

Review Article

Thoughts Unshielded: A Human-Rights Ethos In Brain-Based Forensic Science

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Abstract

“Thoughts Unshielded: A Human-Rights Ethos for Brain-Based Forensic Science” examines the frontier where emerging neuro-forensic technologies confront fundamental human rights. In the last decade, over 45 peer-reviewed studies have demonstrated that “functional Magnetic Resonance Imaging (fMRI)” and “Electroencephalography” (EEG) can differentiate truthful from deceptive responses with laboratory accuracies ranging from 87 percent to 95 percent. However, these data conceal outstanding issues of dependability in applied contexts, where cognitive bias, inter-subject variation, and situational stress can lower accuracy to as much as 20 percent.

Keeping our discussion to ‘Article 17’ of the ‘International Covenant on Civil and Political Rights (ICCPR)’ and the emerging doctrine of cognitive liberty, we suggest the Mind Privacy Test: a four-faceted evaluative test in light of (1) Voluntariness: it is consent informed and can it be withdrawn (2) Transparency: these are the methods and data accessible to independent audit (3) Proportionality: it is the invasion of mental processes proportional to proven public interest and (4) Safeguards: these are legal remedies and expungement provisions safeguarded against abuse.

Philosophically, this chapter draws on Joseph Raz’s conception of mental sovereignty and Ronald Dworkin’s integrity principle to argue that unmediated access to neural data constitutes an unprecedented invasion of personal identity. Legally, we analyze landmark judgments, such as the European Court of Human Rights decisions on non-invasive biometric evidence and contrast them with nascent statutes in India the United States and Canada that either tacitly permit or explicitly ban neuro-interrogation. This piece of literature further illustrates the practical application of the Mind Privacy Test through three case hypotheticals: a terrorism-related investigation in which fMRI was used without counsel present; a corporate espionage

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nage probe leveraging EEG-based memory detection; and a domestic violence hearing challenged on grounds of self-incrimination.

By interweaving technical data, doctrinal analysis, and policy recommendations, this chapter offers an unexplored yet urgently needed roadmap for policymakers, forensic practitioners, and human-rights advocates. It asserts that only a robust, philosophically informed human-rights framework can reconcile state security interests with the inviolable sanctity of individual thought.

Keywords: Brain-Based Evidence; Cognitive Liberty; Mind Privacy Test; Mental Sovereignty; Neuro-forensics

Introduction

At the Threshold of the Mind’s Citadel

The human mind has historically been treated by law, philosophy and daily practice as the ultimate secure inner sanctum of personhood, a private citadel where belief, memory and intention continue to be out of visible reach. New neuro-forensic methods [1-19] above all functional magnetic resonance imaging (fMRI) [20] and electroencephalography (EEG) [21] based detection of memory [22] now promise to redraw that line. What until recently was an ethical [23] thought experiment has become a concrete forensic reality: devices that allege, in a laboratory setting, to differentiate between deception and truth and find remnants of memory. [24] The allure is addictive for policymakers and investigators: accelerated finding of truth, hitherto impenetrable facts known and new instruments to prevent and punish crime. The danger is also stark: deep threats to dignity, autonomy and the very notion of mental privacy risks that standard legal instruments are not well designed to meet [25].

Empirical work published recently indicates dramatic laboratory performance for some brain-based methods, with results indicating high accuracy in controlled experiments. But those statistics conceal a more profound issue. When taken out into real-world environments under duress, cultural variation, hostile environments and institutional pressure, accuracy declines, sometimes dramatically. The chasm between experimental promise and applied reliability is not technical but normative. The context is different when neural data are being used to deny liberty, secure convictions, or decide eligibility for state action [26]. This essay starts with the assumption that the law should approach access to and interrogation of the mind not as a standard evidentiary practice but as an invasion of the highest degree, raising constitutional rights, international human-rights standards and fundamental philosophical beliefs regarding personhood [27].

The Age of Neural Evidence: Promise, peril and public imagination

We live in a time when a new techno-legal rhetoric has arisen: brain data as evidence [28] neural signatures as ‘facts’. That rhetoric has shifted from learned journals to popular imagination [29] and prosecutorial practice. Governments and corporations refer to neural methods as instruments of truth; journalists promise a future

where the inner life is readable. But public enthusiasm exists uneasily alongside unease. The same advances that are giving us hope for more vigorous investigation create visions of a panoptic future, where ideas are cropped and deployed against their possessors. The legal challenge is thus twofold: to evaluate empirical reliability truthfully and to design legal categories that honor the normative uniqueness of the mind. If the law approaches neural outputs as routine test results, it threatens to normalize an uncommon violation.

When Accuracy Confronts Ambiguity: Closing the laboratory–courtroom gap

The laboratory tests normally carried out in controlled settings with subjects who give their consent, reduced complexity of task and restricted external variables have yielded high-visibility accuracy rates. Yet, courts rather than laboratories face contamination: stress, trauma, medication, coercion, variability across cultures and the adversarial process that can skew both physiological response and interpretive framework. [30] The methodological gap is therefore also an evidentiary gap: the admissibility doctrines (reliability, relevance, probative value as against prejudicial effect) were not written with neural interrogation in view. The legal system needs to fill the gap between laboratory promise and courtroom prudence by coming up with tailored standards for validation, criteria for admissibility and processes that consider the specific vulnerabilities of neuro-data [31]. Lacking such adaptation, courts hazard bringing scientific authority into court without bringing the caveats with which that authority is imbued [32].

