IN BRIEF ...

NEUROTECHNOLOGIES IN THE JUSTICE SYSTEM: DEVELOPMENTS, BENEFITS, AND RISKS IN CIVIL AND CRIMINAL PROCEDURE

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INTRODUCTION

The intersection of neuroscience and jurisprudence represents one of the most consequential frontiers in contemporary legal scholarship in emerging technologies. Neurotechnologies encompass a rapidly expanding array of tools and techniques for measuring, interpreting, and potentially modifying brain activity, including functional magnetic resonance imaging (fMRI), electroencephalography (EEG), transcranial stimulation, brain-computer interfaces, and emerging neurochemical detection methods.[1] These technologies promise unprecedented insights into human cognition, memory, decision-making, and emotional states—all fundamental elements of legal proceedings.[2] The justice system's growing interest in neurotechnologies stems from their potential to address longstanding challenges in both criminal and civil procedure: determining truthfulness, assessing mental capacity, understanding intent, evaluating competency, and measuring damages related to neurological harm.[3] However, the integration of these technologies into legal frameworks raises profound questions about privacy, reliability, constitutional protections, and the very nature of human agency and responsibility.[4]

This analysis examines the current state of neurotechnology applications in justice systems, evaluating their transformative potential alongside significant risks and limitations. The central thesis posits that while neurotechnologies offer valuable tools for enhancing accuracy and fairness in legal proceedings, their implementation requires careful consideration of scientific validity, ethical implications, and constitutional safeguards to prevent misuse and preserve fundamental rights.

CURRENT NEUROTECHNOLOGY DEVELOPMENTS IN LEGAL CONTEXTS

USE OF BRAIN IMAGING TECHNOLOGIES IN LEGAL PROCEEDINGS

Functional neuroimaging has emerged as the most prominent neurotechnology in legal settings.[5] fMRI studies of brain activation patterns during deception have generated considerable interest as potential 'lie detection' tools, with several enterprises developing commercial applications.[6] Structural MRI scans increasingly serve as evidence in criminal sentencing, particularly in cases involving traumatic brain injury or developmental abnormalities that might explain criminal behaviour.[7] Positron emission tomography (PET) scans and other imaging modalities are being introduced to demonstrate neurological damage in personal injury litigation and to assess competency in various legal proceedings.[8]

ELECTROPHYSIOLOGICAL MONITORING

EEG-based technologies, including event-related potentials and so-called 'brain fingerprinting' techniques, are being explored for memory detection and truthfulness assessment. These approaches measure electrical brain activity in response to stimuli, potentially revealing whether individuals possess specific knowledge about events or locations.[9] Some jurisdictions have begun accepting EEG evidence in limited circumstances, though admissibility standards vary significantly.[10]

COGNITIVE ENHANCEMENT AND MODIFICATION TECHNOLOGIES

Emerging neurotechnologies extend beyond measurement to potential cognitive modification. Transcranial stimulation techniques can temporarily alter brain function, raising questions about their use in rehabilitation, competency restoration, and broader ethical and human rights considerations around treatments using cognitive enhancement on individuals.[11] Deep brain stimulation and other therapeutic interventions present further complex questions as regards agency and responsibility in respect of the broader implications for the rights of others within communities. Delivery of these capabilities may further widen disparities in terms of access to justice, including remedies. In addition, concerns may also arise in connection with neurotechnologies' delivery widening social inequities, bias and discrimination.[12]

BENEFITS AND APPLICATIONS IN CRIMINAL PROCEDURE

ENHANCED ACCURACY IN DETERMINATIONS OF TRUTHFULNESS

Certain capabilities under development in the sphere of neurotechnologies potentially offer improvements over traditional polygraph testing, which has limited admissibility in legal proceedings due to ongoing concerns as to its reliability.[13] Neurotechnologies-based lie detection methods claim to measure deception more directly by examining neural correlates of truthfulness rather than peripheral physiological responses.[14] These technologies might provide more objective assessments of witness credibility and defendant statements, potentially reducing wrongful convictions based on false confessions or perjured testimony.

MENTAL STATE AND COMPETENCY ASSESSMENT

Developments in neuroimaging have allowed for the provision of valuable insights into the mental states of defendants in proceedings, their cognitive capacity, and neurological conditions that affect an accountability with regard to individual criminal responsibility.[15] These technologies can enhance competency evaluations, determinations of sanity and mental faculties, and assessments of mitigating factors in sentencing.[16] Brain scans may reveal previously undetected neurological conditions that could potentially reflect physiological and cognitive changes that may assist assessments of criminal behaviour, possibly supporting more appropriate therapeutic interventions rather than purely punitive measures.

