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Towards the smarter use of smart drugs: perceptions and experiences of university students in the Netherlands and Lithuania

Aleksi Hupli ¹, Gabija Didžiokaitė ², & Marte Ydema ³

¹ University of Tampere

² Loughborough University

³ University of Amsterdam

Hupli.Aleksi.M@student.uta.fi

Abstract

The use of cognitive enhancement drugs (CEDs) among university students has raised widespread concerns about non-medical prescription drug use, safety, exam cheating, and study-related stress. While much of the empirical research to date has been conducted in the United States and Australia, this article examines perceptions and experiences of CED use among university students in the Netherlands and Lithuania. Our data comes from two qualitative studies and one mixed-methods study drawing in total of 35 semi-structured interviews (20 in the Netherlands; 15 in Lithuania) and from open-ended online survey responses among a convenience sample of 113 students in the Netherlands. Employing a crowded theory approach to interpret our qualitative data, we found most of our informants turned to CEDs to enhance their studying through better concentration and time management. Students used a broad range of pharmaceuticals (with and without a physician's prescription), recreational drugs, and nutritional supplements as cognitive enhancers, were generally well informed about the safety and efficacy of the substances they used, experienced both beneficial and adverse effects, and self-regulated their CED use to balance these effects, ensuring that their use remained moderate and thoughtful.

Keywords: neuroenhancement, smart drugs, university students, user experience, crowded theory analysis, harm reduction

Introduction

The use of psychoactive substances by university students seeking to improve academic performance has attracted the attention of researchers, bioethicists, and government officials. While earlier research centered on North America and Australia, recent years have witnessed increased interest in many European countries, including the United Kingdom, Germany, and Switzerland (www.nerri.eu/; Maier et al., 2013, 2015a, 2015b; Singh et al., 2014; Forlini et al., 2015; for reviews see Ragan et al., 2013; Maier & Schaub, 2015). *Pharmacological neuroenhancement* or “the misuse of prescription drugs, other illicit drugs, or alcohol for the purpose of enhancing cognition, mood, or prosocial behavior in academic or work-related contexts” (Maier & Schaub, 2015, p. 156) has been the subject of numerous government reports and policy guidelines from medical associations (for a review, see Outram & Racine, 2011). The phenomenon has also attracted media attention, which often exaggerates the popularity and efficacy of “smart drugs” (Partridge et al., 2011; cf. Williams et al., 2008; Forlini & Racine, 2009). Although estimates of prevalence vary widely, studies suggest that cognitive enhancement drugs (hereafter CEDs)—including methylphenidate (e.g., Ritalin™) and dextro-amphetamine (e.g., Adderall™), used mainly to treat Attention Deficit/Hyperactive Disorder (ADHD), and modafinil (Provigil™), a wakefulness-promoting drug used mainly to treat narcolepsy—are being used by many individuals without diagnosed medical conditions (Coveney et al., 2011).

Singh and Keller (2010, p. 5) suggest that “the use of stimulants as neuroenhancers appears to be a growing trend among university students around the world.” Neuroenhancement, however, admits to different interpretations (e.g., Arria & Wish, 2006), requiring caution when interpreting figures on prevalence. Most commonly cited surveys also differ in their methods, sampling, sample size, and questions, requiring caution when examining epidemiological patterns of CED use. It is also difficult to transfer findings from the USA to Europe due to different regulatory and educational contexts. In general, European studies have shown lower prevalence rates than American ones (e.g. Mache et al., 2012; Ragan et al., 2013; Maier et al., 2013; Schelle et al., 2015). Nevertheless, students in at least some European countries seem well aware of the phenomenon, including 93.7% of respondents of a survey of 6,275 Swiss students (Maier et al., 2013; cf. Forlini et al., 2015).

