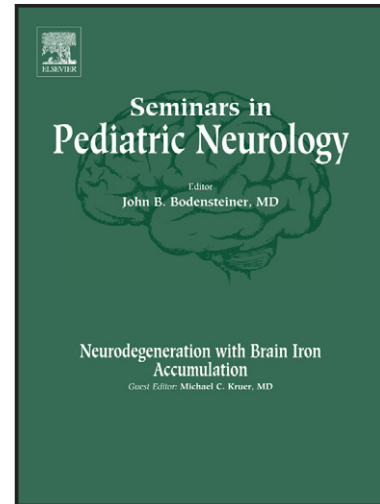


Author's Accepted Manuscript

Cognitive enhancement: Treating or cheating?

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PII: S1071-9091(15)00039-X
DOI: <http://dx.doi.org/10.1016/j.spen.2015.05.003>
Reference: YSPEN547

www.elsevier.com/locate/enganabound

To appear in:
Semin Pediatr Neurol

Cite this article as: Leslie M. Whetstine PhD, Cognitive enhancement: Treating or cheating?,
Semin Pediatr Neurol , <http://dx.doi.org/10.1016/j.spen.2015.05.003>

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Title:

Cognitive Enhancement: Treating or Cheating?

Abstract:

In this article I provide an overview of the moral and medical questions surrounding the use of cognitive enhancers. The discussion will be framed in light of four key considerations (1) is there a difference between therapy and enhancement? (2) How safe are these interventions? (3) Is the use of nootropics cheating? (4) Will enhancers create a further divide of social inequality where only the very wealthy will have access to them?

Keywords:

Cognitive enhancement, nootropics, ethics, cheating

Case: Peter's mother brought him to his pediatrician to request she prescribe Ritalin. Peter is getting ready to take the ACT and the family wants him to do well because he wants to be admitted to the aerospace engineering program at MIT.

The desire to improve oneself is not a new concept or even something that seems terribly controversial. Stroll down an aisle in a bookstore and you will encounter an entire section dedicated to a range of self help topics: how to be happier, thinner, more spiritual, wealthier, smarter, more outgoing, the list is seemingly endless. Very few people regard such self-help tactics as untoward let alone unethical or illegal. This perspective is not necessarily shared, however, when it comes to the role of improvement via cognitive enhancers, also known as nootropics. Sometimes called cosmetic neurology, it refers to the use of drugs or devices that can improve cognition, executive function, memory, and even mood states.

The legitimacy of cognitive enhancement raises a series of questions that involve ethics, medicine, the law, and public policy. In this paper I provide a general overview of cognitive enhancers, examine the various arguments for and against their use, and frame the discussion in light of four key considerations (1) is there a difference between therapy and enhancement? (2) How safe are these interventions? (3) Is the use of nootropics cheating? (4) Will enhancers create a further divide of social inequality where only the very wealthy will have access to them?

It should be addressed at the outset that there is, as yet, no “smart pill” that will transform one into a genius. There are various methods that can, however, enhance our faculties, some of which are products of the new millennium and others date back for

centuries. A number of interventions have already gained acceptance in improving learning, enhancing memory, and affecting emotion. These include brain-training games, mnemonics, tutors, education and even smart phones. The same could be said of some dietary choices including chocolate or coffee, (or for a comprehensive experience, a mocha latte) which are also regarded as unproblematic. Other enhancers are more controversial and include drugs like dextroamphetamine (Adderall), methylphenidate (Ritalin) or modafinil (Provigil) that can enhance cognitive and affective function of the brain even in the absence of pathology. Enhancement devices include brain stimulation through the use of Transcranial Direct Current Stimulation (tDCS), and even implantable brain chips.

Which are these types of enhancers and who is using them?

