

# The Rise of Cognitive Steroids: A Discussion on Fairness and the Need for Regulation

Theresa Lii

If you were offered a pill that would improve memory and concentration, would you take it? If the drug had no adverse side effects, then the discussion becomes an argument of fairness: would using the drug in order to outperform others be considered cheating? When Major League Baseball outfielder Barry Bonds broke the home run record, many critics suggested that an asterisk be placed next to the new record indicating that Bonds had taken performance-enhancing drugs. Would people suggest placing asterisks next to Nobel Prize winners' names to indicate the use of drugs that enhance cognitive abilities? Although the fairness of using of cognition-enhancing drugs for nonmedical pur-

“ Off-label usage is rampant  
in academic circles. ”

poses is suspect, there is no doubt that use of these drugs is rising. To ensure that these drugs are safe for consumption, regulation must be implemented.

Nootropics are drugs that enhance cognition, meaning the brain processes that underlie mental activity such as attention, perception, learning, memory, language, planning and decision-making [1]. For people who suffer from neurological and psychiatric disorders, nootropics can improve quality of life. However, according to a report by the Academy of Medical Sciences, non-prescription use



Is cognitive enhancement fair? Reproduced from [21]

of nootropics by healthy people is becoming increasingly widespread [1]. Off-label usage is particularly rampant in academic circles, where selective pressure for high performance is causing some to seek a competitive edge [2]. According to an informal survey conducted by Nature on its readers, one in five scientists and other professionals—out of 1,400 surveyed—admit to using drugs such as methylphenidates (Ritalin or Concerta), Modafinil (Provigil), and beta-blockers to improve their performance at work [3].

According to the Nature survey, the two most commonly used nootropics in academia are methylphenidates and Modafinil. These drugs were developed by pharmaceutical companies and certified by the FDA to treat symptoms of attention-deficit hyperactivity disorder and sleep disorders, respectively. Methylphenidates such as Ritalin are amphetamine-like drugs that improve attentiveness and focus; Modafinil is a popular drug reputed to offer similar benefits without the undesirable side effects, such as needing to make up for lost sleep in “sleep rebound” or developing tolerance for the drug [4]. According to several studies, Modafinil was shown to reduce fatigue while improving motivation, reaction time, and vigilance [5, 6]. These observed benefits translate to increased productivity and more time that can be spent in the laboratory or cramming for exams. While Modafinil is approved to treat narcolepsy and other sleep disorders, Cephalon—the pharmaceutical company that markets Modafinil—reports that as much as 90 percent of its sales come from people who are using it “off-label” to stay awake for long stretches of time [7].

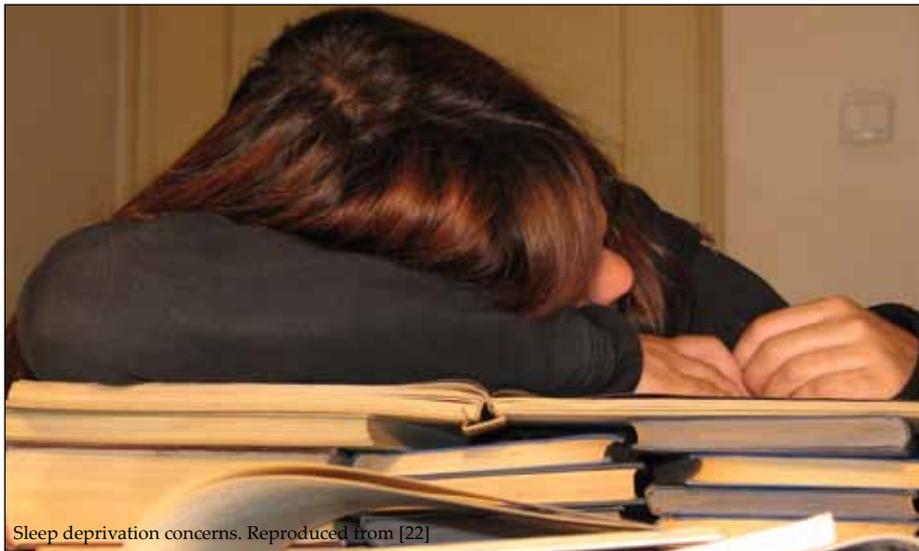
Many people use Modafinil to enhance cognition and wakefulness, but is this a potentially harmful misuse of an otherwise beneficial drug? What remains unclear is the definition of “abuse” in this context. For example, caffeine has been shown to provide temporary improvements in vigilance, learning, memory, and mood [8]. Caffeine is used worldwide to increase productivity because it staves off sleep. Despite