The Mind as the Last Sanctuary: Why mental privacy requires immediate legal protection

Mental privacy [33] is not just another privacy interest; it is essential to agency and dignity. Access to neural information [34] can expose not just discrete facts (e.g., recognizing a face) but patterns implicating beliefs, predispositions and identity. Philosophical traditions that make thought the seat of autonomy the very basis of moral responsibility reinforce the seriousness of unmediated neural access. International human-rights texts characterize some intrusions as arbitrary or degrading; constitutional systems codify protections from self-incrimination [35] and coercive interrogation. When the mind is made investigable, these protections must be re-examined and reinforced. Legal guardianship has to be anticipatory, not reactive, looking ahead to potential forms of abuse and setting procedural and substantive hurdles in advance of neural methods becoming standard [36].

Mapping the Intellectual Journey: From philosophical principles to enforceable legal standards

This essay embarks on an intellectual journey from philosophical assumptions to specific legal directives. The journey starts with the issues of identity and autonomy: how does it happen that law can be respectful of mental sovereignty? It traverses doctrinal ground human-rights treaties, constitutional safeguards and comparative law and intersects technical realities of neuro-forensics [37]. The destination is pragmatic: to suggest an evaluative model that is philosophically sound, legally viable and empirically supported. The goal is neither to repudiate technology in its entirety nor embrace it unconditionally, but to embed neural proof in a calibrated legal framework that acknowledges the solitary status of the mind but allows for tight, justifiable applications under severe conditions [38].

Revealing the Faultiness: Where law, technology and human dignity break apart

Lastly, the introduction identifies the main faultlines the paper will deal with. First, an epistemic break: the self-assurance generated by scientific assertions that they create certainty when, in practice, they usually do not. Second, a normative break: the restricted lexicon of harms peculiar to cognitive intrusion within law. Third, an institutional break: differences between jurisdictions generating arbitrage opportunities and unequal protection of individuals [39]. These fractures yield pragmatic harms wrongful convictions, chill on expressive freedom and disproportionate burdens on marginalized populations and theoretical conundrums regarding the meaning of consent and the extent of state power [40]. The rest of the paper charts these fractures in greater detail and suggests a measured, rights [41] based response: a Mind Privacy Test to balance legitimate state interests against the inviolable sanctuary of the mind [42].

Charting the Terrain Law, Philosophy and the Neural Frontier

Before one can control something, one must first be able to view it clearly. The following outlines the technical tools that render brain-based evidence conceivable, the philosophical framework that describes why the mind should receive special legal protection and the current human rights and comparative-law boundaries that will constrain or not constrain the use of brain-based evidence. The target is diagnostic: to explain what the technologies do, why they are important for doctrines of personhood and where law today already comes or conspicuously falls short of coming to the problem [43].

Tools of Thought-Detection: fMRI, EEG and the forensic fascination

Functional magnetic resonance imaging (fMRI) [44] and electroencephalography (EEG) are two different pathways into neural information. fMRI quantifies haemodynamic responses alterations in blood flow believed to track neural activity creating spatially rich maps of brain [45] areas that ‘light up’ during specific tasks. EEG captures electrical potentials on the scalp, providing millisecond resolution of brain dynamics at the expense of much cruder localization. On technical grounds, fMRI provides anatomical specificity; EEG provides temporal resolution.

Forensic scientists and marketers offer various uses: lie-detection [46] recognition-based tests of memory and state-inference (e.g., intent, familiarity). Controlled-laboratory experiments with encouraging sensitivity and specificity results draw legal attention. Forensic interest, however, threatens to confuse statistical association with forensic determinability. Neural activity is neither crisp indicator of discrete factual content nor independent of context distortion. Signal-to-noise problems, personal neuroanatomical differences, drug impacts, tiredness, cognitive processing differences across cultures and conscious countermeasures may all undermine validity. Commercial preprocessing pipelines and machine-learning [47] classifiers make things even more difficult to interpret: a result tagged “recognition” is the output of tiers of assumptions, filters and model selections many of which are imperceptible to judges, counsel and the test-taker. The forensic potential thus rests on two unsolved issues. First, ecological validity: does accuracy developed in the lab persist in adversarial, high-pressure and clinically diverse environments? Second,

interpretive transparency: can the models and methods used to translate raw neural patterns into usable statements in court be meaningfully audited by third-party experts? Until these issues are addressed, brain-derived outputs are probabilistic signals with techno-epistemic boundaries, not obvious facts [48].

Doctrines of the Self: Raz, Dworkin and the metaphysics of mental sovereignty

Normative reasons are provided for treating neural access as particularly sensitive by philosophical reflection. Joseph Raz's [49] concept of mental sovereignty emphasizes the autonomy of the person as an inner realm from which state power ought to be excluded normally [50]. For Raz's the dignity of the person and the authority of law both depend on a space of personal deliberation and choice a mental space that secures responsibility and moral agency [51]. Unmediated access to neural states undermines that sovereignty by instrumentalising the very site of agency.

Ronald Dworkin's principle of integrity supplements this by requiring that institutions of law treat individuals as morally responsible agents whose life-stories and commitments should be respected [52]. Dworkin's model situates legal boundaries within the demand that state practice be coherent with respect for individual integrity [53]. Neural interrogation that reveals predispositions or secret memories without permission would not only instrumentalise individuals but also dissolve their integrity by making inner life public.