Over the past few years, research directed toward treating or preventing cognitive decline due to neurodegenerative disorders has increased exponentially. Some of the medications developed to treat Alzheimer disease and Parkinson disease, for example, have had the unanticipated side effect of enhancing cognition in those without impairment.¹ Drugs used to treat Attention Deficit Hyperactivity Disorder (ADHD) including Adderall and Ritalin are also reported to enhance working memory, problem solving and mathematical processing in healthy individuals.² Modafinil (Provigil) is a eugeroic prescribed for narcolepsy or for those with erratic sleep patterns due to shift work. It is also reported to effect vigilance, wakefulness, and concentration in healthy individuals. It is perhaps little surprise that drugs touted to maintain alertness would become popular in the high stress and competitive environment of academia. It has been

reported that between 5-35% of college students and 8% of high school seniors have used these stimulants over a one-year period.^{3, 4}

In addition to increasing memory and concentration, one study suggests that such drugs can also significantly influence emotional states.⁵ University students who were non-medical users of Adderall or Ritalin were asked to provide detailed narratives of their experiences. A trend emerged where students reported feeling more motivated, interested, and engaged with their work and found the assignments they were tasked with to be significantly less tedious and more enjoyable when taking such drugs. While professors would certainly appreciate more engaged and interested students, one might be inclined to wonder if getting such results from a pill does not sound a bit dystopian.

The use of cognitive enhancers is not limited to college students, however, as data indicate their professors may also be utilizing such drugs as well. An informal poll of the readers of the journal *Nature*, composed largely of academics, reveals that 20% had used cognitive enhancement at some point.⁶ Cognitive enhancers are also popular in the business sector as well as with the United States military. The United States Defense Advanced Research Projects Agency (DARPA) has a long history of investing in cognitive enhancement research to aid those engaged in lengthy field operations. However, the use of nootropics was implicated as the cause of ‘friendly fire’ in 2002 when US pilots killed Canadian troops. The event was blamed on the usage of “go pills” that apparently caused the pilots to become paranoid.⁷

Transcranial direct current stimulation (tDCS) is a type of non-invasive brain stimulation that uses small jolts of electricity to focus on specific regions in the brain to excite neurons. It is used to encourage neural plasticity to treat a number of conditions

ranging from depression to stroke to traumatic brain injury.⁸ There is some literature that indicates it has a positive effect on learning for those who do not suffer any impairment.⁹ These devices are now portable and can be used for personal use at home without professional oversight. Some have noted that well-intentioned parents might use tDCS on their children despite the unknown effects on a developing brain.¹⁰

The virtues of cognitive enhancement have been extolled and often hyperbolized in the popular media. They have been dubbed “steroids for the brain” and “Viagra for the brain” as well as dramatized in popular films like *Limitless*.¹¹ The Food and Drug Administration does not approve of any drug solely for enhancement purposes. Therefore, while companies are not permitted to market their drugs for enhancement, it is legal for physicians to prescribe them off label as they see fit.¹² This puts physicians in a challenging role as gatekeepers for a class of drugs that have not been evaluated for safety or efficacy for the purposes of neurologic enhancement. In addition, an unscrupulous patient can consult any number of websites that advise how to effectively feign symptoms in order to get a legitimate prescription.¹³ For those who prefer online shopping as opposed to doctor shopping, there is a growing black market where intrepid consumers can purchase drugs online without a prescription. The authenticity and safety of such drugs are unknown.

Some studies suggest that cognitive enhancement is exaggerated and may be little more than the placebo effect. While these drugs can inarguably keep one awake longer to complete a task, there is little data at present to conclude that they improve one’s performance in that task. It is inherently difficult, however, to test how much enhancement a drug or device may provide given the various types of assessments and

measurements used.¹⁴ It has been suggested that individuals may experience enhancement on a spectrum with those with the poorest baseline performance showing the most gains.

Interestingly, nicotine has been shown to significantly improve concentration much more so than the current class of nootropics. “The cognitive-enhancing effects of nicotine in a normal population are more robust than you get with any other agent. With Provigil, for instance, the evidence for cognitive benefits is nowhere near as strong as it is for nicotine.”⁸ In addition to enhancing learning, dozens of studies show nicotine may aid in the treatment of a host of psychiatric and neurological diseases.¹⁵ Ironically, though nicotine patches fail for their FDA approved use in quitting smoking they may be effective in treating Parkinson disease, Tourette syndrome, and schizophrenia.

