consent

- Can a person with a closed loop BCI provide continuing consent?
- Future use in the face of sophisticated analytical methods
- Evolving boundaries for sensitive data
- Abandonment

# DID YOU KNOW THAT...?

➤ Wearable brain sensing headsets have been used to track the stress and awareness levels of school children<sup>77</sup> and employees,<sup>78</sup> raising public concerns about mental privacy, power dynamics, and who should have access to information about peoples' brain states.

Ethical issues  
related to uses and  
misuses of  
Neurotechnology

- Off label usage
- Workplace performance monitoring
- Military use
- Governmental monitoring
- Personalised neuromarketing

# Conceptual Grey Areas

- Invasive non invasive
- Evidence and hype
- Empowerment and vulnerability
- Medical and nonmedical neurotechnology

**Role play: Fishbowl debate on neural ethical issues 50 minutes**

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# **Design a Neurotechnology Tool**

Design a hypothetical neurotechnology and present what problem it addresses, how it empowers users, what ethical safeguards are built in, what unintended consequences might arise and how to govern or regulate it

- Minding rights: Mapping ethical and legal foundations of ‘neurorights’: <https://doi.org/10.1017/S0963180123000245>
- <https://www.nuffieldbioethics.org/wp-content/uploads/Neurotechnology-Literature-Review-WEB-FINAL.pdf>
- Fronda, G., Crivelli, D., & Balconi, M. (2019). Neurocognitive enhancement: Applications and ethical issues. *NeuroRegulation*, 6(3), 161–168. <https://doi.org/10.15540/nr.6.3.161>
- Muñoz, J.M., Marinaro, J.Á., Iglesias, J.A. et al. Effects of the first successful lawsuit against a consumer neurotechnology company for violating brain data privacy. *Nat Biotechnol* 42, 1015–1016 (2024). <https://doi.org/10.1038/s41587-024-02303-2>

<https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/emerging-technologies/neurotech-toolkit.pdf>

<https://cfg.eu/wp-content/uploads/Towards-Inclusive-EU-Governance-of-Neurotechnologies-Full-Report.pdf>

<https://www.nature.com/immersive/d41586-022-03810-5/index.html>