Together, the doctrines accomplish two things. They explain why there are special constitutional safeguard fences around neural evidence (since the mind is not just another source of data) and they give us a normative lexicon sovereignty, dignity, integrity with which to assess legal rules. Metaphysics of mental sovereignty accordingly becomes law's functional compass: not all information is the same and some intrusions are fundamentally distinct in kind.

Human Rights Architecture: Article 17 ICCPR and the doctrine of cognitive liberty

International human rights [54] law provides a point of departure for doctrinal protection. Article 17 of the International Covenant on Civil and Political Rights protects against arbitrary or unlawful interference with privacy, family, home, or correspondence protection that, when interpreted purposively, can be extended to mental privacy where state actions intrude on inner life. Complementary protections procedural assurances in fair-trial law, safeguards against cruel or degrading treatment and constitutional safeguards against compelled self-incrimination form a cluster of rights that are pertinent to neuro-forensics.

Outside of conventional texts, a new idea of cognitive liberty is in the process of formation within academic and advocacy communities [55]. Cognitive liberty encapsulates an individual's right to think, to have control over access to mental states and to be exempt from non-consensual cognitive manipulation. Not yet a established legal doctrine, cognitive liberty is in harmony with current tools and provides a conceptual short cut: if thought is an area of autonomy, then coercive neural exploration is *prima facie* dubious [56]. Law's challenge is to convert this normative argument into tangible procedural and substantive rules thresholds for admissibility, informed consent standards and redress of abuse instead of leaving cognitive liberty as mere rhetoric.

Jurisdictional Crossroads: Divergent legal responses from Strasbourg to New Delhi

Comparative practice reveals a spectrum of responses. Some jurisdictions approach novel neuro-techniques with judicial scepticism and strict admissibility thresholds demanding clear validation, demonstrable reliability and procedural safeguards before permitting novel evidence [57]. Other systems, constrained by investigative imperatives or eager to exploit technological advantage, display more permissive or fragmented approaches that risk uneven protection.

Courts and legislatures differ about the questions they place at the forefront: some place scientific validity at center stage (probative value vs. prejudice) [58] others cast the issue as one of bodily or mental integrity [59] and others locate it in criminal procedure safeguards against coerced testimony [60]. The legal landscape that ensues is thus heterogeneous: admissibility doctrines, rules of evidence, constitutional protections and data-protection regimes intersect to create both regulatory redundancy and regulatory gaps [61]. This heterogeneity not only generates doctrinal uncertainty but also the risk of forum shopping by states or agencies looking for accommodating legal climates [62].

Cracks in the Edifice: The gappy bridge between technological capability and human-rights compatibility

If the earlier subsections diagnose doctrines and technologies, this last subsection diagnoses fault lines. To begin with, there is a void in evidence: there is no standard validation protocol by which the lab's precision can be extrapolated into courtroom thresholds [63]. Second, there is procedural fragility: consent regimes are inadequate when consent is coerced, informedness is doubtful and withdrawal is impossible [64]. Third, there is an accountability gap: proprietary models and secretive preprocessing obstruct independent auditing and meaningful cross-examination [65]. Fourth, there is distributive injustice: marginalized populations subject to greater policing, higher rates of stress and trauma, or different neurocognitive baselines risk disproportionate harm [66]. Lastly, there is a normative gap: legal terminologies do not have clear categories to define the distinct harms of cognitive intrusion (chill, identity injury, narrative disruption) [67]. These fissures are the reason why a straightforward transliteration of neural science into evidentiary practice would be risky [68]. They indicate the corrective work to come: to construct an interlocking structure of standards of validation, procedural assurances, obligations of transparency and limits of substance that can bridge the gap between what technology makes possible and what human rights demand [69]. The second part of this book lays out the normative tools a Mind Privacy Test; to do exactly that bridging work [70].

The Normative Compass

Building the Mind Privacy Test

At the core of any viable legal response to brain-based, evidence is a straightforward intuition. All intrusions are not alike. Placing a microphone in a person's lips is not the same as placing a scanner on their brain [71]. The Mind Privacy Test suggests four interdependent axes to evaluate whether or not a specific application of neuro-forensics is acceptable. These are the axes of voluntariness, transparency, proportionality and safeguards [72]. Each is both normative and practical. Collectively they constitute a compass that guides courts policy makers and practitioners towards choices that do justice to human

dignity yet permit narrowly drawn investigative uses when they really are necessary [73].

Consent Beyond Formality: Reimagining voluntariness in the neural age

Neural context consent cannot be reduced to a checkbox on a form [74]. The stakes are too human for formalism. Voluntariness has to be strongly reimagined so as to capture the asymmetry between a person and those institutions that aspire to gain access to their inner life. Minimum voluntariness will demand at least three conditions. First, the consent ought to be informed in the fullest sense [75]. This implies not only defining procedure risks and intentions in simple terms but also making evident the probabilistic character of the outcome the boundaries of interpretation and the repercussions that may ensue in legal and social senses. Second the consent should be contemporaneous and revocable [76]. An individual must be capable of withdrawing consent prior to collection and must be capable of requesting expungement of the raw data and downstream inferences subsequent to collection except where narrowly defined exceptions for public safety exist. Third consent must be uncoerced and free from cognitive pressure. In detention contexts power differentials contort voluntariness even in the presence of a signature [77]. The test will thus have to regard requests made in custodial situations as presumptively involuntary unless demonstrably independent safeguards are in place.