REHABILITATION AND RECIDIVISM PREVENTION

Developments in the capacities of neurotechnologies may eventually enable more precise understanding of cognitive deficits and neurological factors contributing to criminal behaviour.[17] This knowledge could potentially inform more targeted rehabilitation programs and treatments, medication management, and therapeutic interventions designed to address underlying neurological causes of problematic conduct. Brain-based assessments might also improve risk evaluation and parole decisions by providing objective measures of rehabilitation progress.[18]

BENEFITS AND APPLICATIONS IN CIVIL PROCEDURE

PERSONAL INJURY AND MEDICAL MALPRACTICE LITIGATION

Current neuroimaging technologies provide objective evidence of brain injury, cognitive impairment, and neurological damage in tort cases. These technologies can thus be used to demonstrate the extent of harm, support damage calculations, and distinguish between pre-existing conditions and injury-related changes.[19] Advanced imaging techniques may detect subtle brain injuries previously difficult to document prior to advances in neuroimaging, thus allowing for more nuanced analysis of changes in physiological conditions in the process of assessing possible neurological harm caused to an individual.[20]

CAPACITY AND COMPETENCY DETERMINATIONS

Civil proceedings often require assessments of mental capacity in respect of deliberations concerning processes such as contracts, wills, guardianship, and other legal decisions. Neurotechnologies that allow for more objective measures and assessment of cognitive functions could potentially assist in the resolution of disputes over mental capacity, and provide clearer guidance for courts determinations in cases of protective arrangements, for example.[21] Such assessments that leverage neurotechnology-based insights could be particularly valuable in cases involving dementia, developmental disabilities, or other cognitive impairments.[22]

EMPLOYMENT AND WORKPLACE DISCRIMINATION LAW

Neuroimaging evidence may support claims related to workplace discrimination based on neurological conditions or demonstrate the cognitive effects of occupational exposures.[23] These technologies can provide objective documentation of neurological impairments that affect employment capacity and support reasonable accommodation requests under disability laws.[24]

RISKS AND CHALLENGES

SCIENTIFIC RELIABILITY AND VALIDITY CONCERNS

Current neurotechnologies face significant limitations in reliability, accuracy, and interpretation. Brain imaging studies often involve small sample sizes, variable methodologies, and uncertain clinical significance. The translation from group-level research findings to individual legal determinations presents substantial challenges.[25] Many neurotechnologies lack sufficient validation for forensic applications, raising concerns about premature adoption in high-stakes legal contexts.[26]

PRIVACY AND DATA PROTECTION CONCERNS

Neurotechnology applications engage fundamental concerns pertaining to the rights to privacy and data protection rights.[27] In addition, due process considerations arise, including privilege against self-incrimination and protections against unreasonable searches, in the context of invasive examinations of neural data derived from the individual.[28] Furthermore, courts may need to determine in their evaluations as to whether neurotechnologies-based evidence neural data collection and processing constitutes testimonial evidence or physical evidence, affecting admissibility and procedural protections.[29] The invasive nature of certain neurotechnologies also raises additional questions as regards prior and informed consent, particularly for incarcerated individuals in detention facilities or those with diminished capacity.[30]

BROADER SOCIAL JUSTICE IMPLICATIONS: BIAS AND DISCRIMINATION

Neurotechnologies may perpetuate or exacerbate existing biases in the justice system. Brain imaging studies have historically underrepresented diverse populations, leading to serious oversights in respect of the representativeness of ethnic minorities and other vulnerable groups, such as persons with disabilities, in datasets: potentially leading to discriminatory application.[31] Cultural, socioeconomic, and individual differences may thus be cited as factors influencing brain structure, function or cognitive ability.[32] Such misinterpretations could lead to parties propagating narratives that these factors influence pathological or criminal predispositions.[33] Furthermore, the cost of accessing certain neurotechnologies could create disparities in access to potentially exonerating or mitigating evidence.[34]