While clinical trials have found the efficacy of CEDs among individuals without medical conditions to be either non-existent or limited (e.g., Repantis et al., 2010; Ilieva et al., 2015), this does not match reported user experiences in non-clinical settings (Ilieva et al., 2013). This could be due to the placebo effect or the inadequacy of experimental trials to simulate real-life environments

(Ragan et al., 2013). Lack of agreement on standardized tests problematizes measuring effects among healthy volunteers (Husain & Mehta, 2011). Although surveys, clinical experiments, and commentaries by bioethicists have addressed the use of CEDs by healthy individuals, “there is at present a lack of findings from in-depth, qualitative research that examines the everyday uses and users of medications” (Vrecko, 2013, p. 5). As Smith and Farah (2011) argue, we need to better understand how CEDs work in everyday practice as opposed to laboratory settings.

Despite the limited clinical evidence on efficacy for healthy individuals, the phenomenon of pharmacological neuroenhancement has produced numerous academic commentaries concerning its ethical, social, and policy implications for non-clinical populations (e.g., Farah et al., 2004; Bostrom & Sandberg, 2009; Sahakian & Morein-Zamir, 2011; Hyman, 2011). Critics have cautioned bioethicists for making unsubstantiated claims about the effects and prevalence of CED use, pointing out that the off-label use of psychoactive substances for enhancement purposes is hardly new (e.g. Schermer et al., 2009; Gilbert & Baertschi, 2011; Bell et al., 2012; Illieva & Farah, 2013). Others have warned that the growing research and media interest could inflate “a neuroenhancement bubble” (Lucke et al., 2011). Students often perceive substance use among peers as more common than it really is, and the more aware students become of others using CEDs, the more they may be inclined to see it as the norm (e.g. Perkins, 2002; McCabe, 2008; Outram, 2010). The challenge for policy-makers, educators, and harm-reduction practice, then, is to provide credible information on the possible harms and effects of CEDs without accelerating their use (cf. Schelle et al., 2014, 2015).

Extant studies report similar motivations for university students to use CEDs. Prescription stimulants are most often used during periods of high academic stress (DeSantis et al., 2008, p. 319; cf. Hildt et al., 2014). Methylphenidate is also used for recreational purposes (DuPont et al., 2008). Aikins’ study of licit and illicit users of prescription stimulants on an American university campus found that both types of users “overwhelmingly felt that prescription stimulants enhanced their ability to perform academic tasks” (2011, p. 566; cf. Vrecko, 2013). They also reported unpleasant side-effects which were deemed to be “worth it.” In addition to improving academic and cognitive performance, Mache et al. (2012) found German students using CEDs to cope with stress and pressure to succeed, out of curiosity, because others were doing it, and because they feared being at a disadvantage to CED-using peers. Because they are commonly used, legal, and seen to have fewer side-effects or addiction potential than “hard drugs,” young people are often not afraid to

experiment with prescription medications, which they view as “soft drugs” (Quintero, 2012, p. 513–9; cf. Green & Moore, 2009; DeSantis & Hane, 2010).

This article seeks to add to our knowledge on the practice of cognitive enhancement in real life settings by exploring perceptions and experiences among university students in the Netherlands and Lithuania. We explore reasons why students turn to neuroenhancement, what effects—both desired and adverse—they experience, how they obtain information about CEDs, and control their use to maximize benefits and minimize harms. Based on our findings, we argue that the use of CEDs by healthy individuals is best understood as *functional drug use* (cf. Boys et al., 1999; Boys, Marsden & Strang, 2001). Most students had clear goals behind their CED use, were well informed about the safety and efficacy of the substances they used, experienced both beneficial and adverse effects, and self-regulated their use to balance benefits and harms.

Methods

Our data are drawn from three studies based on semi-structured interviews with current or recently graduated university students (20 interviews in the Netherlands and 15 interviews in Lithuania). One of the studies also included an online survey (N=113) among students in the Netherlands, 24 of whom reported having used CEDs in study situations. The original datasets were gathered separately without a collaborative study design. The researchers met in early 2015 in a workshop organized by the Chemical Youth project to discuss common themes emerging from our separate datasets.

Study participants included both students with and without a neuropsychiatric diagnosis as we found their experiences to be broadly similar. Although the extant literature generally draws a sharp distinction between the use of CEDs for therapeutic reasons and for enhancement—i.e., with and without a physician’s diagnosis—we found this neat distinction broke down in practice. Some of our informants who had been diagnosed with AD(H)D used medications without prescriptions; others, without having been diagnosed by medical professionals, were convinced that they suffered from attention disorders or daytime sleepiness. Other studies have revealed that students fake symptoms to obtain prescriptions for enhancement purposes (e.g., Petersen et al., 2014), further blurring the distinction between the therapeutic use of medicines and their off-label use for enhancement.