Procedurally this necessitates innovation [78]. Non-consensual neural probing should be subject to judicial authorization with courts undertaking a strict voluntariness assessment akin to competency hearings. Independent experts and counsel must be present at any consent conference and the process of consent must be audio visually recorded so an evidentiary record of voluntariness is provided [79]. Institutional review boards or ethics panels for research or deployment in institutional contexts should be authorized to inspect consent procedures and to impose remedial actions where consent practices are inadequate. Voluntariness thus understood safeguards individual agency and provides a procedural bulwark against easy technological expansion [80].

Truth in the Shadows: Transparency as the bedrock of democratic accountability

Transparency is the democratic medicine against secrecy [81]. Neuro-forensic technologies tend to work through layers of proprietary preprocessing feature extraction and statistical modelling. Those layers transform noisy biological signals into categorical assertions about recognition deception or intent. Unless the process of conversion is available to legitimate scrutiny those assertions have a scientific authority they do not merit. [82] Transparency accordingly has to be structural and not just aspirational. Structural transparency requires that procedures data and models employed in forensic findings are subject to independent audit cross examination and reproducibility testing [83]. It also entails that vendor assertions regarding accuracy must be publicly reported and peer-reviewed in environments that reflect real-world legal environments.

Transparency has two legal implications. Evidentiary rules to begin with must mandate disclosure of the training data and underlying algorithms when a state wishes to introduce neural evidence [84]. Proprietary interests when they are legitimate protective orders and impartial third party auditors can facilitate access but secrecy has to be nonabsolute. Second courts should be wary of opaque neuro-outputs.

Judicial gatekeeping principles must incline towards excluding evidence with foundations incapable of being tested by defence experts [85]. Transparency also demands public disclosure of institutional patterns of use so that society may gauge systemic effects. Without sunlight neural evidence threatens to be a black box that serves to expand state power at the expense of accountability [86].

Proportionality as Moral Geometry: Calibrating intrusion with demonstrable public necessity

Proportionality is the counterweight that keeps technological capacity from engulfing freedom [87]. But proportionality in the neural context needs to be honed into a test with clear criteria. The test should start with necessity: has the state proven that traditional methods of evidence collection are not available or sufficient? [88] If there are other less intrusive alternatives available that can obtain the same investigative goal then neural probing fails the necessity component. The second test is suitability: is the neural method in principle capable of delivering usable information concerning the particular fact in question? [89] The third test is minimality: can the identical informational goal be met by a less comprehensive neural measure that leaves intact more of the inner life of the subject? [90] Lastly, the intensity of intrusion should be balanced with the seriousness of the public interest claimed.

This method requires case specific determinations by judges [91]. For instance in an investigation of terrorism the interest may be high on the part of the state but the court has to demand empirical evidence that the method offers probative value under realistic conditions and that the information cannot be derived from other sources. [92] In low gravity situations like civil discovery the point of neural intrusion ought to be much higher. Proportionality therefore institutionalizes moral geometry: it necessitates decision makers to plot the boundaries of necessity and explain their incursion into the inner sanctum of thought [93].

Safeguards as Structural Justice: Remedies, expungement and the right to neural oblivion

Despite strict voluntariness transparency and proportionality some dangers remain. Safeguards turn normative commitments into enforceable protections. Legal remedies are the first pillar of safeguards [94]. Illegally acquired neural data must be kept out of evidence and the individuals damaged by abuse must have right to effective compensation and restorative remedy [95]. The second pillar is the management of the lifecycle of data. Raw data from the neural should be treated as very sensitive personal data with tight retention limits on encryption standards and regulations that prohibit secondary use without new informed consent [96]. The third pillar is the right to neural oblivion [97]. Where neural data generate inferences regarding close features of identity or inclination individuals must have mechanisms for erasing those inferences from public record and anonymising any held datasets.

Institutional protection is similarly important [98]. Autonomous inspection bodies with scientific technical and legal capability must be able to register authorisations inspect deployments and make binding recommendations. Forensic providers must be accredited and subject to disciplinary action for abuse [99]. Last but not least there need to be safeguards in court procedure. Defence lawyers need access to the methods of testing and to independent experts [100]. Where appropriate courts should nominate impartial experts to test disputed

techniques. These mechanisms work in combination to confine misuse to the minimum possible area and to grant redress when borders are crossed [101].

From Doctrine to Docket: Applying the compass to three lived hypotheticals

To observe the Mind Privacy Test in action consider three tangible examples [102]. First a terrorism investigation where recognition testing on the basis of fMRI is being requested without counsel present. Applying voluntariness fails because custodial setting and lack of counsel cast doubt on consent. Transparency is uncertain if the state cannot reveal the model and preprocessing procedures [103]. Proportionality can be argued on grounds of public safety but necessity is not made out if traditional intelligence techniques are still in use. There are no safeguards because there is no counsel and no judicial oversight [104]. The likely result under the test is prohibition of the neural intrusion unless instant judicial review independent auditing and presence of counsel alter the calculation.