Assessing therapy vs. enhancement

Even if nootropics are in their relative infancy it is clear that effective enhancers are on the horizon and we ought to consider the particular questions they raise sooner rather than later. The first question is whether such drugs ought to be regarded as treatment for disease, and therefore should be covered by insurance, or as enhancement and considered in the same realm as vitamins and dietary supplements? This dichotomy would accept nootropics as therapy for those who have a medical diagnosis, such as Ritalin for a patient with ADHD, and reject them for recreational use (an individual who desires to stay up all night to meet a deadline). But drawing distinctions between therapy and enhancement is notoriously hazy and even morally problematic.

A frequently cited example that illustrates the failure of this model is the use of human growth hormone therapy for two boys with short stature.^{16, 17} In this scenario one boy is short because he has a growth hormone deficiency as a result of a brain tumor and the other is short because he has very short parents. The first boy would receive growth hormone under the label of therapy while it would be considered enhancement for the second boy despite the fact both are afflicted by the same condition. But if being short causes difficulty for males, including employment discrimination, limitations in partner selection, and less reproductive success, then it is not clear why treating the second condition should be considered enhancement.^{18, 19}

The trend toward over medicalization further contributes to the ambiguity in defining treatment versus enhancement. Medicalization in this context occurs when newly developed pharmaceuticals serve as the motivating factor to create new classifications of disease. This was clearly seen by the drug Viagra and the subsequent creation of the diagnosis of erectile dysfunction.²⁰ Viagra was originally intended as a cardiovascular drug but had the unanticipated side effect of improving sexual performance, earning it the moniker the “Pfizer Riser” and over a billion dollars in sales.

But is Viagra a treatment for the heretofore-unknown disorder of erectile dysfunction or is it enhancement? Sexual function naturally decreases as men age and if a middle-aged man cannot perform to the degree he could at age 21 is that a normal consequence of the aging process or is he sick and in need of treatment? What constitutes erectile dysfunction seems to greatly depend on one’s notion of what “normal” erectile function should be, but if normal can be improved we are left without an objective baseline for which to determine whether something constitutes treatment or enhancement.

Regenerative medicine including tissue engineering could equally be labeled as enhancement while whole organ transplantation, once a fantasy of science fiction, is now considered treatment. The difference between enhancement and treatment lacks clarity, and terms like “normal” or “average” become meaningless as the state-of-the-art continually improves. Further, some could claim that restoration of natural function is *de facto* therapy and not enhancement, but what of a 70 year-old postmenopausal female who desires to be pregnant?²¹ Should restoring her fertility be regarded treatment in the way Viagra is treatment for 70 year-old men? Concepts of health and illness are not simply objective classifications but are largely culture bound and reflect the biases and social norms of the current society. A review of the Diagnostic and Statistical Manual of Mental Disorders (DSM) from previous editions to its current version clearly demonstrates that nosology is, to a large degree, a social construct.

Safety concerns

Safety concerns are often cited as the reason to summarily reject the use of nootropics and associated interventions. Ritalin and Adderall can cause negative side effects including addiction, heart problems, nausea, anorexia, anxiety, and insomnia. They have been linked to cerebrovascular disease and as potential triggers for underlying mental illness.²² This perspective suggests that the delicate human brain may not tolerate fluctuations in neurochemistry by powerful pharmaceutical agents. Long-term safety is unknown leading some to argue that the small gains they may provide are not worth the risk when there are established strategies to improve physical and mental health. Studies show that diet, proper sleep, and exercise, particularly aerobic exercise, improves

cognitive function.²³ With a growing obesity epidemic and nearly one third of Americans suffering some degree of sleep deprivation, the modification of health habits alone could be an enormous gain in public health.

