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Schleim, Stephan; Quednow, Boris B.

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10  Debunking the ethical neuroenhancement debate

Stephan Schleim, Boris B. Quednow

Abstract

In this chapter we argue that the use of stimulant drugs as performance enhancers is neither new nor more common than it was decades ago. Our literature analysis of scientific sources from the 1960s–80s shows that stimulant consumption of drugs such as amphetamines for enhancement purposes was present and investigated back then prior to the current neuroenhancement debate. Finally, we propose a new theoretical framework with which attitudes toward neuroenhancement in the healthy can be located in a two-dimensional matrix. This framework spans the dimensions knowledge attitudes (pharmacological optimism vs. pharmacological scepticism) and ethical attitudes (pharmacological utilitarianism vs. pharmacological calvinism) and enables the location of common ethical positions on neuroenhancement such as transhumanism and bioconservatism. We conclude that the ethical significance of neuroenhancement was exaggerated and that a more cautious stance toward this phenomenon would likely be more appropriate.

Keywords: neuroenhancement, stimulants, modafinil, methylphenidate, amphetamine, pharmacological Calvinism, neuroethics, transhumanism, bioconservatism

Subject: Cognitive Neuroscience, Psychopharmacology

Collection: Oxford Scholarship Online

10.1 Introduction

Since the end of the 1990s, scholars from a wide range of disciplines including neurobiology, law, and philosophy have been discussing the possibility of improving cognitive skills of the healthy by neuroscience technologies, in particular psychopharmacological drugs (Farah et al. 2004; Greely et al. 2008; Morris 2008; Whitehouse et al. 1997). The social and scientific urgency of this debate rested on two basic assumptions. First, the increasing understanding of the brain makes it likely that new drugs or other approaches for cognitive improvement of healthy people will be developed soon (pharmacological optimism hypothesis). Second, a high and/or increasing number of healthy people already make use of such means, in particular psychostimulants, for the purpose of cognitive or so-called neuroenhancement (neuroenhancement prevalence hypothesis). In this essay, we demonstrate that both assumptions must be reconsidered and conclude with a recommendation to give priority to clinical research that aims to improve the situation of people with neurological or psychiatric disorders instead of the healthy.
10.2 Assumption 1: the pharmacological optimism hypothesis

When the Decade of the Brain was proclaimed by the US government (Bush 1990) and the European Commission (Pandolfi 1993), a wide range of institutions as well as the public at large were called to support the efforts of neuroscience to develop treatments for neurodegenerative disorders such as Alzheimer’s and Parkinson’s diseases and, only for the US initiative, to fight the “war on drugs.” These announcements were made in the context of an increased understanding of the brain but also the recognition that much more research is needed to face these clinical challenges of high social relevance. The current situation, more than 20 years later, is comparable. Our neuroscientific knowledge has increased much more, but in many fields the brain’s complexity makes direct translations from basic research to the practice difficult. For example, the behavior of a comparatively simple model organism such as Caenorhabditis elegans with only 302 neurons still resists complete understanding (Mausfeld 2012; Thomas and Lockery 2000); or researchers who investigate the mechanisms of neurotransmitter release by amphetamine still face mechanistic challenges, more than 100 years after the substance was discovered (Sulzer et al. 2005). Additionally, the development of new pharmacological treatments for mental illnesses has been stagnating since decades and academic researchers as well as the pharmaceutical industry have become aware that the brain mechanisms associated with psychiatric disorders are much more complex than expected by the previously mentioned US and European brain decades as well as by the German decade of the brain 2000–10. Due to this eminent lack of knowledge we are currently in a “crisis” of psychopharmacology (Amara et al. 2011).

