

Chapter 4

A Bubble of Enthusiasm: How Prevalent Is the Use of Prescription Stimulants for Cognitive Enhancement?

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Abstract This chapter focuses on the evidence for the prevalence of non-medical stimulant use by students for cognitive enhancement. Some of what is cited as apparent evidence for widespread cognitive enhancement (also known as neuroenhancement) has a number of weaknesses that we should be aware of. Here, I expand upon several examples whereby the prevalence of cognitive enhancement has been uncritically presented. Caution needs to be exercised to avoid whipping up hype about neuroenhancement by overextending what the currently available data on prevalence really says.

Keywords Cognitive enhancement • Neuroenhancement • Prevalence • Psychostimulants • Prescription drugs • Students

A number of proponents argue that cognitive enhancement has much to offer individuals, and perhaps society, and so ought to be facilitated. If we're to understand the phenomenon, we need to look critically at who is engaging in this kind of neuroenhancement, how many people, and for what for reasons? University students are often considered to be among the highest users of drugs for cognitive enhancement. US studies have reported that stimulants typically indicated for the treatment of Attention Deficit Hyperactivity Disorder (ADHD) are used without prescription by some healthy university students as a “study aid” or for other cognitive enhancement purposes (often interchangeably termed “neuroenhancement”) (Teter et al. 2006). Good social science research can help us understand this practice, thereby informing bioethical and policy discussions about cognitive enhancement. In this chapter, I focus on the evidence for the

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prevalence of non-medical stimulant use by students for cognitive enhancement and how this has been portrayed in some prominent articles from the bioethics literature. In particular, I examine whether some articles have exaggerated the prevalence of cognitive enhancement. Several authors have recently pointed out that enthusiasm about cognitive enhancement among students has often relied on weak evidence for the assertion that cognitive enhancement is widespread (Forlini and Racine 2009; Outram 2010; Hall and Lucke 2010; Lucke et al. 2011). In this paper, I expand upon some of these points. We need better evidence about how widespread neuroenhancement is and more in depth investigations about attitudes and motivations related to the practice.

4.1 How Prevalent Is the Use of Prescription Stimulants for Cognitive Enhancement?

In the bioethics and neuroscience literature, some have claimed that the use of prescription stimulant medications for neuroenhancement is widespread and increasing in prevalence. “Neuroenhancement” *per se* can encompass a wide range of functions and methods of enhancement, but this paper focuses particularly on the use of prescription drugs such as methylphenidate and modafinil to improve functions such as alertness, memory or concentration. These are the drugs that are the most routinely discussed in the bioethics literature, and empirical evidence about their use by US college students as a “study aid” is often cited in support of these claims about prevalence.

When it comes to questions about how widespread this form of neuroenhancement is, there is some uncertainty. Caution needs to be exercised to avoid whipping up hype about neuroenhancement by overextending what the currently available data on prevalence really says (Hall and Lucke 2010; Lucke et al. 2011; Partridge et al. 2011). This should not be construed as a call to dismiss neuroenhancement as a real phenomenon – there are important public health, ethical, and social issues that require our attention. However, some of what is cited as apparent evidence for *widespread* neuroenhancement has a number of weaknesses that we should be aware of.

One concern is that exaggerated claims can inflate an uncritical bubble of enthusiasm about neuroenhancement. Uncritical claims that many students are using Ritalin as a study aid, for example, can be perpetuated throughout the literature and media (Partridge et al. 2011), perhaps resulting in policy recommendations that are based on this uncritical belief. For example, there have been recommendations that we should relax laws that prohibit psychostimulant use without a prescription if it is for cognitive enhancement purposes and that pharmaceutical companies ought to be allowed to market “cognitive enhancement drugs” to healthy people (Greely et al. 2008). These recommendations are largely based on the assumption that many people (especially students) are seeking and engaging in cognitive enhancement already.

More troubling to some is the possibility that uncritically favorable portrayals of using stimulants for neuroenhancement might entice people to engage in the practice before we know exactly what the potential long term harms might be. This enticement might also occur as a result of inflated claims about the prevalence of neuroenhancement, not just inflated claims about the potential benefits. Let's look at some examples from the literature that may give the impression that neuroenhancement is widespread or becoming increasingly common.

4.2 Responding to Requests from Healthy Patients for “Cognitive Enhancers”

Larriviere and colleagues have offered guidance to neurologists on how to respond to healthy patient requests for “neuroenhancing” drugs (Larriviere et al. 2009). This article was written on behalf of the Ethics Law and Humanities Committee of the American Academy of Neurology (AAN) and defends the ethical and legal acceptability of prescribing stimulants to healthy people for the purposes of enhancement. It is essentially premised on the following assertion that neuroenhancement is widespread:

In the last decade, persons with no diagnosed medical or mental health condition have been increasingly seeking and utilizing, for the purpose of enhancing their memory or cognitive skills, prescription drugs originally developed to improve executive function or memory in persons with disorders such as attention deficit hyperactivity disorder or Alzheimer disease (McCabe et al. 2004, 2005a, b; Farah 2005). This practice, now known as neuroenhancement, is gathering momentum (Farah et al. 2004; Maher 2008).