Another safety concern is that “more” may not always be “better” in terms of memory or attentiveness as it could lead to unanticipated problems. Altering the selective process of memory could carry associated effects where gains in one area may lead to diminishments in another. For example, mice that had been genetically engineered for increased learning ability also showed greater sensitivity to pain.¹⁶ Some studies have shown that Adderall may increase focus and attention but might actually reduce creativity.²⁴ Another concern is that it may not be possible to simply amplify memory or cognition without having profound effects on our identity. The progression of Alzheimer disease shows the intricate relationship between memory and executive function to an individual’s sense of self. As Alzheimer disease ravages the mind it is often seen to change the person. Would enhancement have similar consequences on identity? Once enhanced, would one have the same interests, hobbies, or sense of humor? Will the person on “brain steroids” be the same person she was without?²⁵

In response to these criticisms, others would claim that it is inherently paternalistic to restrict nootropics on the basis of safety as long as individuals are fully apprised of the consequences.²⁶ Perhaps there is even an undercurrent of hypocrisy found in the safety argument given our preoccupation and adulation of professional athletes, many who participate in violent sports. Football, boxing, and hockey all carry varying degrees of harm to those who participate yet are tremendously popular with the general public. Football players suffer repeated traumatic brain injuries that can lead to

neurodegenerative disease yet few people would rally for a change to flag football. Crowds cheer and networks replay the most impressive (and dangerous) tackles, checks, and punches. According to this perspective, many activities that are dangerous are not automatically banned, thus responsible discussion of regulation may be a better response than blanket prohibition.²⁶

Still others argue that similar safety concerns apply to those enrolled in highly competitive academic honors programs. The students in these programs are often under intense pressure to succeed, which could take a toll on their mental and physical health. Some side effects of high-pressure academic programs may include insomnia, dyspepsia, headache, anorexia, etc., which mirror many of the side effects documented from prescription stimulants.²⁷ In addition, this perspective argues that enhancers pose no more a threat to health than participating in highly selective educational programs where academic demands may become all consuming.

Is it cheating?

Perhaps the most morally problematic argument against the use of nootropics is that it constitutes a form of cheating. For some, the idea of taking a pill to concentrate, to stay awake longer to study for an exam, or to meet a deadline is regarded as inauthentic and diminishes the hard work of those who put in the effort naturally. Some have worried that it deforms our character and devalues the spirit of perseverance and self-discipline.¹⁷ Accordingly, if achievements come too easily and without a substantial investment of time and struggle, this could have the paradoxical effect of dampening the ambition

necessary to overcome future challenges and obstacles. Most of the discussions on cheating have focused on how it would apply in an academic setting.

Universities have academic codes of conduct that prohibit cheating and plagiarism but have yet to directly address the use of cognitive enhancers as violations of academic integrity since they are regarded in a moral gray zone. The President's Council on Bioethics has claimed the use of nootropics is "cheap" and compares those who use them with plagiarists, implying that work produced under the influence of nootropics is "less one's own and less worthy of our admiration."² Goodman, an opponent of this point of view, argues that it is precisely this cultural hegemony that regards cognitive enhancement as something immoral and undignified that keeps most people from using them. He recounts the collective moral outrage that followed after major league baseball player Barry Bonds admitted to steroid use and suggests that social conventions reinforce compliance but do not necessarily rely on any sound justification.

Goodman further argues that to assume using nootropics is cheating requires that we regard accomplishment in the most narrow of terms, one that focuses solely on the individual.² His alternate view suggests that accomplishment is not exclusively the result of the individual but could be seen as a collaborative process, one where outside social and cultural influences shape the product. This collaborative process is clearly seen across centuries from art and literature to philosophy and music. No one person can take credit in this model, instead ideas are developed and refined over time and passed down through tradition. Cognitive enhancers become yet another type of influence, though Goodman claims they ought not be hidden, they should be disclosed as readily as if one collaborated with another author.

Still, others would argue that labeling nootropics as cheating solely on the basis that they confer particular cognitive advantages is insufficient since the institution of education attempts to impart the same goals. Education, like drugs, can have a profound physical effect on the brain by changing neuronal connections, which affect memory and information processing. According to this position, education is a benefit, not only to the individual but also to society at large, and to label one form of enhancement as acceptable but another as immoral requires justification that has not been forthcoming.²⁷

Olthof et al argue that education, and in particular, honors programs, seek to modify, expand, and enhance a select cadre of students and such programs are considered not only legitimate, but perhaps the hallmark of academic excellence. Honors programs target the best and brightest not solely to develop individual talent but with the expectation that individuals will contribute to the “knowledge economy.”²⁷ It is difficult, then, to make clear distinctions between what are acceptable methods of improvement and what are considered cheating.