Ritalin: off-prescription use is increasingly widespread. Reproduced from [20]

the benefits that caffeine confers, most people would not equate caffeine with other performance enhancing drugs such as steroids.

As brain-boosting drugs become more sophisticated, however, when do we declare that a substance has entered the domain of cognitive steroids? Not surprisingly, there are already people in the sports industry who disapprove of wakefulness- and concentration-boosting drugs. In 2004, the World Anti-Doping Agency added Modafinil to its list of prohibited drugs [9]. If a sports watchdog organization deems Modafinil unethical in athletic settings, should it also be unethical in academic settings? Increased use of nootropics in general could raise the stan-



Sleep deprivation concerns. Reproduced from [22]

do have long-term consequences on normal-functioning brains [10, 11, 12]. Due to the possibility that nootropics can harm young and developing brains, protective measures should be taken to prevent the unnecessary medicating of children. According to an article by Mark Henderson, science editor of *The Times*, “more formal laws may be required to

prevent coercive use of such drugs... by parents or teachers who want their children to perform better at school” [13]. But how the government should enforce such laws remains unclear.

While no student, physician, or scientist should require an exogenous substance for his or her mental creativity and performance on the job, there will undoubtedly be people who do use nootropics regularly to boost their cognitive function. Therefore, nootropics should be regulated like any other medicinal drug in order to lessen the likelihood of abuse and harm.

Currently, drugs are developed and labeled for a specific disorder, and non-prescription usage goes largely unchecked [14]. The current “wink and nod” acceptance of off-label usage by the general public is unwise, as it provides little opportunity to assess risks. Right now, “we simply do not know what the long-term effect of the use of such drugs in healthy populations will be,” a British Medical Association report concludes [15].

The risks are not limited to chemical toxicity; there may be secondary hazards associated with nootropics’ intended purpose. For example, drugs that increase wakefulness sap

## “ A pharmaceutical race to become the best and the brightest. ”

dard for “normal” academic performance and, as a result, lead to an “achievement gap” between those who can obtain these medications and those who cannot. Because so many cannot afford or access the drugs, using nootropics to gain a competitive advantage is an inherently unfair practice.

With increased use lies the possibility of developing a severe psychological dependence on these drugs. For example, students may begin to believe that the only way they can maximize their academic performance is by taking daily doses of a nootropic. They may become reluctant to stop taking the drug for fear of losing their perceived gain in intellectual function. Here, the use of cognitive enhancers poses not only an ethical problem but also a practical one. Using drugs to boost one’s productivity may prove useful in the short run, but if one becomes dependent on the drug, then both the financial burden of continual self-medication as well as the psychological dependence may not be worth the short-term gain.

Psychological dependence at the individual level can also lead to dependence at the societal level. In a pharmaceutical race to become the best and brightest, everyone may become pressured into consuming nootropics. Workers who see their colleagues taking nootropic pills may feel compelled to take these drugs so they do not lag behind in productivity. Parents may also feel that their children will be at a disadvantage if they are not taking cognition-enhancing drugs. Although the long-term effects of methylphenidates on children are not well-documented, many researchers agree that methylphenidates