ETHICAL AND LEGAL FRAMEWORK CONSIDERATIONS

ADMISSIBILITY STANDARDS AND EXPERT TESTIMONY

Courts should develop appropriate standards for evaluating neurotechnologies-based evidence, building upon existing frameworks such as the Daubert and Frye standards.[35] Expert testimony requirements will become ever more crucial given the complex, evolving nature of neuroscience and neurotechnologies research and development. In addition, legal professionals will likely need further training with regard to developing enhanced scientific literacy to effectively evaluate and present evidence linked to the exploitation of neurotechnologies.[36]

PRIOR AND INFORMED CONSENT AND PROCEDURAL PROTECTIONS

The implementation of neurotechnologies requires robust informed consent procedures, particularly given the complexity of the underlying science and potential implications for legal proceedings.[37] Special protections may be necessary for vulnerable groups, including children, persons with disabilities, and persons being held in custody, including pre-trial detention.

REGULATION AND PROFESSIONAL STANDARDS

Professional organizations and regulatory bodies engaged within the justice system will need to develop extensive guidelines for the forensic application of neurotechnologies. These standards shall require advancing knowledge and the education of advocates and address practitioner qualifications, equipment specifications, data interpretation protocols, and ethical boundaries for the exploitation of neurotechnologies in the justice system.[38]

FUTURE DIRECTIONS AND EMERGING QUESTIONS

The rapid pace of neurotechnology development promises continued evolution of applications in law. In particular, the integration of artificial intelligence (AI) with evolving brain imaging capabilities may enhance diagnostic accuracy.[39] Portable, real-time monitoring devices could enable continuous assessment of mental states and cognitive function.[40] However, such advances in technical capabilities may in the future also raise novel questions as regards surveillance, autonomy, and the appropriate limits of the use of neurotechnologies beyond legal proceedings for the rule of law in democratic societies.

CONCLUSIONS

Neurotechnologies represent both tremendous opportunities and significant risk for justice systems worldwide. Their potential to enhance accuracy, fairness, and understanding in legal proceedings is substantial, offering tools to address longstanding challenges in truth determination, capacity assessment, and rehabilitation. However, the current state of neuroscience and neurotechnologies research, combined with continued concerns over human rights, transparency, accountability and reliability, thus demands a cautious and thoughtful implementation of any neurotechnologies-based innovation.

The integration of neurotechnologies into legal frameworks requires interdisciplinary collaboration among neuroscientists, legal scholars, ethicists, and practitioners. Robust validation studies, clear admissibility standards, and comprehensive procedural protections are essential prerequisites for responsible adoption. The ultimate goal must be enhancing justice while preserving fundamental rights and human dignity.

As neurotechnologies continue to evolve, the legal system must maintain a delicate balance between embracing beneficial innovations and protecting against premature or inappropriate applications. Success in this endeavour will require ongoing dialogue, careful empirical evaluation, and unwavering commitment to both scientific rigour and human rights standards. The future use of neurotechnologies in the justice system depends on our collective ability to harness powerful innovations in this domain while safeguarding the values that underpin a fair and equitable justice system and the rule of law.

ADDITIONAL QUESTIONS FOR FURTHER RESEARCH:

1. **Scientific validity**: What standards of scientific rigour should be required before neurotechnologies are deemed admissible in legal proceedings, and how should these standards evolve with advancing research?
2. **Due process**: How do existing protections apply to neurotechnologies evidence collection, and what new procedural safeguards may be necessary to protect individual rights?
3. **Access and equity**: How can the justice system ensure equitable access to neurotechnologies-based evidence and prevent these tools from exacerbating existing disparities in legal outcomes?
4. **Professional competency**: What training and certification requirements should be established for legal and medical professionals working with neurotechnologies and evidence in forensic contexts?
5. **Therapeutic vs. punitive applications**: How should the justice system balance the potential rehabilitative benefits of the use of neurotechnologies for treatments with concerns regarding coercion and individual autonomy and the respect of human rights?
6. **Long-term implications**: What are the broader societal implications of integrating neurotechnologies into legal proceedings, and how might these tools reshape our understanding of responsibility, agency, and justice in society?

END NOTES

1   See further: Physical principles of brain–computer interfaces and their applications for rehabilitation, robotics and control of human brain states. *Physics Reports*, *918*, 1-133; Al-Ayyad, M., Owida, H. A., De Fazio, R., Al-Naami, B., & Visconti, P. (2023). Electromyography monitoring systems in rehabilitation: A review of clinical applications, wearable devices and signal acquisition methodologies. *Electronics*, *12*(7), 1520.