Some have argued that zero sum games where an individual is ranked according to the performance of her peers may require a different paradigm for the use of enhancers. If individuals are assessed based on individual performance rather than in relation to those of his or her peers then the issue of cheating is moot. Olthof et al argue it is the method of assessment that determines whether an intervention ought to be considered cheating more so than the type of enhancer. To the President’s Council’s concern that we risk losing our character if studying becomes too easy through the use of enhancers, an alternative view is to regard enhancers not as “smart pills” but as

augmenters to the educational process similar to the use of calculators or computers in the classroom.

Equal Access

The final issue under consideration is whether the use of nootropics would worsen social inequality. Buchanan argues that this will depend primarily on the kinds of interventions that are considered in the category of enhancement.²⁸ Implantable brain chips or embryonic screening, for example, will likely remain expensive and available to a small few. Addressing the issue of genetic improvement and unequal access, Princeton biologist Lee Silver has suggested the possibility that this could lead to a genetic aristocracy where wealth would ensure health and disease would be confined to the poor.²⁹ If, however, enhancement refers to drugs and other low impact interventions like tDCS then economic concerns are less problematic.²⁸ A related concern is that some may feel pressured to take nootropics if they become readily available in order to remain competitive in an enhanced society. Further, some employers may require use of enhancers such as the military, medicine, and aviation. Much of this discussion remains speculative but a climate of enhancement would require safeguards to protect individual autonomy.

Looking toward the future

Along the spectrum of cognitive enhancers are pharmaceuticals designed specifically to diminish functions including memory, attachment, and even sexual function. Some philosophers have endorsed diminishment as enhancement under a

Welfarist claim that the definition of enhancement should be broad enough in scope to include biological or psychological changes that promote one's welfare under a particular set of circumstances.³⁰

Accordingly, Earp et al argue that some drugs that reduce function actually enhance quality of life. For example, anti-love drugs may benefit a battered spouse who cannot otherwise break his or her emotional connection to an abuser. Victims of violent crimes can be relieved of traumatic memories and could benefit from drugs that attenuate their emotional content. Sex offenders often have the option of chemical castration as conditions for parole.³⁰

On a potentially brighter note (depending on one's point of view) love drugs are currently being investigated to reinforce the bond between couples that might otherwise dissolve over time.³¹ These interventions raise their own attendant concerns but it is clear that the next generation of cognitive enhancement is under way, which means the questions addressed herein will have to shift to the level of public policy.

