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Perspective

Neuroenhancement and Cognitive Liberty: Redrawing the Boundaries of Autonomy

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ABSTRACT

Pharmacological and technological cognitive enhancement has moved from a fringe curiosity to a widespread practice among students, shift workers, and professionals under sustained cognitive load, and the bioethics literature has responded with an expanded vocabulary of autonomy centered on the concept of cognitive liberty.

This perspective reviews the substances and technologies most commonly discussed under this heading, from off-label stimulant use to non-invasive brain stimulation and consumer neurotechnology, and the empirical evidence on their effects and risks in healthy users.

It then examines the central philosophical dispute: whether a right to self-directed cognitive enhancement follows from established bioethical autonomy principles, and whether that right can be reconciled with concerns about soft coercion, distributive unfairness, and authenticity that emerge once enhancement becomes socially common rather than exceptional.

We trace how this debate has begun migrating into law through the emerging 'neurorights' movement, using Chile's 2021 constitutional reform as a case study, and find that legal protection has so far advanced further for neurotechnology-driven data collection than for pharmacological self-enhancement.

We conclude that a workable framework needs to combine a presumption in favor of competent adult choice with institutional guardrails against coercion and legal protections for mental privacy that keep pace with, rather than trail behind, the technologies this debate increasingly involves.

Keywords: cognitive liberty; neuroenhancement; neuroethics; autonomy; neurorights

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INTRODUCTION

A student who takes methylphenidate before an exam, an executive who relies on modafinil to survive a

punishing travel schedule, and a surgeon who uses a stimulant to stay sharp through a long overnight case are all doing something that was barely discussed in bioethics twenty years ago: using a pharmacological or technological intervention to improve a brain that is not, by any clinical definition, sick. The philosophical vocabulary that has grown up around this practice increasingly centers on a single contested idea -- cognitive liberty, understood as a right to control one's own mental processes, to enhance them if one chooses, and to refuse interventions one does not want [1]. The term has migrated from activist and legal-theory circles into mainstream neuroethics remarkably quickly, in part because it captures something existing autonomy talk does not: a claim not just against interference, but for the freedom to modify one's own cognition using tools that did not exist when informed-consent doctrine was written [2].

Neuroenhancement forces a re-examination of what autonomy is supposed to protect. Classical bioethical autonomy is largely reactive -- it protects a person's right to refuse an intervention proposed by someone else. Cognitive liberty, as advanced in the neuroethics literature, adds a proactive dimension: an affirmative claim to access interventions that alter one's own mind, subject to some as-yet-unsettled limits [3]. That addition is not merely rhetorical. It reshapes debates about drug scheduling, off-label prescribing, workplace policy, and now constitutional and international human-rights law, as jurisdictions begin asking whether freedom of thought and mental self-determination need explicit legal protection in an era of neurotechnology that can read as well as alter brain states [4].

This review surveys the ethical terrain that has formed around pharmacological and technological cognitive enhancement, with particular attention to how the concept of cognitive liberty has been used both to defend and to complicate claims of individual autonomy. We look first at the substances and technologies actually in use, then at the philosophical case for and against a right to enhance, then at the coercion and justice problems that arise once enhancement becomes socially normal rather than exceptional, and finally at the emerging "neurorights" legal movement that has begun translating cognitive liberty from a philosophical proposal into constitutional and statutory text.

WHAT NEUROENHANCEMENT ACTUALLY LOOKS LIKE

Much of the applied literature on neuroenhancement concerns a small number of well-studied stimulants repurposed from clinical use: methylphenidate and amphetamine salts prescribed for attention-deficit disorders, and modafinil, developed for narcolepsy and shift-work sleep disorder. Survey and pharmacology work has found modest but real improvements in sustained attention and working memory in healthy

adults taking these drugs off-label, though the effect sizes are smaller and more variable than popular coverage of "smart drugs" typically implies [5]. Reviews of the clinical pharmacology note an uncomfortable asymmetry: the drugs are well studied in patient populations with cognitive impairment, but the evidence base for healthy, non-clinical users is thinner, shorter in duration, and rarely designed to detect the subtle harms -- sleep disruption, dependency risk, altered risk tolerance -- that matter most for a population using the drug electively [6].