## “ More formal laws may be required to prevent coercive use of such drugs. ”

necessary hours of sleep from their users, leading to disorientation, impaired judgment, and increased risk-taking that result from prolonged insomnia [16]. Such drugs make users believe that they need less sleep, but in reality people still need seven to nine hours of sleep every day, as recommended by the National Sleep Foundation [17]. Despite the urgent need for testing and risk assessment, it is possible that regulation of nootropics may not be implemented until a sleep-deprivation-induced accident, whether behind the wheel or on the operating table, occurs. A much healthier approach would be to accept the fact that cognitive enhancers might one day be widely used, determine which age groups

to thoroughly assess effects and side-effects, and then use these results to label drugs that are offered for public consumption. In short, nootropics should be explicitly labeled as cognition-enhancers and subject to rigorous testing like any other FDA-regulated drug.

Of course, pharmaceutical companies have already picked up on the demand for nootropics. There are certainly potential profits in repackaging certain drugs so that they are marketed as cognition enhancers. However, before doing so,

“ the use of nootropics for gaining academic advantage is inherently unfair. ”

these companies must again go through testing to earn the FDA seal of approval. Many pharmaceutical companies are currently conducting research on the cognition-enhancing properties of drugs that are approved for other purposes.

Cephalon recently sponsored a study that assesses the memory-enhancing properties of its product Modafinil. Amy DiCamillo, who heads the Cephalon-sponsored study, presented a poster on this topic at the 2008 Society for Neuroscience annual meeting [18]. Her study specifically evaluated whether Modafinil improves short-term and working memory in rats.

In addition to recycling old drugs, pharmaceutical companies are also beginning to investigate and develop novel compounds that will enhance cognition. Abbott Laboratories sponsored an animal-based study on the effects of a novel H3 receptor agonist on learning and memory, and it will not be long before testing moves from animal studies to human-based clinical trials [19]. Eventually, drugs whose primary purpose is cognitive enhancement may be manufactured for public consumption.

From an ethical standpoint, the use of nootropics for gaining an academic advantage is inherently unfair. How-

ever, there will always be people who have no qualms about taking nootropics to get ahead. Because a market for these drugs exists, the same kind of FDA regulation that is applied to all other medications should be applied to nootropics as well. Regulation places responsibility on drug companies so that their products are rigorously tested to protect the public's health. This way, nootropic usage can become mainstream in a safe and regulated manner. The development of cognition-enhancing pharmaceuticals is moving forward at an incredible pace— yet ethics still has to catch up and define the boundaries between “fair” and “unfair.” Despite the opposition to tampering with the brain in a way that confers unnecessary advantages, nootropics are here to stay. ■

*Theresa Lii is an undergraduate student at Brown University.*

At risk? Reproduced from [23]



#### References:

- [1] Academy of Medical Sciences. Brain science, addiction, and drugs. AMS working group report. 2008;143-159.
- [2] Bee, P. Smart drugs for straight As. Times Online [newspaper online]. 2007 May 14 [cited 2008 Dec 11]; para 4. Available from: [http://www.timesonline.co.uk/tol/life\\_and\\_style/health/features/article1780141.ece](http://www.timesonline.co.uk/tol/life_and_style/health/features/article1780141.ece).
- [3] Maher B. Poll results: look who's doping. Nature. 2008;452(7188):674-5.
- [4] Legarde D, Batejat D, Van Beers P, Sarafian D, Pradella S. Interest of Modafinil, a new psychostimulant, during a sixty-hour sleep deprivation experiment. Fund Clin Pharmacol. 1995;9(3):271-279.
- [5] Baranski JV, Pigeau R, Jacobs I. Effects of modafinil on cognitive and meta-cognitive performance. Hum Psychopharmacol Clin Exp. 2004;19:323-332.
- [6] Turner DC, Robins TW, Clark L, Aron AR, Dowson J, Sahakian BJ. Cognitive enhancing effects of modafinil in healthy volunteers. Psychopharmacol. 2003;165:260-269.
- [7] O'Connor, A. (2004). Wakefulness Finds a Powerful Ally. The New York Times, D1 and D6.
- [8] Lieberman HR, Tharion WJ, Shukitt-Hale B, Speckman KL, Tully R. Effects of caffeine, sleep loss, and stress on cognitive performance and mood during U.S. Navy SEAL training. Sea-Air-Land. Psychopharmacol. 2002;164(3):250-261.
- [9] WADA Prohibited List, 2004. World Anti-Doping Agency; 2004. p. 2.
- [10] Bobinchock A. Early Ritalin Exposure May Cause Long-Term Effects on the Brain: Research in animal models underscores need for correct diagnosis of ADHD. McLean Hospital News & Information: Press Releases. 2004 Dec 12 [cited 2008 Dec 11]; para 6. Available from: <http://www.mclean.harvard.edu/news/press/current.php?id=65>.
- [11] Grund T, Lehmann K, Bock N, Rothenberger A, Teuchert-Noodt G. Influence of methylphenidate on brain development – an update of recent animal experiments. Behav Brain Funct. 2006;2(2).
- [12] Gately, B. Possible Long-Term Effects of Stimulants on Brain and Behavior. Medical News Today [newspaper online]. 2003 Dec 14 [cited 2008 Dec 11]; para 16. Available from: <http://www.medicalnewstoday.com/articles/4870.php>.