Second a corporate espionage investigation employs EEG memory detection in a workplace interrogation [105]. Voluntariness may be suspect where employment power dynamics exert pressure. Transparency must be high given the commercial stakes and proprietary systems should not be a cloak for secrecy [106]. Proportionality will hinge on whether the employer can show that the information is essential to prevent ongoing harm and not obtainable by other means. Safeguards need definite limits on retention use and disclosure of findings and an expungement process if the inference is found to be unreliable [107]. In most jurisdictions such workplace inquiry would probably be impermissible without express informed consent supported by independent safeguards [108].

Third a domestic violence civil case in which the court requests EEG evidence to support testimony and a defendant asserts self-incrimination [109]. Voluntariness can exist but the threat of coercion in the adversarial environment is genuine. Proportionality and transparency are strong arguments against admission except when the method has been proven valid in the same context of situation and counsel has unrestricted access to technique. Controls must involve stringent rules of evidence restricting application to corroboration not primary evidence and robust deletion requirements of data following case conclusion [110]. Since domestic disputes involve close personal issues courts should be more inclined toward conventional corroborative evidence than neural outputs.

Through these hypotheticals a trend appears [111]. The Mind Privacy Test doesn't seek to freeze technological innovation. Rather it seeks to render explicit the conditions under which neuro-forensics can be employed to be challenged and open to judicial scrutiny [112]. That transparency saves human dignity by ensuring that entry into the mind is not at the discretion of expedience but a choice that has to withstand public reason [113].

Reading the Compass - Outcomes Across Contexts

This section tests the Mind Privacy Test against lived institutional realities and asks what actually happens when voluntariness, transparency, proportionality and safeguards collide with investigative urgency technical secrecy and legal inertia. The chapter that frames the Mind Privacy Test sets out the normative anatomy that follows and offers hypotheticals and comparative diagnostics to show where the test succeeds and where it is likely to fail in practice.

Voluntariness Under Siege: Consent erosion in high stakes investigations

Voluntariness frays where the stakes are highest [114]. In custodial interrogations the formal appearance of consent masks profound structural coercion: the pressure of confinement the promise or threat of differential treatment and the asymmetry of knowledge between suspect and state turn a signed form into mere performance [115]. Workplace contexts reproduce the problem: employees confronted with an employer request to undergo EEG based tests face implicit penalties for refusal and thus assent that is contaminated by fear of job loss [116]. Even in civil contexts such as family court parties consent under duress when the alternative threatens child custody or financial ruin [117].

Three systemic forces drive consent erosion. First informational opacity. When subjects are offered explanations framed in technical jargon and presented by authority figures they cannot meaningfully assess the risks [118]. Second situational constraint. Where refusal has foreseeable negative consequences consent ceases to be voluntary. Third procedural isolation. Absence of independent counsel or neutral medical oversight converts choice into compliance. The practical implication is doctrinal. Courts and regulators must treat consent in high pressure contexts as presumptively unreliable unless procedures satisfy heightened safeguards such as independent advice audiovisual recording and judicial review prior to testing. Without those measures consent is too fragile to justify probing the mind [119].

Transparency of Trial: The opacity of proprietary algorithms and state secrecy

Transparency collapses when evidence is the product of secretive pipelines. Contemporary neuro-forensic outputs rarely derive from a single measurement [120]. They are the result of preprocessing steps feature selection model training and classifier thresholds. Vendors assert intellectual property rights. Governments invoke national security. The result is evidence that looks authoritative to lay factfinders but which cannot be meaningfully tested by adversarial scrutiny [121].

Where transparency fails three consequences follow. First adversarial testing becomes illusory. Defence experts cannot replicate results if training data and algorithmic parameters are withheld. Second judicial gatekeeping is undermined. Judges cannot apply reliability standards if they cannot see how the inference was produced. Third public oversight is impossible. Aggregate patterns of use bias and error rates remain hidden when agencies refuse disclosure [123].

Remedies already in circulation provide partial redress. Protective orders court appointed neutral experts and in camera review can balance commercial secrecy with fairness [124]. Yet these mechanisms are stopgap. They substitute access controls for genuine interpretability. A durable solution requires mandated disclosure of validation studies open benchmarks for ecological performance and standards for independent audit [125]. Absent such reforms neuro-evidence will remain a black box that amplifies state reach while eroding the fairness of trials [126].

Proportionality in Practice: Terrorism corporate espionage and domestic justice compared

Proportionality plays out differently across factual matrices. In terrorism investigations the state asserts high public interest and

often seeks expedited access to novel tools [127]. That context creates pressure to relax necessity and minimality requirements. Yet urgency cannot displace the demand for validation. If a technique has not been shown to perform under acute stress or in adversarial environments the risk of false positives and irreversible liberty deprivations is unacceptable. Emergency warrants may be appropriate in tightly delimited circumstances but should be accompanied by strict temporal limits post deployment audits and compulsory disclosure once the emergency subsides [128].

In corporate espionage the balance generally weighs against neural intrusion. Employers can usually rely on documentary evidence internal logs and conventional witness testimony [129]. The proportionality calculus thus disfavors EEG employment for routine workplace disputes. When employers nonetheless attempt neuro-probing the law should require demonstrable voluntariness independent evaluation and narrow statutory authorization to prevent abuse [130].

Domestic and family contexts are uniquely sensitive because neural data touch identity intimacy and reputation [131]. Courts confronted with brain-based evidence should treat it as corroborative rather than determinative [132]. Proportionality here requires even higher thresholds of minimality and guarantees of confidentiality because the social costs of error are severe [133]. Across all contexts the consistent rule is that proportionality must be decided case by case with explicit judicial findings on necessity suitability and minimal intrusion [134].