Many of the early papers on cognitive enhancement suggested that new dementia or attention disorder drugs, once they are approved for clinical practice, can also be used to improve memory or attention performance in the healthy (Farah et al. 2004; Whitehouse et al. 1997). Yet, it turns out that the development of such drugs to later succeed in clinical trials, let alone to make them available to the general healthy public without causing serious harm, is very difficult. Recently, as an expression of the crisis, several pharmaceutical companies announced they would give up their research into disorders of the central nervous system because comparably low clinical approval success rates and comparably high development costs make these investments too risky (Miller 2010; van Gerven and Cohen 2011). Understandably, these developments caused serious concerns among clinical pharmacologists. If it is already difficult to re-establish a state of health or to prevent further neurodegeneration, despite the vast amount of research carried out, then we may assume that cognitively improving healthy brains will not be easier.

It is therefore likely that the brain of a well-rested person is already optimally tuned and can hardly be enhanced. Instead, every pharmacological intervention is likely to be fraught with several trade-offs (de Jongh et al. 2008; Quednow 2010a, b; Wood et al. 2014). These trade-offs can be described on the dimension of enhancement–impairment or more general with regard to desired effect and undesired side effects. That means acute enhancement in one aspect of cognition will be secured with an acute impairment in another cognitive, emotional, or behavioral facet. Moreover, it is likely that a chronic use of any pharmacological enhancer will also be followed by a sustained or even chronic cognitive and emotional impairment, because the brain will probably adapt to the repeated pharmacological stimulus, as shown with the stimulant drug cocaine (Vonmoos et al. 2014). In addition, these cost effectiveness trade-offs are highly individual and it is impossible to predict which individual will have a benefit or an impairment in any cognitive domain (Quednow 2010a, b; Wood et al. 2014). Therefore, the pharmacological optimism hypothesis is not plausible in the light of recent developments in neuroscience.
With regard to the neuroenhancement prevalence hypothesis, others and we have already warned that widely communicated figures of 15, 20, and even 30% of regular neuroenhancement users may be based on selective or biased interpretations (Hall and Lucke 2010; Lucke et al. 2011a; Quednow 2010a,b; Schleim 2010, 2014b). Investigating 142 English newspaper articles on the prevalence of neuroenhancement for the period 2008–10, Partridge and colleagues found that 94% of the articles present it as common, increasing, or both (Partridge et al. 2011). Two-thirds of them referred to scientific sources to justify these claims. If our concerns about the neuroenhancement prevalence hypothesis are correct, this finding implies that the public is systematically misled about the frequency of stimulant consumption and that some scientists—wittingly or unwittingly—contribute to this misrepresentation. In our view, a careful look at the prevalence studies does not support this second basic assumption of the neuroenhancement debate as outlined in the following.

The studies investigating larger (N > 1000) and more representative samples, mostly of college and university students, usually report a past-year or lifetime prevalence (i.e., at least once in the respective period) of nonmedical stimulant consumption of less than 10% (Smith and Farah 2011). However, interpretations and comparability of these figures are made difficult by different operationalizations of neuroenhancement in these studies. Some surveys asked for specific drugs such as methylphenidate or amphetamine only, others for a wide array of substances. Additionally, most studies defined nonmedical drug consumption broadly so that they included various motivations besides neuroenhancement, such as losing weight or feeling high, what is generally referred to as “recreational” or “lifestyle use.” A survey investigating a nonrepresentative sample of 1500 high school pupils and university students in Germany exclusively asked about the consumption of prescription stimulants and illicit drugs for the purpose of improving vigilance, concentration, or memory (Franke et al. 2011). Lifetime prevalence for prescription stimulants was 1.3% but for illicit drugs was 2.6%. Past-year prevalence rates showed low levels ranging between 0.1 and 1.0% for the different groups and substance classes. In contrast to widespread presentations of an epidemic use of neuroenhancers particularly in students, these figures suggest the opposite (Schleim 2010, 2014b). On the basis of a more recent and representative survey, the same group estimated a much higher 12-month-prevalence of 20% for Germany, but only after including caffeine tablets, vitamins, and other dietary supplements that are legally sold over the counter in pharmacies without a prescription (Dietz et al. 2013).