The impression given to the reader is that a lot of people desire psychostimulants for cognitive enhancement, that the practice has become more common over the last 10 years and that there will only be more to come – so much so, that the AAN sees the need to advise their physicians about how to navigate the growing tide of people wanting neuroenhancers. But let's look closer at this assumption and assess whether it is well founded on the basis of the evidence cited by the AAN committee.

Of the five articles Larriviere et al. (2009) cite to support their claims about the demand and prevalence of people seeking neuroenhancement, two are commentary articles on the ethics of neuroenhancement by Farah and colleagues (Farah et al. 2004; Farah 2005). These commentaries don't report direct evidence of prevalence – for example, they didn't conduct an empirical study about the prevalence of neuroenhancement or systematically review such studies. This is not a failing of these articles of course – they weren't intended to perform such a function – but the problem is that Larriviere et al. (2009) cite them as evidence to support their own claim that stimulants are being increasingly sought for neuroenhancement. Also cited by Larriviere et al. (2009) is an often cited online survey about neuroenhancement among 1,400 readers of *Nature* (Maher 2008). However, this poll was an exercise intended to stimulate debate about neuroenhancement rather than an attempt to conduct a rigorous scientific study – it surveyed a self-selected

sample of academics and there are few details of the methodology available, casting doubts about how representative this data really is. This online poll has also often been referred to in the media as evidence for widespread and increasing neuroenhancement (Partridge et al. 2011).

Also cited as evidence of increasing neuroenhancement in the AAN paper, is a survey of the non-medical use of prescription *opioids* by college students (McCabe et al. 2005a) – not ADHD drugs or Alzheimer’s drugs as indicated by Larriviere et al. (2009). It is unclear why this paper was referred to given that there has been little suggestion elsewhere of the possibility that prescription opioids are commonly used by healthy people to improve memory or other cognitive skills, and in any case, the survey referred to did not ask about prescription opioid use for neuroenhancement. In fact, of the sources cited by Larriviere et al. (2009) to support the claim that stimulants are being increasingly sought for neuroenhancement, only one is an empirical study estimating the prevalence of illicit Ritalin use (McCabe et al. 2004). However, this survey was conducted with high school students only, and there is little information about why Ritalin was taken illicitly. That is, the results of that study don’t allow us to say exactly how much of this non-medical use was for neuroenhancement purposes.

In summary, on the basis of the evidence cited by Larriviere et al. (2009), we don’t see a robust case that healthy people are increasingly seeking and utilizing prescription drugs specifically for the purposes of neuroenhancement – let alone that the practice has increased over the last decade. That doesn’t necessarily mean that there isn’t any evidence that some people are engaging in cognitive enhancement, but this example shows that the assumption of widespread cognitive enhancement is sometimes made uncritically. The clinical implications of the AAN’s guidance on this issue have attracted some criticism (Boot et al. 2012), and we might have reason to also be concerned that the impetus for providing such guidance in the first place has been ill-informed.

4.3 Surveying “Non-medical Use of Stimulants”

Surveys of the non-medical use of prescription stimulants are useful to the extent that they may give us an indication of how many people have used the drugs most often thought to be enhancers. But estimates of prevalence can vary because some studies have small sample sizes, or, despite having larger samples, they survey from a particular pool (e.g. students from only one university). Some ask only about lifetime prevalence, rather than recent use or frequency of use. Some only ask about specific stimulants. Most surveys have been with US samples only.

One of the largest nationwide surveys of US college students about their non-medical use of prescription stimulants involved over 10,000 students at 119 colleges (McCabe et al. 2005b). This data was collected in 2001 and found that the lifetime prevalence of non-medical prescription stimulant use was 6.9 %, past year prevalence was 4.1 %, and past month prevalence was 2.1 %. As seen

in the Larriviere et al. (2009) example, findings about the non-medical use of stimulants are often cited as *de facto* evidence of cognitive enhancement. The problem is that such surveys do not typically ask students specifically whether they use these drugs for enhancement – perhaps because these surveys are conducted by public health researchers primarily interested in prescription drug abuse and issues of addiction, rather than cognitive enhancement. Many of these surveys have asked about the use of a stimulant “without a prescription” or for “non-medical reasons.” As well as for cognitive enhancement, non-medical use of prescription stimulants might potentially be for a number of other reasons – for fun, to get high, possibly to alleviate the effects of a hangover, to lose weight, or as a form of self-treatment of symptoms in people who believe they have ADHD. And yet, when the prevalence of non-medical prescription stimulant use is reported simply as the prevalence of “neuroenhancement,” then the prevalence of neuroenhancement may be overestimated when we take into account all the potential reasons for non-medical stimulant use.