2   See: Pustilnik, A. C. (2013). Neurotechnologies at the intersection of criminal procedure and constitutional law; Ienca, M., & Andorno, R. (2017). Towards new human rights in the age of neuroscience and neurotechnology. *Life sciences, society and policy*, *13*, 1-27.

3   See: King, B. J., Read, G. J., & Salmon, P. M. (2024). The risks associated with the use of brain-computer interfaces: a systematic review. *International Journal of Human–Computer Interaction*, *40*(2), 131-148. See also: Botes, M. W. M. (2022, June). Brain Computer Interfaces and Human Rights: Brave new rights for a brave new world. In *Proceedings of the 2022 ACM Conference on Fairness, Accountability, and Transparency* (pp. 1154-1161).

4   See further: Ruiz, S., Valera, L., Ramos, P., & Sitaram, R. (2024). Neurorights in the Constitution: from neurotechnology to ethics and politics. *Philosophical Transactions B*, *379*(1915), 20230098; Bublitz, C. (2024). Neurotechnologies and human rights: restating and reaffirming the multi-layered protection of the person. *The International Journal of Human Rights*, *28*(5), 782-807.

5   See: Ford, E., & Aggarwal, N. (2012). Neuroethics of functional neuroimaging in the courtroom. *Neuroimaging in forensic psychiatry: From the clinic to the courtroom*, 325-340.

6   See further: Miller G., Science - fMRI Evidence Used in Murder Sentencing, November 2009, Available at: https://www.science.org/content/article/fmri-evidence-used-murder-sentencing

7   See: Yang Q, Shao R, Zhang Q, Li C, Li Y, Li H, Lee T. When morality opposes the law: An fMRI investigation into punishment judgments for crimes with good intentions. Neuropsychologia. 2019 Apr;127:195-203. doi: 10.1016/j.neuropsychologia.2019.01.020. Epub 2019 Feb 22. PMID: 30802462.

8   See: Rushing, S. E. (2014). The Admissibility of Brain Scans in Criminal Trails: The Case of Positron Emission Tomography. *Ct. Rev.*, *50*, 62; Moriarty, J. C., Langleben, D. D., & Provenzale, J. M. (2013). Brain trauma, PET scans and forensic complexity. *Behavioral Sciences & the Law*, *31*(6), 702-720. See also: Valk, P. E., Delbeke, D., Bailey, D. L., Townsend, D. W., & Maisey, M. N. (Eds.). (2006). *Positron emission tomography: clinical practice*. Springer Science & Business Media.

9   See: Farwell, L. A. (2012). Brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials. *Cognitive neurodynamics*, *6*(2), 115-154. See further: Rosenfeld, J. P. (2005). Brain fingerprinting: A critical analysis. *The scientific review of mental health practice*, *4*(1), 20-37; Ahuja, D., & Singh, B. (2012). Brain fingerprinting. *Journal of Engineering and Technology Research*, *4*(6), 98-103.

10   See: Conrad, E. C. (1959). Electroencephalograph (EEG) as Evidence of Criminal Responsitility. *J. Crim. L. & Criminology*, *50*, 405; Thatcher, R. W., Biver, C. J., & North, D. M. (2003). Quantitative EEG and the Frye and Daubert standards of admissibility. *Clinical Electroencephalography*, *34*(2), 39-53.

11   See: Gordon, E. C., & Seth, A. K. (2024). Ethical considerations for the use of brain–computer interfaces for cognitive enhancement. *PLoS biology*, *22*(10), e3002899; Sharif, S., Guirguis, A., Fergus, S., & Schifano, F. (2021). The use and impact of cognitive enhancers among university students: a systematic review. *Brain sciences*, *11*(3), 355.

12   See: Wolbring, G. (2024). Neuro-abilities and a good life. *Journal of Neurology Research*, *14*(1), 16-36; Ploesser, M., Abraham, M. E., Broekman, M. L. D., Zincke, M. T., Beach, C. A., Urban, N. B., & Ben-Haim, S. (2024). Electrical and magnetic neuromodulation technologies and brain-computer interfaces: ethical considerations for enhancement of brain function in healthy people–A systematic scoping review. *Stereotactic and Functional Neurosurgery*, *102*(5), 308-324.