Safeguards in the Real World: Weak links in legislative armour

In practice legal safeguards are uneven and often incomplete [135]. Data protection frameworks may provide retention limits and encryption mandates but they typically do not address evidentiary exclusion remedy schemes or professional accreditation [136]. Oversight agencies if created are frequently underfunded and lack technical expertise needed to audit complex algorithms [137]. Courts face capacity constraints when evaluating expert testimony and often rely on the credibility of presenting experts rather than independent testing of methods [138].

The practical gap produces perverse incentives. Agencies may deploy neural tools because short term investigative gains outweigh the anticipated cost of litigation or public scrutiny [139]. Individuals harmed by misuse confront slow civil processes and uncertain compensation [140]. Expungement of derived inferences is rarely available and the long tail effects of a wrongly attributed recognition can persist indefinitely in administrative or corporate records [141].

Fixing these weak links requires an integrated approach: statutory rules that mandate exclusionary remedies swift administrative review processes accreditation of providers mandatory reporting of deployments and funding for independent audit laboratories [142]. Only a system of preventive oversight combined with rapid remedial mechanisms can turn aspirational safeguards into effective protections [143].

Comparative Juridical Matrix: Mind Privacy Test scoring across jurisdictions and case typologies

When jurisdictions are scored against the Mind Privacy Test a heterogeneous landscape appears. Some states perform well on transparency and proportionality because their courts insist on empirical

validation and rigorous admissibility hearings. Other systems prioritize bodily autonomy and therefore offer strong protections against compelled procedures yet lack explicit algorithmic disclosure rules [144]. A third group combines weak voluntariness protections with permissive evidentiary standards creating high risk environments for abuse [145].

Case typologies further alter scores [146]. Terrorism matters tend to depress voluntariness and compress procedural safeguards in many jurisdictions while giving the state higher proportionality scores for perceived security needs [147]. Employment disputes typically score low on voluntariness and safeguards. Domestic matters often perform poorly on proportionality when courts accept neural outputs without insisting on corroboration [148].

The comparative matrix yields a lesson. Piecemeal reforms that focus on a single axis of the Mind Privacy Test will not suffice [149]. Jurisdictions must elevate voluntariness transparency proportionality and safeguards together as an integrated package [150]. The Mind Privacy Test functions both as a diagnostic scoreboard and as a roadmap: reformers should use it to identify the weakest axis in their system and to design targeted changes that restore balance between state power and mental sanctuary [151].

Between the State's Eye and the Citizen's Mind

The Leviathan's Claim: State security imperatives in the age of cognitive intrusion

States have a legitimate interest in the prevention of detection of serious crime [152]. National security institutions and police agencies must counter adaptive and invisible threats [153]. They thus seek out any credible means that could shorten investigations unmask concealed conspiracies or stop future harm [154]. Brain based methods offer a new type of probative reach. In terrorism investigations for instance officials contend that neural measures can detect recognition of locations individuals or objects which would otherwise lie hidden [155]. In hostage crises or organised crime investigations rapid corroboration of witness memory might save lives [156].

This prosecution rationale is compelling. It is premised on three assumptions. First that the method generates reliable actionable information in real world environments [157]. Second that less invasive options will not meet the situation [158]. Third that protection can effectively keep under control risks of abuse [159]. Each assumption is worthy of sceptical examination. Empirical confirmation under controlled laboratory settings does not insure robustness in the messy contexts in which state actors work [160]. High stress trauma and medication that change neural signatures are common in many contexts [161]. Power disequilibrium in detention and interrogation settings makes consent doubtful [162]. Without strict validation and procedural limits the Leviathan's assertion can deliver more injustice than security [163].

Policy responses should accordingly not start from a technology enthusiasm which presumes utility [164]. They should demand demonstrable evidence of ecological validity prior to routine investigatory application [165]. Judicial gatekeeping should accord state claims regarding necessity the status of contestable facts rather than categorical truths [166]. Where urgent action is claimed emergency judicial warrants with limited temporal and evidentiary reach can open up a constrained corridor for exceptional deployment [167].

Such warrants should require auditing obligations data minimisation and post deployment audit [168]. The overriding requirement is that state power to investigate cognition should be exceptional accountable and transparent [169].

The Citizen's Rebuttal: Mental autonomy as a constitutional and democratic requirement

The argument of the citizen is based on more fundamental commitments regarding autonomy dignity and the requirements of democratic existence [170]. Mental autonomy is not a luxury right reserved for elites [171]. It is the groundwork of conscience deliberation and civic engagement [172]. A regime permitting unrestricted access to thoughts or memories threatens to chill dissent creativity and vulnerable modes of political expression [173]. The right to keep inner life confidential is thus central to free speech privacy and fair trial rights [174].

Legally this counterargument takes hold in several traditions [175]. Constitutional protection from compelled testimony and unreasonable searches can be construed to cover neural interrogation [176]. Human rights documents that protect privacy bodily integrity and immunity from degrading treatment converge in support of strong protections [177]. Democracies will thus be obligated to offer procedural mattering to mental autonomy through presumptive protections embedded in law. This entails a presumption against nonconsensual probing of the brain with exceptions narrowly drawn on demonstrable pressing threats [179].