Modafinil in particular has become something of a case study for the field because its use is concentrated among people functioning under sustained cognitive load rather than in acute crisis -- shift workers, on-call physicians, graduate students, and increasingly office workers using it as what one analysis called "a workplace drug" [7]. The same review noted that while modafinil's acute safety profile in healthy adults looks reassuring in short trials, the ethical questions it raises are less about toxicity than about what happens to workplace expectations once even a modest enhancement becomes available: does an employee who declines it fall behind a colleague who accepts, and does that dynamic quietly convert a personal choice into an implicit occupational requirement [8]. Survey work on off-label modafinil use among healthy adults corroborates the workplace framing, finding safety concerns are real but secondary in most users' own accounts to concerns about fairness and dependency [8].

Beyond pharmacology, neuroenhancement also increasingly refers to non-invasive brain stimulation (transcranial direct-current and magnetic stimulation) and to consumer neurotechnology -- wearable EEG devices marketed for attention training, mood tracking, or meditation feedback. A review of neurotechnological cognitive enhancement specifically framed these devices as raising a dual character rarely present in pharmacological enhancement: the same headset that can measurably improve sustained attention can also constrain the user by making their attentional lapses newly visible to an employer or insurer [9]. These technologies raise a version of the same enhancement debate but compound it with a data problem: unlike a pill, a neurotechnology device typically generates a continuous stream of neural data that can be stored, analyzed, and potentially used to infer mental states the user never consented to disclosing, a concern that has become central to the neurorights literature discussed later in this review [10]. Legal commentary on mental privacy has argued that this inferential risk, rather than direct neural readout, is actually the more pressing near-term threat, since most consumer devices on the market today infer mental states from proxy signals rather than recording brain activity with clinical precision [11].

STUDENT USE AND THE QUESTION OF CHEATING

Nowhere has the coercion argument been tested more directly than in universities, where non-prescribed stimulant use for exam preparation is common enough to have generated its own empirical literature. A 2024 preprint examining student attitudes toward non-prescribed modafinil use found that students were divided on whether the practice constitutes cheating, with many drawing a distinction between using a substance to "reach one's own baseline" under stress and using it to gain a competitive edge over peers who choose not to use it [12]. That distinction maps closely onto a philosophical fault line in the wider enhancement literature: whether an intervention should be evaluated by its effect (does it improve performance beyond what is achievable unenhanced) or by its function (does it restore capacities eroded by sleep deprivation, stress, or ordinary variation, rather than adding wholly new capacities) [13].

Table 1 summarizes how four commonly discussed philosophical positions on cognitive enhancement weigh the individual-autonomy claim underlying cognitive liberty against the collective concerns -- coercion, fairness, and authenticity -- that recur throughout this literature. Figure 1 presents the same comparison schematically, plotting each position's relative emphasis on individual autonomy against its relative emphasis on collective risk.

THE CASE FOR A RIGHT TO ENHANCE

The strongest philosophical defenses of neuroenhancement extend, rather than depart from, existing bioethical commitments to autonomy and self-determination. If competent adults are permitted to make risky, irreversible choices about their bodies in contexts ranging from cosmetic surgery to extreme sport, proponents argue, it is difficult to justify singling out cognitive enhancement for special prohibition purely because the target organ is the brain [14]. An influential early argument in this vein held that once the risks of a cognitive-enhancing drug are understood and accepted by a competent user, society's proper role is to ensure informed choice and monitor safety, not to prohibit use outright -- a position summarized in an oft-cited call for regulatory frameworks that would treat healthy cognitive enhancement more like an informed lifestyle choice than a moral transgression [15].

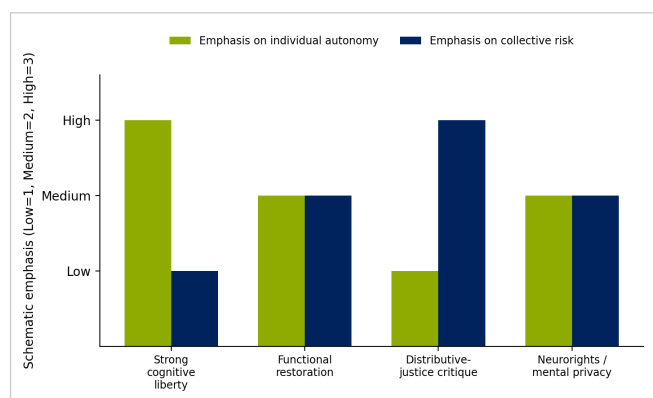
Cognitive-liberty theorists push this further, arguing that the right to alter one's own cognition is not merely permitted by general autonomy principles but deserves independent recognition, precisely because mental self-determination is foundational to every other exercise of autonomy: a person cannot meaningfully consent to anything if the state or a third party can dictate the boundaries of the cognitive processes with which they consent [2]. This framing has practical bite in debates over drug scheduling, where