Furthermore, new figures from Switzerland contradict the neuroenhancement prevalence hypothesis as well. A representative survey among 6275 students from the universities of Zurich and Basel revealed that the lifetime prevalence for the use of methylphenidate (4.1%), modafinil (0.3%), amphetamine (0.4%), and cocaine (0.2%) as neuroenhancers is rather low, while a considerable number of students used these substances as recreational drugs: methylphenidate 2.2%, modafinil 0.1%, amphetamine 3.7%, and cocaine 4.2% (Maier et al. 2013). Moreover, representative surveys of health insurance firms from Germany and Switzerland have shown that less than 1% of employees had used stimulants at least once in their lives (DAK 2009; Maier and Schaub 2014). In the DAK Study, of 3000 participants aged between 20 and 50 years, only 0.93% reported to have ever used stimulant drugs against tiredness and sleepiness, while only 0.63% have used these compounds for better concentration at least once (DAK 2009). In the SUVA study, only 0.60% of 10,000 participants between 15 and 74 years have used methylphenidate at least once for neuroenhancement purposes (Maier and Schaub 2014; see also Maier et al. 2015). These numbers strongly suggest that the claimed epidemic use of stimulant drugs as neuroenhancers is a myth. With respect to the claim that the prevalence rates are increasing, an analysis of the scientific literature before the 1990s may shed more light on the validity of the neuroenhancement prevalence hypothesis.
For the purpose of this paper, we searched for surveys on the prevalence of nonmedical drug consumption from the 1960s to the 1980s. It has been already noted in the cognitive enhancement debate (Quednow 2010a), that medical amphetamine consumption was common in the USA in the 1960s and that prevalence dropped until the 1980s, but then increased again since the early 1990s and reached the levels of the 1960s in mid–2000s, when combining amphetamine and the nowadays much more commonly used methylphenidate (Rasmussen 2008a). However, to our knowledge, nobody has ever investigated whether neuroenhancement might have already been common or perhaps even more frequent in earlier decades.

Interestingly, already in the 1950s, amphetamine sold as Raphetamine was advertised to increase “mental alertness” (see figure in Rasmussen 2008a, 976). Thus, the idea to improve cognitive performance by stimulants is not unique to our time. Much to our surprise, we also found several studies as well as reviews on the prevalence of drug consumption for recreational, self-treatment, and instrumental use decades before some ethicists conceived this as a new problem. For example, Smith and Blachly (1966) investigated the prevalence of amphetamine usage in a nonrepresentative sample of 297 medical students. From the 208 subjects who completed the anonymous questionnaires, 92 (44%) had used amphetamine at least once, 73 (79% of the 92) more than once. When asked for the benefits of the drug consumption, 46% named reduced fatigue, 11% reduced appetite, 10% increased alertness, and 4% each increased attention span and motivation.

Wechsler and Rohman (1981) investigated drug use patterns of a larger representative sample of 7170 New England college students in 1977. Within the previous year, 59.3% of the students had used marijuana, 16.2% stimulants, 11.1% cocaine, 9.6% tranquilizers, 7.8% hallucinogens, and lower percentages a number of other drugs. Most importantly, 16% had used stimulants, 11% cocaine, and 10% tranquilizers to stay awake or study, but only 5, 2, and 3%, respectively, reported using these substances more than once a month. These authors also reviewed mean percentages of college students who have used different kinds of drugs (i.e., lifetime prevalence) for the period from 1967 to 1972. Marijuana consumption was most frequent, with 20 to 50%, followed by stimulants at about 20%, depressants/sedatives at about 15%, hallucinogens 7 to 13%, and opiates at about 4%.

Additionally, McAuliffe and colleagues investigated the prevalence of nonmedical drug use in samples of young physicians and premedical, medical, nursing, and other students in New England. They also reviewed prevalence data from 1964 until 1982 (McAuliffe et al. 1984). In a sample of 152 premedical and 211 nonpremedical students at Harvard College surveyed in 1979, 56 and 59%, respectively, had used marijuana, and 24 and 28% had used amphetamines, tranquilizers, or hallucinogens, respectively. From 257 undergraduates surveyed in 1981 at the same college, 56% had used marijuana, 14% amphetamines, 6% tranquilizers, and 9% hallucinogens. A survey of about 2000 nursing, business, medical, communications, law, social work, and counseling professional school students yielded a lifetime prevalence of marijuana use of 61 to 79%, amphetamines 14 to 26%, tranquilizers 13 to 33%, hallucinogens 9 to 30%, sedatives 5 to 17%, cocaine 14 to 29%, and heroin and other opiates 2 to 7%, respectively, for the different student groups. Confined to health professionals and students, they reviewed 21 other studies reporting similar figures of nonmedical drug use.