1. Mehlman MJ: Cognition-Enhancing Drugs. *Milbank Q* 82:483–506, 2004.
2. Goodman R: Humility Pills: Building an Ethics of Cognitive Enhancement. *J Med Philos* 39:258–278, 2014.
3. Emanuel RM, Frelsen SL, Kashima KJ, et al.: Cognitive Enhancement Drug Use Among Future Physicians: Findings from a Multi-Institutional Census of Medical Students. *J Gen Intern Med* 28:1028–1034, 2013.
4. Szalavitz M: Teens Taking ADHD Drugs to Get Good Grades: How Big a Problem Is It? *Time*. Available at: <http://healthland.time.com/2012/06/11/kids-taking-adhd-drugs-to-get-good-grades-how-big-a-problem-is-it/>. Accessed December 16, 2014.
5. Vrecko S: Just How Cognitive Is “Cognitive Enhancement”? On the Significance of Emotions in University Students’ Experiences with Study Drugs. *AJOB Neurosci* 4:4–12, 2013.
6. Maher B: Poll results: look who’s doping. *Nat News* 452:674–675, 2008.
7. Do cognitive-enhancing drugs work? *BBC News*. Available at: <http://www.bbc.co.uk/news/health-15600900>. Accessed December 8, 2014.
8. Hurley D: *Smarter: The New Science of Building Brain Power*. Hudson Street Press; 2013.
9. Kadosh RC, Levy N, O’Shea J, et al.: The neuroethics of non-invasive brain stimulation. *Curr Biol* 22:R108–R111, 2012.
10. Madan CR: Augmented memory: a survey of the approaches to remembering more. *Front Syst Neurosci* 8, 2014. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3939671/>. Accessed November 29, 2014.
11. Steroids for the Brain: Are They Worth the Risk? 2012. Available at: https://www.youtube.com/watch?v=JiY5uFLQG2E&feature=youtube_gdata_player. Accessed December 13, 2014.
12. Muhammed K: Cosmetic neurology: the role of healthcare professionals. *Med Health Care Philos* 17:239–240, 2014.
13. 5th SM, Comments 2014|Life Hacks|2: How to get an Adderall prescription. *Smart Drugs Coll*. Available at: <https://smartdrugsforcollege.com/how-to-get-your-doctor-to-prescribe-you-adderall/>. Accessed December 13, 2014.
14. Husain M, Mehta MA: Cognitive enhancement by drugs in health and disease. *Trends Cogn Sci* 15:28–36, 2011.
15. Nicotine, the Wonder Drug? | *DiscoverMagazine.com*. *Discov Mag*. Available at: <http://discovermagazine.com/2014/march/13-nicotine-fix>. Accessed December 10, 2014.
16. Wolpe PR: Treatment, enhancement, and the ethics of neurotherapeutics. *Brain Cogn* 50:387–395, 2002.
17. Kass L: *Beyond therapy: biotechnology and the pursuit of happiness*. Harper Perennial; 2003.
18. Standing tall pays off, study finds. <http://www.apa.org>. Available at: <http://www.apa.org/monitor/julaug04/standing.aspx>. Accessed December 13, 2014.
19. Brewer G, Riley C: Height, relationship satisfaction, jealousy, and mate retention. *Evol Psychol* 7:477–489, 2009.

20. Project TBP: Assessing a Decade of Viagra. NPR.org. Available at: <http://www.npr.org/templates/story/story.php?storyId=89140269>. Accessed December 16, 2014.
21. Kass LR: Ageless bodies, happy souls. *New Atlantis* 1:9–28, 2003.
22. Saniotis A, Henneberg M, Kumaratilake J, et al.: “Messing with the mind”: evolutionary challenges to human brain augmentation. *Front Syst Neurosci* 8, 2014. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4179735/>. Accessed December 1, 2014.
23. Chapman SB, Aslan S, Spence JS, et al.: Shorter term aerobic exercise improves brain, cognition, and cardiovascular fitness in aging. *Front Aging Neurosci* 5:75, 2013.
24. Ansburg PI, Hill K: Creative and analytic thinkers differ in their use of attentional resources. *Personal Individ Differ* 34:1141–1152, 2003.
25. Whitehouse PJ, Juengst E, Mehlman M, et al.: Enhancing cognition in the intellectually intact. *Hastings Cent Rep* 27:14–22, 1997.
26. Savulescu J: A Liberal Consequentialist Approach to Regulation of Cognitive Enhancers. *Am J Bioeth* 13:53–55, 2013.
27. Olthof B, Peeters A, Schelle K, et al.: If you’re smart, we’ll make you smarter. Applying the reasoning behind the development of honours programmes to other forms of cognitive enhancement. , 2013. Available at: <http://philpapers.org/rec/OLTIYS>. Accessed December 1, 2014.
28. Andersen R: Why Cognitive Enhancement Is in Your Future (and Your Past). *The Atlantic*, 2012. Available at: <http://www.theatlantic.com/technology/archive/2012/02/why-cognitive-enhancement-is-in-your-future-and-your-past/252566/>. Accessed December 4, 2014.
29. 1998 19 January: It’s not the meek who will inherit. *Times High Educ*. Available at: <http://www.timeshighereducation.co.uk/features/its-not-the-meek-who-will-inherit/105415.article>. Accessed December 16, 2014.
30. Earp BD, Sandberg A, Kahane G, et al.: When is diminishment a form of enhancement? Rethinking the enhancement debate in biomedical ethics. *Front Syst Neurosci* 8, 2014. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3912453/>. Accessed November 29, 2014.
31. Savulescu J, Sandberg A: Neuroenhancement of Love and Marriage: The Chemicals Between Us. *Neuroethics* 1:31–44, 2008.