All informants gave their oral informed consent to participate in the study and were guaranteed anonymity. All names in this article are pseudonyms.¹

Interviews

The semi-structured interviews, which took place between March and December 2013, were recorded and transcribed verbatim in English or in their original Dutch and Lithuanian; excerpts here have been translated and edited for clarity. Informants were recruited mainly by snowball sampling from personal networks in the Netherlands, and additionally by adverts in students' mailing lists, personal Facebook pages, and through a small youth community website in Lithuania. The sole inclusion criterion was that the informant had used a substance to enhance their work or studying (in Lithuania) or had experience using a cognitive enhancement drug (in the Netherlands). Some interviewees used psychostimulants with a doctor's prescription; others used them off-label. Some, mostly in Lithuania, used "recreational" drugs as well as vitamins and nutritional supplements marketed as supporting mental work as CEDs.

Twenty interviews took place in Amsterdam; 15 in Vilnius and Kaunas, Lithuania. The interviewees—15 males and 20 females—ranged in age from 19 to 29, with a mean age of 23. Eight interviewees had been diagnosed with ADHD/ADD, and one with daytime sleepiness; three were in the process of getting a medical diagnosis or had diagnosed themselves as having ADD or daytime sleepiness. Ritalin and Concerta were the most commonly used CEDs, while Modafinil, Racetam-group substances, Ephedra, Gingko Biloba, food supplements for the brain (e.g. Neurozan), vitamins, cannabis, amphetamine, methamphetamine, GABA, cocaine, and LSD were also mentioned by interviewees as cognitive enhancers.

Survey

An online survey was distributed through Facebook and via email through academic managers (for a review of using Facebook in the social sciences, see Wilson et al., 2012). The survey consisted of 24 questions, developed by the first author after an initial round of six interviews. Data obtained from these initial interviews informed the design of the questionnaire, which included questions on basic demographics, substances used, reasons for use, and perceived effects. The survey was posted

¹ The data presented in the article were collected during research conducted for Medical Anthropology and Sociology MA thesis projects (in the case of Hupli and Didžiokaitė) and an Anthropology BA thesis (Ydema) at the University of Amsterdam, following standard ethics operating procedures which include use of pseudonyms and informed consent. The analysis presented was conducted with support of the ChemicalYouth project which is led by Anita Hardon. The ChemicalYouth project has been approved by the ethics committee of the University of Amsterdam Faculty for Social and Behavioral studies.

as a direct web link on social media student groups affiliated to the University of Amsterdam and the VU University Amsterdam, and was open from the beginning of April 2013 to the end of May 2013. These groups had in total almost 3,000 members at the time. The convenience sample consists of 113 respondents of whom 71% were female, and 78% between the ages of 18 and 24. Half were social sciences and humanities majors; medical students, at 35%, were the second largest group. 59% of the respondents were Dutch, 25% were from another European Union country, and 15% from a non-EU country (one respondent had an unclear country of origin).

Of the 113 respondents, 24 (21%) reported having tried CEDs, defined in the survey as “prescription medication (for example Ritalin, Concerta, Modafinil, Adderall) used to affect study situations.” Ten of these 24 students had been diagnosed with a medical condition (mostly ADD/ADHD, N=8). The lifetime prevalence of off-label CED use was therefore 12% (N=14). Most had discontinued use suggesting that the point prevalence rate of off-label CED use was 1.8% (N=2), which is in line with other European surveys showing relatively low prevalence rates of off-label CED use compared to the US (Mache et al., 2012; Ragan et al., 2013; Maier et al., 2013; Schelle et al., 2015). Half of the respondents (N=12) who had tried CEDs reported using them less than once per semester; five reported using once per semester. Four respondents reported daily use and all were diagnosed with ADD/ADHD. This indicates that CED use was also infrequent. Several medications for ADHD were the most commonly mentioned in the survey responses: Ritalin (N=19), Concerta (N=6), and Adderall (N=4). Other substances used for enhancement purposes included Modafinil (N=1), Racetam-group substances (N=2), and benzodiazepines (Oxazepam, Lorazepam, and Diazepam) (N=2). Almost half (N=11) of the survey respondents who reported having tried CEDs named more than one substance.