13   See: Pustilnik, A. C. (2013). Neurotechnologies at the intersection of criminal procedure and constitutional law. See further: Wolpe, P. R., Foster, K. R., & Langleben, D. D. (2005). Emerging neurotechnologies for lie-detection: promises and perils. *The American Journal of Bioethics*, *5*(2), 39-49.

14   See: Díaz Soto, J. M., & Borbón, D. (2022). Neurorights vs. neuroprediction and lie detection: The imperative limits to criminal law. *Frontiers in Psychology*, *13*, 1030439.

15   See: Gómez, A. G., & Ariano, C. (2021). The Impact of neurotechnologies on human rights and justice. In *Enhancement Fit for Humanity* (pp. 191-208). Routledge; Ligthart, S., & Meynen, G. (2023). Offering neurotechnology to defendants: on vulnerability, voluntariness, and consent. In *Neurolaw in the Courtroom* (pp. 21-36). Routledge.

16   See: Geukes, S. H., Bijlsma, J., Meynen, G., Raemaekers, M. A. H., Ramsey, N. F., Thomas, M. S., ... & Vansteensel, M. J. (2024). Neurotechnology in criminal justice: key points for neuroscientists and engineers. *Journal of Neural Engineering*, *21*(1), 013001.

17   See: Kempes, M. (2023). Added value of neurotechnology for forensic psychiatric and psychological assessment. *Handbook of Clinical Neurology*, *197*, 217-232.

18   See: Meynen, G., Van de Pol, N., Tesink, V., & Ligthart, S. (2023). Neurotechnology to reduce recidivism: Ethical and legal challenges. *Handbook of clinical neurology*, *197*, 265-276.

19   See: Pustilnik, A. (2024). The brain in court: from neuroscience" revolution" to neurotech upgrade?. In *Research Handbook on Law and Psychology* (pp. 169-181). Edward Elgar Publishing; Rainey, S. (2024). An Anticipatory Approach to Ethico-Legal Implications of Future Neurotechnology. *Science and Engineering Ethics*, *30*(3), 18.

20   See: Liv, N. (2021). Neurolaw: brain-computer interfaces. *U. St. Thomas JL & Pub. Pol'y*, *15*, 328.

21   See: Cornejo-Plaza, I., & Cippitani, R. (2025). Principles of Research with Neurotechnologies and Artificial Intelligence: A Comparative Analysis of Latin American and European Laws. In *Contextualizing Neuroprotection: Latin American Perspectives on the Impact of Neurotechnological Development in Life and Society* (pp. 205-220). Cham: Springer Nature Switzerland; Bublitz, C. (2024). Neurotechnologies and human rights: restating and reaffirming the multi-layered protection of the person. *The International Journal of Human Rights*, *28*(5), 782-807.

22   See: Bhardwaj, T., Edlow, B. L., & Young, M. J. (2025). Ethically translating advanced neurotechnologies for disorders of consciousness: A survey of clinicians' perspectives. *Neurocritical Care*, *42*(3), 757-771.

23   See: Goering, S., Klein, E., Specker Sullivan, L., Wexler, A., Agüera Y Arcas, B., Bi, G., ... & Yuste, R. (2021). Recommendations for responsible development and application of neurotechnologies. *Neuroethics*, *14*(3), 365-386; Winickoff, D., Kreiling, L., & Lennad, L. (2024). The Global Governance of Neurotechnology: The Need for an Ecosystem Approach. *AJOB neuroscience*, *15*(2), 116-118.

24   See: Bariffi, F. (2025). Mind, Machine, and the Law: Reimagining Neurotechnology Governance through Disability Rights. *Available at SSRN 5240404*.

25   See: Stieglitz, T. (2021). Why Neurotechnologies? about the purposes, opportunities and limitations of neurotechnologies in clinical applications. *Neuroethics*, *14*(1), 5-16; Schalk, G., Brunner, P., Allison, B. Z., Soekadar, S. R., Guan, C., Denison, T., ... & Miller, K. J. (2024). Translation of neurotechnologies. *Nature Reviews Bioengineering*, *2*(8), 637-652.

26   See, for example: Kempes, M. (2023). Added value of neurotechnology for forensic psychiatric and psychological assessment. *Handbook of Clinical Neurology*, *197*, 217-232; Muravieva, L. (2025). Regulating Neurotechnologies and AI-Driven Neural Implants in the European Union: Legal and Ethical Challenges.