Greely et al. (2008), begin their *Nature* article by saying that:

Today, on university campuses around the world, students are striking deals to buy and sell prescription drugs such as Adderall and Ritalin – not to get high, but to get higher grades, to provide an edge over their fellow students or to increase in some measurable way their capacity for learning.

What they are describing is the non-medical use of stimulants specifically for cognitive enhancement. They go on to say:

One survey estimated that almost 7 % of students in US universities have used prescription stimulants **in this way**, and that on some campuses, up to 25 % of students had used them in the past year. These students are early adopters of a trend that is likely to grow.

The survey they refer to is the McCabe et al. (2005b) survey of over 10,000 students, just mentioned. However, although that survey didn't ask *why* students had used prescription stimulants illicitly, Greely et al. (2008) seem to assume it was for neuroenhancement. This assumption misconstrues the findings. It is also interesting to note that highlighting the *lifetime* prevalence (which is higher than the past year or past month prevalence) may give the reader the impression that the behavior is more widespread. Reporting an outlier may have the same effect. The overwhelming majority of colleges that were surveyed by McCabe et al. (2005b) had a past year prevalence rate of between 0 and 4 %. Only one college out of 119 had a prevalence of 25 %, but it is this one outlier that is mentioned in the Greely et al. (2008) article.

To avoid some of these problems there is a clear need for better estimates of how many people are using prescription stimulants specifically for cognitive enhancement, and the discussion about cognitive enhancement would benefit from more international evidence. In countries such as Australia and New Zealand, there have been no studies exploring the prevalence of prescription stimulant use for cognitive enhancement. Although the prescription rates of stimulants have increased significantly in Australia over the last decade (Hollingworth et al. 2011), whether or not these drugs are being increasingly used by healthy people to improve cognition is unknown. In Germany, a recent study surveyed 1,547 pupils and students about

their use of prescription stimulants specifically for cognitive enhancement (Franke et al. 2011). The lifetime prevalence for cognitive enhancement was 1.29 %, past year prevalence 0.26 %, and past month prevalence only 0.06 % (one student). These results indicate a relatively low prevalence, particularly when put in the context of US data (although these results should be generalized to other contexts with some caution). While it would not be surprising if the prevalence of cognitive enhancement varied across countries, it is interesting to contrast the low prevalence of cognitive enhancement in the German survey with some claims that the use of prescription stimulants as a study aid (particularly Ritalin) is much more widespread in the USA.

4.4 Perpetuating the Assumption that Neuroenhancement Is Widespread

Let us look at some examples of how the neuroenhancement “bubble of enthusiasm” can be inflated when a survey’s findings are misconstrued by others as evidence of widespread cognitive enhancement. A good example of this is a survey titled “Student perceptions of methylphenidate abuse at a public liberal arts college” (Babcock and Byrne 2000). Babcock and Byrne surveyed 283 students at one US college (MCLA) using a simple 10 item, “yes/no” questionnaire – this included no items asking specifically about the use of Ritalin (or any other substances) as a study aid or for cognitive enhancement. It did, however, include the item “*Have you ever taken Ritalin for fun (non-medical purposes)?*” – to which 16.6 % of respondents indicated “yes.”

However, since their publication over a decade ago, these findings about the lifetime prevalence of *recreational* Ritalin use have been inaccurately reported on a number of occasions by other authors as evidence for the widespread use of stimulants for *neuroenhancement*. For example, Farah et al. (2004) in the journal *Nature Reviews Neuroscience*, cite the results of the Babcock and Byrne survey when they say that:

The use of prescription stimulants (such as methylphenidate and dextroamphetamine) as study aids by high school and college students who do not have ADHD has recently drawn attention, and might include as many as 16 % of the students on some campuses (Babcock and Byrne 2000).