The survey respondents are not a representative sample of the student population in Amsterdam but the survey data served to triangulate our interview findings. Conversely, the interview data helped to elaborate upon findings from the survey.

Analysis

The qualitative data sets that make up this article embraced a grounded theory approach (Glaser & Strauss, 1967) that builds theory from collected data, privileging user experiences without imposing a preordained framework on their accounts. In analyzing our collective data, we made use of Bröer et al.’s (forthcoming) crowded theory approach, in which “the idea is to use the power of online tools to enhance collaboration, validate interpretations and co-author conclusions in qualitative

research” (<http://aissr.uva.nl/news/content/2014/09/crowded-theory.html>). Crowded theory relies on the collective interpretation of data sets rather than line-by-line coding by individual researchers. Although designed for larger groups of analysts, it suited our purposes as we were not aiming to develop new theoretical categories, but to explore emerging themes which arose from comparative interpretations of our data. As none of us were trained in using Bröer et al.’s novel software, we relied on Google Docs, video calls on Skype, and email exchange when comparing interpretations of our data.

In the first phase of analysis we shared with each other the relevant excerpts from our original interviews and the open-ended qualitative responses from the survey. This allowed us to compare initial interpretations of our own data with that of the other two researchers. In the second phase we analyzed these thematic datasets, first individually and then as a group. Although the aim of collaborative interpretation is not to continue until consensus is reached but to give participating researchers the possibility to agree to disagree (Bröer et al., forthcoming), there were no major disagreements over our interpretations, adding to the validity of our findings.

Why use cognitive enhancement drugs?

University students in the Netherlands and Lithuania reported many different reasons for using CEDs. Of the 24 Amsterdam survey respondents who had taken CEDs, five had doctors’ prescriptions. Twelve others, without prescriptions, had tried CEDs to enhance their studying, while six reported using CEDs recreationally or out of curiosity. Interviewees mentioned getting better grades, being more creative, staying awake in class after a night out, better managing time, and improving performance while working, travelling, or doing sports as reasons to use CEDs. The breadth of reported reasons to use CEDs echoes the findings of Partridge et al. (2013), who found students using prescription stimulants for all sorts of lifestyle reasons and not solely to enhance cognition in academic contexts (cf. DeSantis et al., 2008; Hildt et al., 2014).

Brian explained the range of purposes for which he and his friends used off-label Modafinil:

We used it for working and for partying. So you go to a club until late and then you drive home sometimes. We took it to be awake in the car so you don't have car accidents. And we took it while raving to be like sharp and the next day you could still work. And we took it while studying. Enhancement actually for tests and stuff.

Echoing previous studies (DeSantis et al., 2008; Hildt et al., 2014), our informants who used CEDs to enhance academic performance were broadly seeking two goals: improved concentration and more effective time management. The latter often meant more studying in less time or extending the time of studying. Frank used CEDs off-label before he was diagnosed with ADD:

Yeah, with most of my friends, I spoke to a couple of them because I knew I was going to be interviewed, most of them told me that they do as I do myself: when their deadline comes closer and you're running out of time, you use it mainly to stretch the limited time you have to its maximum potential so you can work in the night and still function in the day or the other way around. You can work in the daytime and then you use your nighttime to do your job or to have your social life. But you're reducing, severely reducing your amount of sleep. And then I think the second reason for most people is concentration.

Experimenting with CEDs was also occasionally linked to the knowledge students had acquired from their studies. Gabriel had tried Modafinil and Racetam-type drugs mainly to get better grades and improve memory, but also because it's "related to psychology and you do a lot of stuff about memory and a lot of stuff about neurotransmitters and stuff, so I think I was quite interested if I could sort of change it all."