- [13] Henderson M. Academy of Medical Sciences suggests urine tests to detect smart drugs. Times Online [newspaper online]. 2008 May 22 [cited 2008 Dec 11]; para 6. Available from: <http://www.timesonline.co.uk/tol/news/uk/education/article3980936.ece>.
- [14] Groho, JM. FDA to Drug Companies: Off-Label Use Ok [document on the internet]. PsychCentral; 2008 Feb 17 [cited 2008 Dec 11]. Available from: <http://psychcentral.com/blog/archives/2008/02/17/fda-to-drug-companies-off-label-use-ok/>.
- [15] British Medical Association Ethics Department. Boosting your brainpower: ethical aspects of cognitive enhancements. British Medical Association discussion papers. 2007:17.
- [16] Killgore WD, Grugle NL, Killgore DB, Leavitt BP, Watlington GI, McNair S, et al. Restoration of risk-propensity during sleep deprivation: caffeine, dextroamphetamine, and modafinil. Aviat Space Environ Med. 2008;79(9):867-74.
- [17] National Sleep Foundation. How Much Sleep Do We Really Need? [document on the internet]. National Sleep Foundation Sleep Facts & Information; [cited 2008 Dec 11]. Available from: [http://www.sleepfoundation.org/site/c.huXKjM0lxF/b.2417325/k.3EAC/How\\_Much\\_Sleep\\_Do\\_We\\_Really\\_Need.htm](http://www.sleepfoundation.org/site/c.huXKjM0lxF/b.2417325/k.3EAC/How_Much_Sleep_Do_We_Really_Need.htm).
- [18] Society for Neuroscience. Final Program: Sunday: Scientific Sessions Listings. Society for Neuroscience: 2008. p. 139.
- [19] Cowart M, Faghieh R, Curtis MP, Gfessler GA, Bennani YL, Black LA, et al. 4-(2-[2-(R)-methylpyrrolidin-1-yl]ethyl)benzofuran-5-yl]benzonitrile and related 2-aminoethylbenzofuran H3 receptor antagonists potently enhance cognition and attention. J Med Chem. 2005;48(1):38-55.
- [20] Ritalin by Sponge. Wikimedia Commons under CC-BY-SA 3.0. Available from: <http://commons.wikimedia.org/wiki/File:Ritalin-SR-20mg-full.jpg>.
- [21] Final Exam Day by dcjohn. Flickr under CC-BY 2.0. Available from: <http://www.flickr.com/photos/dcjohn/74907741/>.
- [22] Too tired by Sanja Genero. stock.xchng © sxc.hu. Available from: <http://www.sxc.hu/photo/896217>.
- [23] Brain by everyone's idle. Flickr under CC-BY-SA 2.0. Available from: <http://www.flickr.com/photos/mgdtgd/3507973704>.