Although 16.6 % of participants had used Ritalin for fun, Babcock and Byrne’s survey included no items assessing the prevalence of using methylphenidate or dextroamphetamine as a study aid (and did not survey any high school students). In fact, Babcock and Byrne make no actual mention of neuroenhancement apart from one sentence in the discussion that says, “Personal communications with students at MCLA suggest that methylphenidate is sometimes used as a study aid for ‘pulling all-nighters.’” This is worded as a tentative aside by Babcock and Byrne, not an actual finding of the survey – we aren’t told how many students were personally

contacted; how they were contacted; exactly how frequently Ritalin was used this way; whether this was a rumor they had heard or whether they had actually engaged in the practice; and it is not even clear whether the students who were personally communicated with were even participants in the original study. With this in mind, it is surprising to read that Farah et al. (2004) and other articles in the bioethical literature cite this survey as good evidence that many students at some universities are engaging in neuroenhancement, by using stimulants (particularly Ritalin) as a study aid. In discussing the potential use of stimulants for cognitive enhancement by surgeons, Warren et al. (2009) perpetuate the claim by saying that, “an estimated 16 % of students at some United States universities take prescription medication as study aids (Babcock and Byrne 2000).”

Again, the finding that 16.6 % of students had used Ritalin for fun has been incorrectly reported as evidence that 16 % had used prescription medications as a study aid – two very different purposes! Other examples uncritically extend the Babcock and Byrne data even further. In his 2006 paper in the *Journal of Medical Ethics*, Chatterjee says: “Based on the belief that these drugs improve test performance, the use of stimulant medications among college students in the US is widespread (Babcock and Byrne 2000).”

In the above example, the Babcock and Byrne data is embellished as evidence for widespread use of stimulants across US colleges – no longer even using the caveat “at some colleges”. Riis et al. (2008) make a similar claim:

... many college students are aware of Ritalin’s effectiveness. One study estimated that as many as 16 % of college students have used it as a study aid, often illegally using pills prescribed for someone else (Babcock and Byrne 2000).

In their article discussing ethical issues related to psychopharmacology and adolescents, Koelch et al. (2008) claim, “A growing number of publications show that especially stimulants are being used for improving task performance during examinations.”

Babcock and Byrne (2000) is among the five articles cited to support this claim, although it is unclear why. Mehlman (2004) also cites Babcock and Byrne when discussing the ethics of cognition enhancing drugs, saying, “Students have long used amphetamines as a study aid with methylphenidate (Ritalin®) being the current cognitive enhancement drug of choice on U.S. college campuses.”

Aside from giving readers the impression that cognitive enhancement is more widespread than the evidence indicates, there are other important consequences. For example, we have seen that Farah et al. (2004) cite the Babcock and Byrne survey as evidence that up to 16 % of students at some colleges use stimulants for cognitive enhancement – as mentioned earlier in this paper, the AAN guidelines by Larriviere et al. (2009) on prescribing neuroenhancers to healthy people is essentially based on the assumption that neuroenhancement is widespread and becoming increasingly common. Interestingly, Farah et al. (2004) is among the evidence cited by Larriviere et al. (2009) for this claim.

Babcock and Byrne were interested in investigating the abuse of Ritalin by students, and prescription stimulants do carry a risk of addiction. Studies have found

that students who said they had used prescription stimulants non-medically were more likely to be white, male, and live in a fraternity, and they were also much more likely to have used other illicit drugs (McCabe et al. 2005b). This trend might indicate a number of different things that we need to explore in order to conduct good social science research. Perhaps college students who use illicit drugs are also inclined to seek out pharmacological solutions to their study pressures. Or we might find that within a university there are “hot spots” of neuroenhancement – groups (such as fraternities) where stimulant use for neuroenhancement is common, but outside these groups the behavior may be rare. A person’s social proximity to these “hot spots” may then influence whether/how they are exposed to pharmaceutical cognitive enhancement. When it comes to estimating how prevalent neuroenhancement is, if a person is close to these “hot spots,” then neuroenhancement may seem more prevalent than it really is.

Bioethicists are probably not the only ones who may have overestimated the prevalence of neuroenhancement. A 2008 survey, querying more than 3,000 students, asked students whether they had actually used prescription stimulants for non-medical reasons in the past year – 6 % had (the details of the survey mean that we don’t know how much of this was for cognitive enhancement) (McCabe 2008). But participants were also asked to estimate how prevalent they thought stimulant use was on campus, and the average estimate was 20 %. Around 70 % of participants overestimated the prevalence of stimulant use by their peers. In particular, those who had used stimulants thought the prevalence was much higher than those who hadn’t used stimulants. If this is true of non-medical stimulant use in general, then it is worth exploring whether it is true for neuroenhancement. One of the potential problems is that a social norm about this kind of substance use may be created. If people think that many others are taking prescription stimulants for neuroenhancement, then perhaps it seems more acceptable, and maybe more people will be enticed to try it.

We need to understand the potential short and long term health risks of stimulant use by healthy people, before we accept (or promote) the practice. Well conducted social science research using both qualitative and quantitative methods will help to inform us about the prevalence, motivations and attitudes of students using prescription stimulants for cognitive enhancement purposes. This empirical evidence will then help to better inform ethical and policy discussions about neuroenhancement.

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