Students often expected CEDs to work as *smart drugs*, with their expectations following the drug's pharmacological profile in therapeutic settings. Ritalin was expected to improve concentration and wakefulness, Racetam-group substances to improve memory, and Modafinil to help stay awake and study longer:

Aleksi Hupli [AH]: Before you used them, what did you expect to happen?

Gabriel: I don't really know. I think I expected to be able to remember things better with the Racetam type of drugs. I think I just expected to remember better. With Modafinil I expected to be able to sit there for longer and study for longer. I don't think I had any strong expectations but you know those are the two things they say, well people have said they do so.

Experienced effects

Did students using CEDs achieve their desired aims? With Ritalin, many of our undiagnosed informants expected improved concentration and wakefulness. But they were often disappointed with the results, either not feeling the effects at all or finding them to be mild and only slightly beneficial:

AH: Did it [Ritalin] work?

Fiona: Umm, well I passed the exam but didn't really have the feeling that the drug did anything.

Bella: Yeah well, a little. Like usually I just go on Facebook all the time if I'm studying, I'm really unfocused and all over the place but when I took it, Facebook wasn't interesting anymore for a while, but I didn't feel super-smart or super-focused or anything.

Taking Ritalin was no panacea; one still had to study. It could reduce distractions but did not make one, as was often expected, “super-focused.” Uncertainty about effectiveness—whether it was prescription medication or a food supplement—was common. Students were cautious in judging efficacy and acknowledged that the changes they experienced might be a subjective effect or a placebo:

Vaiva: I hoped that [vitamins for memory] will help, maybe because I had such hopes, I started at some unconscious level to be more attentive, but you can't dig into it now. Maybe it worked as a placebo effect as well, now I no longer know.

Henry: Yeah it's also the, what's it called... the effect from a pill that...

AH: The placebo?

Henry: Yeah, the placebo effect. That's also why I sometimes just take a quarter or a crumble of it just because I know I will think that it does work but it's not even because of the pill. It's just my head that thinks it works. But that's enough sometimes (laughter).

Despite often being disappointed with the actual effects—and sometimes acknowledging that the positive effects were due to their expectations—some students did report increased focus, motivation, and creativity, which encouraged them to continue using CEDs. Vrecko (2013) has pointed to the role played by emotions in students' use of CEDs to improve academic performance. Diane indeed confirmed that the effects of taking Ritalin were largely motivational:

First I tried like half a pill and the second time I took a whole pill. So that's about it... I felt like now that I took a pill I should study. It was more like a motivation for myself than it was an actual physical effect. So it was more like oh my god I'm going to take a pill so I better study [laughter]. I think I was a bit distracted and figured that, well, at the point that I'm taking this pill to study, everything seems to open to study.

Mo (self-diagnosed with ADD) emphasized that Ritalin “does not work if you don’t give a shit. You can take two Ritalins, but then it won’t work anyway. You have to be like: well, ok, I want to learn now.” Having the motivation to study seemed to be a prerequisite for CEDs to have their desired effects. Other studies, however, have pointed to students experiencing positive effects from CEDs even when their quest to obtain better grades remained unfulfilled (Partridge et al., 2013; Hildt et al., 2014).

Greater focus, motivation, and creativity

Eighteen of the 24 survey respondents who had used CEDs reported improved concentration; a further four reported increased attentiveness and improved memory. Many of our interviewees also reported that CEDs enabled them to better concentrate and remain focused. Henry (undiagnosed) had used Ritalin and Concerta about 50 times in the past nine years:

AH: Could you describe the effects that you feel when you study with [Ritalin]?

Henry: Yeah, the most important thing is that my concentration goes up a lot so I can study for three hours in a row... and doing just one thing instead of just studying for one hour and doing other things at the same time and actually not really studying. That’s the main thing. And the studying days are a lot longer.

Although Roderick was undiagnosed at the time of the interview, he was convinced that he had ADD and received Ritalin from his diagnosed sibling:

Roderick: Then I did [take Ritalin for the first time] and I suddenly had an enormous focus. I found it quite heavy. Normally there are a thousand things haunting through my head, but after using Ritalin I really had only one goal, and that was studying, studying, studying.

MY: How does it feel?