cognitive-liberty advocates argue that criminalizing possession of a substance used purely for self-directed cognitive modification, absent harm to others, is difficult to square with the harm principle that ostensibly underlies most drug policy [16]. Neuroscientifically grounded ethics work has argued that resolving this debate well requires more than philosophical argument alone; it needs a clearer empirical picture of exactly which cognitive domains a given intervention improves, and at what cost to others such as sleep or emotional regulation, before regulators can weigh the autonomy claim against realistic estimates of harm [17].

Table 1. Four philosophical positions in the neuroenhancement debate, compared by their emphasis on individual autonomy (cognitive liberty) versus collective concerns.

Position	Core claim	Main collective concern raised	Policy leaning
Strong cognitive liberty	Competent adults have a right to modify their own cognition, analogous to other risk-accepting bodily choices	Downplays coercion and access-inequality effects	Deregulate ; treat as informed lifestyle choice
Functional restoration view	Enhancement is more defensible when it restores capacity eroded by fatigue or stress than when it adds novel capacity	Line between restoration and advantage is hard to draw in practice	Permit under clinical or occupational guidance
Distributive-justice critique	Uneven access to enhancement risks widening existing educational and occupational inequality	Autonomy claims can mask structural unfairness	Regulate access; subsidize or restrict to preserve fairness
Neurorights / mental-privacy view	Protection should focus on preventing unauthorized external manipulation and data extraction, not on restricting self-directed use	Leaves pharmacological self-enhancement largely unaddressed	Constitutional/statutory protection targeted at neurotechnology

Figure 1. Schematic comparison of the four positions in Table 1 by their relative emphasis on individual autonomy versus collective risk (illustrative scale, not derived from a single empirical study).



COERCION, FAIRNESS, AND THE LIMITS OF INDIVIDUAL CHOICE

The autonomy-based defense of neuroenhancement runs into its sharpest objection once enhancement becomes common rather than rare: a choice made freely by one person can generate structural pressure on everyone around them. If enough surgeons, air-traffic controllers, or graduate students use a stimulant to extend safe working hours or study time, an individual's decision not to use it stops being a neutral preference and starts being a competitive disadvantage, which several commentators describe as a form of soft coercion that individual-level consent analysis is poorly equipped to detect [18]. This is structurally similar to arguments made about performance-enhancing drugs in sport, except that neuroenhancement lacks anything resembling a governing body that could set and enforce a shared baseline.

A related justice objection concerns unequal access. Prescription stimulants, non-invasive brain stimulation devices, and newer consumer neurotechnology are not evenly distributed across income levels, and critics have argued that a cognitive-liberty framework focused narrowly on the right to enhance says nothing about the prior question of who can actually afford to exercise that right, potentially widening rather than narrowing existing inequality in educational and occupational outcomes [19]. The 2015 report from the U.S. Presidential Commission for the Study of Bioethical Issues addressed this tension directly, concluding that any policy response to cognitive enhancement needs to weigh individual liberty against distributive fairness and the possibility that widespread use could reset social expectations about "normal" performance in ways that pressure non-users regardless of their own preferences [20].

A third objection concerns authenticity: whether cognitive enhancement changes not just what a person can do but who they are, and whether achievements reached with pharmacological assistance carry the same meaning as those reached without it.

Neuroethics reviews addressing pharmacological enhancement note that this worry, though intuitively powerful, has proven difficult to state in a way that does not also indict other widely accepted enhancements -- caffeine, education, or corrective surgery -- raising the question of whether authenticity objections are doing independent philosophical work or simply expressing discomfort with novelty [21].

FROM PHILOSOPHY TO LAW: THE NEURORIGHTS MOVEMENT

Cognitive liberty has moved from journal articles into legislative text faster than most bioethics concepts typically do. Chile amended its constitution in 2021 to explicitly protect "neurorights," including mental privacy and protection against manipulation of neural activity, becoming the first country to embed such protections at the constitutional level [22]. A 2023 perspective examining Chile's approach specifically to pharmacological neuroenhancement argued that the new framework, while historically significant, leaves considerable interpretive work undone: it is not yet clear how a constitutional right against unauthorized manipulation of neural activity should apply to a person who voluntarily takes a cognitive-enhancing drug, since the intervention originates with the user rather than an external party [23].