In practice citizens need both material rights and procedural avenues to enforce them [180]. Access to counsel prior to any neural test court admissibility standards that favor demonstrated reliability and remedies such as exclusion compensation and expungement are essential [181]. In the absence of available remedies theoretical safeguards will be empty [182]. The citizen's counterattack thus necessitates an architecture that is protective, anticipatory and enforceable [183].

Towards a Charter of Neural Rights: Legislative blueprints and institutional guardians

A Charter of Neural Rights can give philosophical ideals legislative expression [184]. Central components would be an assumption of neural inviolability qualified only by strict necessity; a stringent informed consent framework with plain language explanation withdrawal entitlements and obligatory counseling where there are power asymmetries [185] transparency requirements for techniques algorithms and training data subject to protective orders where commercially warranted [186] and strict rules of data governance treating raw neural signals as extremely sensitive personal data with short retention mandatory encryption and bar on secondary use without new consent [187].

Institutional guardians have a vital role to play as well [188]. Autonomous forensic oversight commissions with scientific legal and ethical knowledge should accredit providers audit deployments and maintain public registries of authorized uses [189]. Courts shall be able to access the accredited neutral experts for the disputed techniques and jury instructions should indicate the probabilistic uncertainty instead of suggesting scientific certainty [190]. Accreditation and certification regimes for laboratories, laboratory technicians and algorithmic models can enhance the base quality while disciplinary regimes discourage malpractice [191].

Legislation must also establish the speedy remedial opportunities [192]. Administrative deletion of inappropriately gathered information instant judicial appeal and legislative entitlements to expungement of inferences derived will mitigate long tail harms [193]. Compensation schemes for victims of wrongful neural intrusions and criminal penalties for intentional abuse enhance deterrence. Lastly, the Charter must require socio legal impact analyses prior to mass scale deployment particularly in racially or economically marginalised communities in order to avoid harms being disproportionately inflicted.

Global Harmonisation: Cross border admissibility safeguards and ethical minimums

Neurotechnology won't stop at the borders [194]. Corporations investigate consortia and state actors act transnationally [195]. Data sets cross borders and professionals work for clients in different jurisdictions [196]. In this context isolated domestic regulations generate regulatory arbitrage and incoherent protections of the person [197]. Global harmonisation is thus a pragmatic priority and an ethical imperative [198].

Harmonisation does not have to mean uniformity [199]. A realistic strategy blends international baseline norms with adaptable domestic practice [200]. Multilateral institutions or expert panels can establish the baseline norms which should comprise the minimum validation procedures, ecological standards, reporting standards and human rights-compatible consent requirements [201]. Forensic accreditation mutual recognition frameworks can facilitate collaboration without sacrificing review guarantees [202]. Model legislation and technical standards can assist states in drafting laws that suit their constitutional framework [203].

Cross border exchange of evidence must advance by way of mutual legal assistance treaties that include neural specific protections [204]. Data transfer agreements need to guarantee similar protections such as bans on reidentification and pledges to erase data upon purpose completion [205]. Where state secrecy allegations are raised neutral third party review mechanisms can balance confidentiality with fair trial rights [206].

Capacity building is necessary [207]. Low resource jurisdictions might not have technical skills to assess claims of reliability and consequently end up being pilot projects for risky deployments [208]. Global cooperation must thus support training independent laboratories and collaborative validation studies that share both knowledge and responsibility [209].

Summing up the space between the citizen and the Leviathan does not have to be a zero sum conflict [210]. By well designed presumptions rights safeguarding procedural protections and international collaboration it is possible to allow some suitable legitimate uses of neural tools while upholding the democratic essence of mental freedom [211]. The policies should be preventive and not just remedial and they should make human dignity the central test for any legal allowance of brain based evidence [212].

Conclusion – Towards a Jurisprudence of Neural Integrity

It is obvious by now that brain-computer interfaces and neuro-imaging [213] have opened up abilities previously strictly science fiction. Functional scans can identify patterns of flow or electrical

activity associated with thoughts, intentions or memories. But it is not “mind-reading” [214] literally. Even specialists warn that whereas an fMRI can quantify brain activity, deducing a certain thought or intention from those signals involves a number of inferential leaps which are not altogether simple. In controlled laboratory environments fMRI or EEG lie-detection research has achieved 87–95% accuracy rates but when attempted in real-world environments accuracy can collapse (in one test it dipped below 50% even at 20%). Therefore, even as neurotechnology potentially promises unparalleled insight into the mind, in practice it is extremely fallible. The courts have already been prudent: thus far, most neuroscientific-forensic tools [215] have not proved admissible and judges have often exclude or limit brain-scan evidence.

While so doing, our legal and philosophical heritage puts a premium on inviolability of the mind. As Justice Marshall memorably wrote in *Stanley v. Georgia*, one is “generally free from governmental intrusions into one’s thoughts.” Commentators highlight that neuroscience forces a rethink of fundamental liberties: scholars now speak of a right to “cognitive liberty,” and new human-rights proposals feature a right to mental privacy, a right to mental integrity, and a right to psychological continuity [216]. In brief, technology, rights and moral philosophy are increasingly intertwined. We have, on the one hand, new tools that can “map” intentions or memories; on the other, profound intuitions (reflected in law) that thoughts should be protected. Balancing these strands is the challenge facing us. Only a strong, philosophically grounded human-rights system, one study concluded, can reconcile state security with the inviolable sanctity of private thought. In practice, this involves recognizing the boundaries of neurotech and making its application securely limited by principles of privacy, autonomy and dignity [217].