Roderick: What I said. Instead of getting constant stimuli from outside, or also just in your head, that is sort of cancelled out. You can think about other things than the things you have to learn, but the moment you want to think about one thing you only think about that thing and you don’t get distracted by something from outside or from your own head. You are just totally concentrated.

Most of our informants had tried a variety of recreational drugs. Frank, who had used amphetamine and Ritalin to improve his focus before being diagnosed with ADD, stated that taking LSD had also improved his creative thinking:

I got stuck in that specific paper for a week without you know anything on your screen and then in the final 36 hours I told my girlfriend, ok this is all shit. After I took the LSD I deleted I think 80% and rewrote the whole thing in I think 24 hours and then I handed it in and got an 8.5. That was good. I do consider that cognitive enhancing but in a completely different way. So the classical thing would be amphetamine.

When asked whether he had used CEDs just to get high, Brian responded:

No, no. But it is a good feeling when you wake up, you take your pill, you drink a coffee. And you're sometimes a little bit high in the morning. It feels like ecstasy, like when ecstasy hits. It is a good feeling. I did a little methamphetamine with my Bachelor's thesis. It's great because you're so into it. But then I discovered Oxazepam too, to get all the thoughts away. I don't know. I also think that's the thing that's coming up. Because people know that you can combine it, it's even better and it's like yeah... and Oxazepam is also everywhere, it's very cheap.

The passages above suggest that the experienced effects of CEDs are comparable to those of recreational drugs; that they affect not only cognition but also mood and creativity; that illicit drugs are also used as study aids; and that prescription drugs such as Oxazepam and psychedelics which are rarely considered as cognitive enhancers are also used for this purpose. As our aim was to let users define what they perceived as CEDs, this raises issues for future studies. Our data also reveals the difficulty of clearly distinguishing between the use of CEDs for therapeutic and enhancement purposes. Some students without an official diagnosis were convinced they had ADD; others who had been diagnosed refused to accept the disease label. Some diagnosed students still obtained the drugs illegally or did not follow the treatment regimes prescribed by their doctors. Nevertheless, when describing the effects of stimulants, our informants had typically similar experiences.

Side-effects

What side-effects did students experience from their use of CEDs? Both diagnosed and undiagnosed students reported adverse side-effects, especially when using prescription drugs. Eighteen of the 24 survey respondents who had used CEDs reported a variety of side-effects including loss of appetite, sleeplessness, nervousness, and increased agitation. These findings from the survey were largely corroborated in the interviews.

Lotte (diagnosed with ADD) experienced numerous side-effects: she lost a lot of weight and had almost black and blue hands and feet, a condition called Raynaud's disease. She only used Ritalin when she felt she really needed to: "I only take Ritalin if I am chaotic in my head for a really long period of time, and if I see no other option." Amelia (diagnosed with ADD at age 12, later with ADHD) felt that ADHD medication worked for her, even though she experienced side-effects like depression and appetite loss. But she reported adverse effects when the medications wore off. Cecilia (diagnosed with ADD) decided to stop using Ritalin for "as soon as the effect wore off, my muscles were very sore and tense and it felt like my body had cramped up for a couple of hours."

Undiagnosed students also suffered adverse effects. Some, like Anna who used Ritalin once before her final exams, "got really anxious and nervous and uptight and a little paranoid and just uneasy." Eglè (self-diagnosed with daytime sleepiness) found that Modafinil "slightly erases my memory. It feels like I'm doing tasks, but the next day I might not remember what I was doing." When asked whether taking CEDs helped his studies, Gabriel answered that his grades actually went down because he was distracted by worries that "I was going to die, you know, because there's lots of stuff about Modafinil and getting like all sorts of crazy skin diseases."

Despite experiencing benefits, Jasper (diagnosed with ADD) eventually decided to quit taking Ritalin due to its side-effects (for him, aggression, difficulty sleeping, and feeling down). He struggled to balance Ritalin's benefits and harms:

Marte Ydema [MY]: How do you feel when you use Ritalin?

Jasper: It is just emptying your head and you can totally commit to something. Look, Ritalin has a lot of advantages, but now it is the question if it is worth the disadvantages.