More generally, a survey from 1960 carried out in the city of Newcastle upon Tyne, UK, found that the equivalent of 200,000 5-mg tablets of amphetamine sulfate was prescribed to a population of 269,389 inhabitants, a quantity that would have been sufficient to supply 1.24% of the city’s population with a daily dose of 10 mg. Depression and anxiety, fatigue, and obesity were the most common reasons for the prescription, while “to stay awake,” to “pep up,” or to delay ejaculation was also mentioned (Kiloh and Brandon 1962). Analogously, about 5% of the US population used prescribed amphetamines in 1971 (Rasmussen 2008a). Whereas such consumption would be considered as medical use in current surveys, these figures support the notion that stimulants were used for various “lifestyle” motives in earlier periods.

In summary, these figures demonstrate that the phenomenon of drug use for reasons other than treating a recognized medical disorder, including instrumental use to improve one’s cognitive performance, was already present and even scientifically investigated long before the present debate on the ethics of neuroenhancement was started. In harsh contrast to the neuroenhancement prevalence hypothesis underlying the putative social and scientific urgency of the debate, this use was at least just as frequent in
Several questions are raised by this survey which deserves further investigation. (a) Do individuals who feel that their performance is improved by the use of amphetamines actually perform better? (b) What is the class standing of those individuals who use the drug to improve their performance? (c) If increased learning occurs, is it transient or permanent? (d) If students who frequently use the drug to facilitate learning do derive benefit from its use, why don’t they use the drug continuously? (e) What other drugs are used and to what extent do medical students undertake self-medication? How is this affected by drug salesmen with their samples?

These questions have lost none of their relevance 50 years later and reflect some recent debates on the facts and fallacies of neuroenhancement; e.g., whether stimulants are rather secondary enhancers by improving vigilance and motivation instead of cognitive functions directly (Quednow 2010a,b). A major difference between the 1960s–80s and the present seems to be a lack of ethical reflection in scholarly journals in the past, while drug regulation was an important point on the political agenda at the time (Rasmussen 2008b). One notable exception was the psychiatrist Gerald Klerman, who discussed drugs in the light of social values (Klerman 1970, 1972).

### 10.5 Drugs and social values

Initially, two main positions on the ethical aspects of neuroenhancement can be identified. Proponents such as Henry Greely and colleagues have stated,

“We should welcome new methods of improving our brain function. In a world in which human work spans and lifespans are increasing, cognitive enhancement tools—including the pharmacological—will be increasingly useful for improved quality of life and extended work productivity, as well as to stave off normal and pathological age-related cognitive declines. Safe and effective cognitive enhancers will benefit both the individual and society”

(Greely et al. 2008, 705).

In contrast, bioconservatives such as Leon Kass has cautioned,

“The greatest moral challenges headed our way do not in fact come from hate-filled fanatics threatening death and destruction. They come rather from well meaning scientists and technologists offering life, pleasure, and enhancement”

(Kass 2008, 5).