In the United States, by contrast, no comparable constitutional amendment has been proposed, and legal scholarship examining how existing constitutional doctrine might apply to cognitive enhancement has generally concluded that current substantive-due-process and bodily-autonomy case law offers only an indirect and untested basis for a cognitive-liberty claim, leaving the question open to future litigation rather than settled precedent [24]. Other jurisdictions have moved more cautiously, and comparative legal scholarship has begun cataloguing where "neurorights" language actually creates enforceable protections versus where it remains aspirational. A recent comparative analysis of the global south's approaches, focused on Brazil, found that enthusiasm for constitutional neurorights has outpaced the development of implementing legislation and enforcement mechanisms in most countries that have discussed the idea [25]. A parallel critique from legal scholars examining Chile's own framework four years after enactment argued that even the most developed neurorights regime leaves a substantial gray zone around inferred mental data -- information about mental states derived indirectly from behavioral or physiological data rather than captured directly from neural signals -- precisely the kind of data most consumer neurotechnology actually collects [26]. Advocacy organizations tracking the movement across Latin America have reached a similar conclusion: the language of neurorights has spread faster than the technical and regulatory infrastructure needed to make mental privacy protections meaningful in practice [27].

Table 1 (referenced above) situates these emerging legal instruments alongside the philosophical positions that motivate them; notably, the strongest textual protections that have been enacted so far target neurotechnology-driven data collection and manipulation rather than pharmacological self-enhancement, suggesting that lawmakers have found it easier to regulate an external device reading or altering the brain than to regulate a person's own choice to alter their own chemistry.

TOWARD A WORKABLE FRAMEWORK

None of this literature converges on a single settled answer, but several points of rough consensus can be drawn from it. First, a blanket prohibition on cognitive enhancement is difficult to defend on harm-principle grounds alone, particularly for substances with an established safety record in clinical populations, which is likely why serious policy proposals since at least the mid-2000s have favored regulated access and honest disclosure over criminalization [28]. Second, the coercion problem cannot be solved purely at the level of individual consent; it requires institutional responses -- workplace policies, professional-body guidance, and in high-stakes settings such as aviation or surgery, explicit rules about permissible use -- that treat enhancement as a collective-action problem rather than a private choice [7]. Third, mental-privacy protections aimed at neurotechnology are advancing faster than parallel protections for pharmacological cognitive liberty, which means the two halves of the neuroenhancement debate are currently governed by mismatched legal regimes even though they raise closely related autonomy claims [3].

CONCLUSION

Cognitive liberty gives the neuroenhancement debate a vocabulary that classical autonomy language lacks: a way of naming both the right to refuse unwanted interference with one's own cognition and the right to pursue wanted enhancement of it. That vocabulary has proven genuinely useful, but it has not resolved the underlying tension between individual freedom and the social effects of widespread, unevenly distributed enhancement. The most defensible way forward, on the current literature, does not choose between cognitive liberty and collective protection but pairs them: honest regulatory frameworks that treat competent adult enhancement choices as presumptively legitimate, institutional guardrails against the soft coercion that spreads once enhancement becomes common, and legal protection for mental privacy that keeps pace with the neurotechnology this debate increasingly involves, rather than trailing years behind it as current neurorights implementation still does.

DECLARATIONS

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Conflict of Interest

The authors declare no conflicts of interest relevant to this work.

Author Contributions

Stefan Bakker conceived the review, coordinated the literature synthesis, and drafted the sections on pharmacological enhancement and student use. Erik Fischer developed the philosophical framing of cognitive liberty and drafted the sections on the case for and against a right to enhance. Vaclav Zielinska contributed the analysis of the neurorights legal movement and critically revised the manuscript. All authors read and approved the final version.

Ethics Statement

As a literature review synthesizing previously published research and policy analysis, this article did not involve new data collection from human or animal subjects and did not require institutional ethics committee approval.

Data Availability

No new data were generated or analyzed for this review. All sources discussed are cited in the reference list and are publicly available through their respective publishers.