Self-regulation

Almost all of our informants experienced both beneficial and adverse effects and tried to balance between them. Before consuming CEDs, many of our study participants tried to inform themselves about the substance they intended to use. Some simply read the drug's patient information leaflet. In other cases, the drug was given to them or recommended by trusted friends or relatives:

AH: Did you look up information about it [Modafinil] before you used it?

Emilia: No, just from my friends who told me it was this drug that the army used and it was to stay awake and stay focused.

AH: So you got that information from your friend?

Emilia: Yeah, my friends because they were using it more often.

Others researched the substance online, gathering information about its effects, possible risks, and usefulness:

AH: Did you look at information about them before using?

Gabriel (undiagnosed): Yeah, definitely, Wikipedia was a good source but there was also a forum called LongeCity, I think it was called, and it's just a forum which is not primarily for talking about cognitive enhancements and nootropics or anything but... that's been like one of the main focuses on people talking about it and talking about new drugs.

Others combined information from friends and the internet. Kipras (undiagnosed) was recommended Armodafinil by his ex-girlfriend and wanted to be better informed:

Gabija Didžiokaitė [GD]: Why did you look for info online? What did you want to find out?

Kipras: Well, just when you're doing something unfamiliar you want, well, to know more.

GD: Because it's a drug, or just because?

Kipras: I'm just watching out. If I would hear that there's a big risk, that something bad will happen or something, then I wouldn't have agreed [to use it].

GD: So in a sense you were trying to get more info about that [Armodafinil], to find out more about side-effects?

Kipras: Not necessarily side-effects, just effect. If it's worth it in general.

Students who had been diagnosed with a medical condition would, in addition to other sources, turn to their doctor for information. But being diagnosed by a medical professional did not necessarily translate into faith in the treatment:

AH: When you got the diagnosis and got prescribed did you look up, well you probably got information from your doctor but did you look up information yourself as well?

Cecilia (diagnosed with ADD): I did, I googled it of course and I got some information from my doctor, but looking back... I think I did not do enough research because I could have known that Ritalin is only helpful if you're really active, if you really have ADHD and I knew I didn't have that. So it was kind of strange why he prescribed that to me but you know then again I'm kind of experimental.

Being informed boiled down to two themes: safety and efficacy. One needs to “watch out” and be aware of a drug’s side-effects and other risks. Students sought information on usual dosages and how these can be adjusted depending on their needs, to avoid both over and under dosage and to foster safe and efficient use. Students using illegal substances also emphasized the importance of knowing where and whom the drugs came from to avoid fake or dangerous products. By searching for information on the effectiveness of a substance and other people’s experiences with it, they knew what (not) to expect and whether it fit their needs.

Students who spent more time researching CEDs had specific ideas about what information was relevant as well as which sources were reliable. Our findings here echo those of Quintero and Bundy (2011): that most young people know how to navigate the wealth of information online and determine which sources are reliable. Some study participants only trusted scientific research.

GD: So you know [the effects and side-effects] of all of the substances you use?

Petras: Yes, I know it all.

GD: Side-effects?

Petras: Side-effects and so on. For example Creatine, they say that it ruins your kidneys, it shouldn't be used. Scientist checked: they gave it to an ill person with only one kidney. Nothing, 20 grams per day, for a month—nothing, normal.

GD: But if there's a risk, aren't you afraid to use it?

Petras: I'm not afraid. Until there's a scientific basis that it is [dangerous].

University students using CEDs in both the Netherlands and Lithuania emphasized the importance of being well informed. In this, they differed from their often-studied American peers (DeSantis et al., 2009; DeSantis & Hane, 2010; Aikins, 2011). The widespread concern to learn as much as possible about the CED and its possible dangers—whether the drug was prescribed, used off-label, or illicit—translated into a greater sense of control over the experience.

DeSantis and Hane (2010) found that many of their American student informants regulated their CED use by limiting it to important assignments and exams, looking askance at peers who did not regulate their use. Many of our informants in the Netherlands and Lithuania expressed similar ideas:

Maria: I don't know, I have nothing against [cannabis], but on the other hand, there is this, I don't know maybe it's mom's influence, that even if it's nothing bad, but still, it shouldn't be done often. This kind of thinking. Because if it would be super good, I could use it every day. But why am I not doing that? Probably because I think it shouldn't be done every day.