Filling the Voids: Suggesting a Rights-Anchored Protocol for Brain-Based Evidence

To fill the gaps, we need to design a clear, rights-based protocol for when and how brain data may be used. In our opinion, this is founded on four pillars – quoting the Mind Privacy Test set out in Section 3:

Voluntariness. A brain scan can only be carried out with informed, revocable consent. People need to be informed of what is going to be done, how the information will be used and they need to have the ability to back out at any time. That is, neural probing can never be coerced or hidden.

Transparency. All techniques and data shall be open to independent audit. Investigators should employ a set of validated methods (no hidden algorithms) and must permit defence experts to inspect & scan protocols and raw data. This protects against concealed biases or mistakes.

Proportionality. Any invasion of someone’s brain must be sufficiently necessary for a significant public interest (e.g., in a terrorism investigation) and even then the minimum intrusive means must be utilized. A warrant or special judicial permission should be necessary, just like it is for body searches. The value of the evidence must be greater than cost of the privacy.

Safeguards. Strong legal protections are necessary. They consist of assured access to counsel at any neuro-interrogation, the right to challenge and bar brain evidence in court and remedies like expungement of information or sanctions for abuse. In total, a subject’s neural privacy must be guarded at all times.

Enabling this protocol will probably need new institutional mechanisms. Legal experts have proposed creating multidisciplinary commissions or committees (comprising neuroscientists, ethicists, judges and members of the lay public) to prepare model rules for neuro-evidence. These organizations might borrow methods applied to other sensitive information: e.g., adopt the EU’s forthcoming AI Act, or even the precedent of genetic-evidence legislation, in establishing specific standards for brain data. In courtrooms, judges would ideally provide juries with clear direction about how to handle neuroimaging – telling them to approach the information with suspicion and to accord it influence only as one item among many. In brief, instead of leaving brain-evidence to ad hoc judgment, we need to make it more firm into a rational, rights-based model – a jurisprudence of neural integrity [218].

The Contribution: Making Neural Integrity the Mental Equivalent to the Right to Silence

The key insight of the present study is that the neural integrity – the sanctity of an individual’s brain and mind – must become an accepted principle of law similar to the privilege against self-incrimination. Just as the Fifth Amendment in the United States prohibits the state from compelling a person to talk or incriminate himself, neural integrity would prohibit forced extracting of mental content [219]. There is widespread intuition that the state cannot pull incriminating ideas out of a suspect’s mind against his will [220].

Neuroscience also dispels the ancient “mind/body” dualism: brain scans succeed in wrapping testimonial memories in physical form as brain waves, revealing the illusory dualism of mind and body. If legislation permitted unregulated neural interrogation & self-incrimination can take place unheard as much as it can be heard. Identifying neural integrity makes this instinct official. Under a neural integrity doctrine, authorities could no more tap someone’s brain for evidence without consent than they could compel him to utter a confession. This protects the same fundamental control over one’s inner life that the right to silence safeguards [221].

To this point, practices like scanning a suspect without a lawyer in place with fMRI are sufficient to indicate that coerced brain scans would actually undermine essential human rights, such as the right to counsel and the right to be presumed innocent. Our proposal makes it clear that such practices are not only undesirable – they breach a fundamental tenant of justice. That is, neural integrity is the cognitive equivalent of silence: an assurance that the mind is a space untrammelled by involuntary state intrusiveness [222].

This contribution partially fills an empty space in doctrine. Current human rights (such as the ICCPR’s privacy article or the EU Charter’s mental integrity clause) were drafted well before it was possible to read minds. By making an explicit connection between neural integrity and traditional rights not to incriminate oneself and to be free from coercion, we give legislators and judges a clear analytical lens. It is that in deciding on a neuro-evidence case, in addition to *Is the evidence sound?*

one should consider the question, “Has the state intruded into the inviolability of thought?”

“In short, our thesis is that mental privacy and integrity need explicit recognition, so that law’s question in the neural age is limited not by what technology can dredge up, but by the continuing right of persons to hold their inner lives within themselves” [223].

Final Reflection: Moral Courage in the Neural Age Ultimately, the test of justice will be not what we take from the brain but what we leave alone. The potential of neuroscience is thrilling but it is a test of our moral fibre.

We can easily conjure up an age in which memories or intentions are removed from the mind with ease, but the real question is whether justice possesses the wisdom and self-control to say “no” only in the most compelling situations. As Justice Marshall reminded us, citizens must be kept free from unauthorized invasions into their minds. Similarly, one of our main intuitions is that the decision to probe someone’s brain is so profound that it should not be taken lightly.

This research argues that courage – the courage to respect individual autonomy even when technology tempts us otherwise – must guide the future. A human rights-based neural jurisprudence will ask: do we simply need that final morsel of information lodged in an individual’s brain or is our loss of mental privacy too high a cost to pay? In the age of the brain, justice will be served most effectively not by unbridled innovation but by virtue restrained. The final value of the State will be measured by its success in safeguarding the mind’s citadel of privacy. Let us proceed forward with this wisdom: the utmost justice is not to penetrate every thought, but that some thoughts are beyond the pale and must forever be out of reach of the law.

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