REFERENCES

1. Sententia W (2004) Neuroethical considerations: cognitive liberty and converging technologies for improving human cognition. *Annals of the New York Academy of Sciences*.
2. Bublitz JC (2013) My mind is mine!? Cognitive liberty as a legal concept. In: Hildt E, Franke AG (eds) *Cognitive Enhancement*, Springer.
3. Ienca M, Andorno R (2017) Towards new human rights in the age of neuroscience and neurotechnology. *Life Sciences, Society and Policy*, DOI:[10.1186/s40504-017-0050-1](https://doi.org/10.1186/s40504-017-0050-1).
4. Cognitive liberty. A first step towards a human neuro-rights framework (2021) University of Padua working paper.
5. Husain M, Mehta MA (2011) Cognitive enhancement by drugs in health and disease. *Trends in Cognitive Sciences*, PMID:21507708.
6. Sahakian BJ, Morein-Zamir S (2015) Pharmacological cognitive enhancement: treatment of neuropsychiatric disorders and lifestyle use by healthy people. *Lancet Psychiatry*.

7. Bruhl AB, d'Angelo C, Sahakian BJ (2019) Neuroethical issues in cognitive enhancement: modafinil as the example of a workplace drug? *Journal of Psychopharmacology*, DOI:[10.1177/2398212818816018](https://doi.org/10.1177/2398212818816018).
8. The increasing lifestyle use of modafinil by healthy people: safety and ethical issues (2015) *European Neuropsychopharmacology*.
9. Neurotechnological cognitive enhancement and human rights: a complex dynamic between empowerment and constraint (2023) *Journal of Law and the Biosciences*.
10. Ienca M (2022) Neuroethics and neurorights. *Frontiers/PMC review*.
11. Neurorights and Mental Privacy (2025) UAB Institute for Human Rights Blog.
12. Student Cognitive Enhancement with Non-Prescribed Modafinil. Is it Cheating? (2024) medRxiv preprint.
13. Cakic V (2009) Smart drugs for cognitive enhancement: ethical and pragmatic considerations in the era of cosmetic neurology. *Journal of Medical Ethics*, PMID:19717695.
14. An Ethical Argument for Regulated Cognitive Enhancement in Adults (2022) *Voices in Bioethics*.
15. Greely H, Sahakian B, Harris J, Kessler RC, Gazzaniga M, Campbell P, Farah MJ (2008) Towards responsible use of cognitive-enhancing drugs by the healthy. *Nature*, DOI:[10.1038/456702a](https://doi.org/10.1038/456702a).
16. Jotterand F, Dubljevic V (2016) *Cognitive Enhancement: Ethical and Policy Implications in International Perspectives*. Oxford University Press.
17. Maslen H, Faulmuller N, Savulescu J (2014) Pharmacological cognitive enhancement -- how neuroscientific research could advance ethical debate. *Frontiers in Systems Neuroscience*.
18. Schleim S (2015) The is and ought of the ethics of neuroenhancement: mind the gap. *Frontiers in Psychology*, DOI:[10.3389/fpsyg.2015.01998](https://doi.org/10.3389/fpsyg.2015.01998).
19. Outram SM, Racine E (2011) Examining reports and policies on cognitive enhancement: approaches, rationale, and recommendations. *Accountability in Research*.
20. Presidential Commission for the Study of Bioethical Issues (2015) *Gray Matters: Topics at the Intersection of Neuroscience, Ethics, and Society*.
21. Mohamed AD (2014) Neuroethical issues in pharmacological cognitive enhancement. *WIREs Cognitive Science*, DOI:[10.1002/wcs.1306](https://doi.org/10.1002/wcs.1306).
22. Chile: Pioneering the protection of neurorights (2023) *The UNESCO Courier*.
23. On pharmacological neuroenhancement as part of the new neurorights' pioneering legislation in Chile: a perspective (2023) *Frontiers in Psychology*, PMID:37497151.
24. Cognitive Enhancement and American Constitutional Law (2023) In: *Handbook of Neuroethics*, Springer.
25. Neurorights: comparing some perspectives on legal reform in global south to analyze the Brazilian case (2026) *Frontiers in Human Neuroscience*.
26. Even Chile's Neurorights Leave Inferred Mental Data in a Gray Zone (2026) *Stanford Law School, Law and Biosciences Blog*.
27. Privacy and the Rise of "Neurorights" in Latin America (2023) *Future of Privacy Forum*.
28. Farah MJ, et al. (2004) Neurocognitive enhancement: what can we do and what should we do? *Nature Reviews Neuroscience*, PMID:15100724.