These antithetic ethical positions toward neuroenhancement seem to resemble a social antagonism that was originally coined by Gerald Klerman in order to explain different attitudes regarding the drug culture of the 1960s and 1970s: psychotropic hedonism versus pharmacological Calvinism (Klerman 1970, 1972). As the term “hedonism” is less useful with respect to a putatively performance-enhancing technology, we would like to slightly adapt this antagonism to the ethical neuroenhancement debate as follows: pharmacological utilitarianism versus pharmacological Calvinism. The former focus on the reward results (or utility) expected by neuroenhancement and they believe that cognitive enhancement is deeply human, in essence not different from self-betterment through education, culture, sports, sleep, diet, and any information technology. For the welfare of mankind, such interventions will increase the quality of life, can potentially prevent cognitive decline with aging, and are particularly desirable in specific professions (e.g., pilots, air-traffic controllers, surgeons). Quite the opposite is assumed by the pharmacological Calvinists. They emphasize the reward effort and suppose that neuroenhancement of the healthy is absolutely inhuman, unnatural, and artificial, is nothing more than deception, will likely promote unfairness and social inequalities, is the same as drug abuse, is a form of biocapitalism and consequently a coercion of freedom, and in the end is only another form of disease mongering by the pharmaceutical (for review of the different positions see Bostrom and Sandberg 2009; Dees 2007; Greely et al. 2008; Hughes 2009; Kass 2008; Mehlman 2004; Morris 2008; Reiner 2013; Sandberg and Bostrom 2006; Whitehouse et al. 1997).
Here, we would like to propose an additional axis on which attitudes to neuroenhancement can be described, distinguishing different beliefs about the degree of novel knowledge science will provide in the future in order to develop improved pharmacological interventions: pharmacological optimism versus pharmacological skepticism. With these two axes for ethical and knowledge attitudes, we aim to present a two-dimensional matrix enabling the location of different stances on neuroenhancement. We hope that this provides a useful theoretical tool to better evaluate the ethical, legal, and social aspects of drug use for enhancement purposes. This framework properly illustrates that, e.g., proponents and bioconservatives share an optimistic attitude as both suppose that neuroenhancement actually works (Figure 10.1). An extremely affirmative position is taken by transhumanists, who are aiming at limitless human enhancement, therefore combining an extreme position on the knowledge and ethics dimension (Bostrom and Sandberg 2009; Sandberg and Bostrom 2006).

**Figure 10.1**

The two axes of knowledge and ethical attitudes define a two-dimensional matrix that allows the location of several positions within the ethical neuroenhancement debate. For example, both transhumanists and alarmistic bioconservatives are pharmacological optimists, as they believe that pharmacological neuroenhancement is possible; yet they take opposing ethical views, with the former rewarding results or the utility of an intervention and the latter rewarding merit or effort spent to achieve a certain aim.

As stated earlier, the present authors would like to argue for their more cautious position as they have demonstrated that the ethical significance of neuroenhancement is currently over-rated because it is unsafe and less efficient (see section 10.2), most likely addictive (e.g., Bell et al. 2012; Mohamed 2012; Morton and Stockton 2000), much less prevalent than often assumed (see section 10.3), and only desired by a minority (Quednow 2010a, Maier et al. 2015). A balanced position between optimism and skepticism seems to be more appropriate to us. Without suggesting that we know “the truth,” we would like to coin an ideal position: pharmacological realism. However, when considering the vast complexity of the brain, the development of safe and efficient compounds for use in healthy subjects seems implausible at least in the medium term. This perspective might even be described as pharmacological skepticism and ranges into the Calvinistic dimension (see Figure 10.1). Finally we would agree with our Brazilian colleague João R. Oliveira that “myriad personality traits are just as important as memory or ‘intelligence’ in the overall scheme of a successful life” (Oliveira 2009, 532).
10.6 Conclusion

The discussion of the pharmacological optimism and neuroenhancement prevalence hypotheses in sections 10.2 and 10.3 strongly suggests that neuroenhancement is not epidemic and neither a new nor an increasing phenomenon, putting these important presuppositions of the ethical debate into question. Thus, we again propose that this discussion is mainly a phantom debate (Quednow 2010a, Schleim 2014a) or a bubble (Lucke et al. 2011b), which was primarily created and is still kept alive in order to generate public research funding for a few bioethicists, psychiatrists, and neuroscientists. It seems that in particular the newly established neuroethicists strongly benefited from framing what may just have been common drug consumption by a few students as a completely new and urgent problem in the light of the decades of the brain. In correspondence with our conclusion, the US Presidential Commission for the Study of Bioethical Issues recently warned about the detrimental social and scientific effects of the hype on neuroenhancement (Allen and Strand 2015; Presidential Commission for the Study of Bioethical Issues 2015).