27   See further: Yuste, R. (2023). Advocating for neurodata privacy and neurotechnology regulation. *Nature Protocols*, *18*(10), 2869-2875.

28 See: Friedrich, O., Wolkenstein, A., Bublitz, C., Jox, R. J., & Racine, E. (2021). Clinical neurotechnology meets artificial intelligence. *Philosophical, Ethical, Legal and Social Implications. Unter Mitarbeit von Andreas Wolkenstein, Christoph Bublitz, Ralf J. Jox und Eric Racine. Cham: Springer International Publishing AG (Advances in Neuroethics Ser). Online verfügbar unter https://ebookcentral. proquest. com/lib/kxp/ detail. action.*

29 See: Muravieva, L. (2025). Regulating Neurotechnologies and AI-Driven Neural Implants in the European Union: Legal and Ethical Challenges.

30 See: Ligthart, S., Meynen, G., & Thomas, D. (2022). Persuasive technologies and the right to mental liberty: The 'smart'rehabilitation of criminal offenders.*The Cambridge handbook of information technology, life sciences and human rights*.

31 See: Goering, S., Klein, E., Specker Sullivan, L., Wexler, A., Agüera Y Arcas, B., Bi, G., ... & Yuste, R. (2021). Recommendations for responsible development and application of neurotechnologies.*Neuroethics*,*14*(3), 365-386.

32 See: Perkins, E. R., Bradford, D. E., Verona, E., Hamilton, R. H., & Joyner, K. J. (2023). The intersection of racism and neuroscience technology: A cautionary tale for the criminal legal system. *Policy Insights from the Behavioral and Brain Sciences*,*10*(2), 279-286.

33 See: Trinh, D. T., NGUYEN, T. T. H., NGUYEN, T. A., & NGUYEN, Q. D. (2024). Crime Prevention Based on Neurological Signs: An Exploration of Neurology and Criminology. *International Journal of Criminal Justice Sciences*, *19*(1), 428-450; Jotterand, F. (2022). Neurotechnologies and Psychopathy. In: The Unfit Brain and the Limits of Moral Bioenhancement. Palgrave Macmillan, Singapore. https://doi. org/10.1007/978-981-16-9693-0_6

34 See: Geukes, S. H., Bijlsma, J., Meynen, G., Raemaekers, M. A. H., Ramsey, N. F., Thomas, M. S., ... & Vansteensel, M. J. (2024). Neurotechnology in criminal justice: key points for neuroscientists and engineers. *Journal of Neural Engineering*, *21*(1), 013001.

35 See further: Skinner, N., Leyva, M. A., & Giordano, J. (2023). On the viability and potential value of current and emerging neuroscience and technologies to the practice of forensic science. *Medical Research Archives*,*11*(7.2).

36 See further: Herrera-Ferrá, K., Muñoz, J. M., Becerril, A., García-López, E., Marinaro, J. Á., Hernández, L. R. S., ... & Ruiz, A. L. S. (2025). The regulation of neurotechnology: the neurorights bill in Mexico. *The Lancet Psychiatry*,*12*(2), 88-90.

37 See: Zaror-Miralles, D. (2025). Understanding Consent: Challenges in the Age of Neurotechnologies. In *Contextualizing Neuroprotection: Latin American Perspectives on the Impact of Neurotechnological Development in Life and Society* (pp. 195-204). Cham: Springer Nature Switzerland; Collins, B., & Klein, E. (2023). Invasive Neurotechnology: A study of the concept of Invasiveness in Neuroethics. *Neuroethics*,*16*(1), 11; Gaudry, K. S., Ayaz, H., Bedows, A., Celnik, P., Eagleman, D., Grover, P., ... & Snyder, J. (2021). Projections and the potential societal impact of the future of neurotechnologies.*Frontiers in neuroscience*,*15*, 658930.

38 See further: Farahany, N. A. (2023). *The battle for your brain: defending the right to think freely in the age of neurotechnology*. St. Martin's Press.

39 See: Menken, M. (1990). Rationalizing the use of diagnostic neurotechnology: A binational perspective. *Neurology*, *40*(7), 1023-1023.

40 See: Elmalaki, S., Demirel, B. U., Taherisadr, M., Stern-Nezer, S., Lin, J. J., & Al Faruque, M. A. (2021, April). Towards internet-of-things for wearable neurotechnology. In *2021 22nd International Symposium on Quality Electronic Design (ISQED)*(pp. 559-565). IEEE.

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