Somewhat ironically, the exponential growth in stimulant production, particularly in the USA (Figure 10.2), hardly received attention by neuroethicists as they understood that as a reflection of medical treatment and therefore not as a form of enhancement and, consequentially, not as an important ethical problem. The enhancement/treatment distinction is a very basic one in ethical discourse (US President’s Council on Bioethics 2003) and may explain why many neuroethicists fail to see the actual social relevance of exponentially increasing figures of stimulant prescriptions for attention disorders, which is discussed by medical sociologists under the label of medicalization or pharmaceuticalization (Abraham 2010; Bell and Figert 2012; Rose 2006). To put this idea in a provocative manner, many neuroethicists created a new problem and then presented themselves as the experts to regulate the legal, ethical, and social aspects of it (Schleim 2014b). Indeed, scholarly publications on neuroenhancement literally exploded right after the institutionalization of neuroethics in 2004 (Figure 10.2).

Figure 10.2

Number of publications (left axis) listed in the ISI Web of Science per year for the topic searches “cognitive enhancement” (dark gray line), “mood enhancement” (black), and “neuroenhancement” (light gray) and annual production quotas of methylphenidate (light gray bars) and amphetamine (excluding amphetamine produced for conversion; dark gray bars) in kilograms (right axis), based on official figures published by the US Drug Enforcement Agency and the Federal Register. Publications on enhancement topics exploded right after the institutionalization of neuroethics in 2004. Aggregate publication numbers (all three kinds of enhancement) and production quotas (methylphenidate plus amphetamine) correlate at $r = 0.97$. We refrain from an attempt to explain this extremely high correlation here, but speculate that both increases may reflect the medicalization/pharmaceuticalization of social problems.

It is common to compare benefits and risks for the ethical evaluation of a practice such as neuroenhancement. However, we would like to point out that in addition to the individuals’ and societies’ benefits and risks that have been frequently discussed—such as competitive advantages, distributive justice, coercion to conform—additional opportunity costs are present which were not sufficiently
considered previously. Scientific means and resources are scarce, yet there are many people suffering from psychiatric disorders for whom the development of new psychopharmacological drugs might lead to a serious decrease of suffering and increase in quality of life. Particularly in current times when many pharmacological companies already have dropped or have announced to drop psychopharmacological projects and, thus, means and resources have become even scarcer, we would like to encourage the investigation of treatments for psychiatric disorders instead of the development of neuroenhancement drugs for the healthy (Schleim and Quednow 2015). What applies to pharmacologists applies to theoreticians and ethicists competing for research grants, too. Our discussion suggests that important perspectives are neglected when only one kind of experts such as neuroethicists analyzes these problems. As Raymond De Vries emphasized some years ago, it may be important to guard the self-appointed guardians of neuroscience (De Vries 2007).

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Notes

1. See this German press release of November 5, 1999, http://idw-online.de/de/news15426 (accessed December 23, 2014). In our perception, not many activities of the German decade of the brain were accomplished.

2. It should be noted that we were approved to contact Swiss participants who reported a neuroenhancement use of methylphenidate in the online surveys of Maier et al. (2013) and Maier and Schaub (2014) in order to investigate their neuropsychological performance and personality profile at the Psychiatric Hospital of the University of Zurich (see Maier et al. 2015). However, in personal interviews it turned out that most of these participants tried methylphenidate only once or that the compound was often prescribed for an underlying attention deficit hyperactivity disorder, which was not declared in the online survey. Therefore, regular use of methylphenidate for neuroenhancement purposes in mentally healthy individuals was very rare and we will show in a future publication that the personality profile of these users is highly specific.

3. It was noted by Louis Menand in an article in The New Yorker published on March 1, 2010 that Klerman may have misunderstood Calvinist theology when he coined that term, but we would like to leave that discussion aside for our purposes and use the concept since it has become established in the scholarly debate (http://www.newyorker.com/magazine/2010/03/01/head-case-2, accessed December 23, 2014).


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