Jovita: I would only use [food supplement] on certain days, not before all the tests, when it seems easy, then it doesn't matter, but if there's an exam, my hands and legs are shaking, then I would take it.

Numerous students expressed variations of the idea that there can be too much of a good thing. Using any substance too frequently undermines its purposive use; when this happened, CEDs were no longer valued positively. Some stated that CEDs should only be used reasonably, and that users needed to be clear about their motives:

Steponas: I think, that [smoking cannabis] needs... to be done, as long as you know, why you are doing it. As long as you know, that it has an aim, as long as you can control it in some way.

Viktorija: Yes, I think it's safe and healthy, if you're doing it mindfully and with help, if you need [lithium], if it suits you, then why not.

The great majority of our informants perceived their use of CEDs to be serving a clear purpose, and sought to limit their use to aiding the performance of specific tasks.

Discussion

In this article we sought to contribute to the current academic, policy, and media discussion on neuroenhancement by focusing on the perceptions and experiences of university students in the Netherlands and Lithuania. Although the generalizability of our findings to student populations in these countries is limited, they do give a more nuanced picture of the use of CEDs in everyday life.

Our student informants used a plethora of substances for cognitive enhancement, broadly construed. Although prescription stimulants prevailed in our Dutch data sets, they were far from the only substances used by students, while in Lithuania more students turned to nutritional supplements and illicit drugs. While these differences could in part be due to the recruitment strategies of the studies that inform this article, they also reflect the availability of psychostimulants in the two countries, rooted in psychiatric practice. According to the International Narcotics Board (2014), the

Netherlands is the eleventh largest consumer of Schedule II stimulants in the world; routine prescription by psychiatrists leads to much higher diversion potential for enhancement purposes. In contrast, psychostimulants are rarely used to treat adult ADHD in Lithuania, while pharmacological treatments have only recently been introduced for children (Lithuanian Society of Child and Adolescent Psychiatry, 2015).

Future research needs to take into account the great variety of substances that students perceive and use as CEDs in real life settings. The breadth of substances that our informants used as neuroenhancers echoes the findings of a recent survey which asked university students in the UK and Ireland to define *smart drugs*. While most students pointed to stimulants (caffeine pills, methylphenidate, energy drinks, Modafinil, Adderall, speed), others also identified vitamin supplements, cannabis, LSD, and tranquilizers as smart drugs (Singh et al., 2014).

The range of substances used by students for cognitive enhancement furthermore suggests that they are pursuing different effects: enhanced focus, motivation, memory, or creativity; better nighttime sleep or less daytime sleepiness; stimulation or relaxation. We found our informants to consider different mental and physical states as beneficial. But although the desired effects differed, how prescription stimulants, illicit drugs, supplements, and vitamins were perceived and employed as functional “tools” to attain specific goals was broadly similar.

While some of the effects experienced by our informants were clearly functional, others were adverse (cf. Van den Ende et al., 2010). Both students with and without diagnosed medical conditions had to balance the beneficial and adverse effects they experienced from their use of CEDs. Some students were puzzled by the efficacy of the CEDs they consumed and attributed positive effects to a possible placebo effect (cf. Moerman, 2002). The concept, first applied in the context of medicines and treatment, can readily be applied to practices of enhancement outside of medical supervision.

For our student informants, the use of CEDs was not—as critics often assume—a reckless undertaking driven by peer pressure. They self-regulated their use of CEDs, wanting it to be moderate, controlled, and occasional. They found it important to be conscious of the reasons why they took CEDs; when they were mindful of their use, they felt more responsible and in control of the substance, rather than being controlled by it. Losing control over one’s use was associated with

addiction; knowing why one uses CEDs and using them rationally were thought to inhibit addiction and dependence.

Students reported two main reasons for being well informed: to be safer in their use and to make the most of the CED. By being informed about the drug's efficacy and other people's experiences with it, they learnt what to expect and how to interpret its effects (cf. Becker, 1963). Even those who used vitamins or food supplements—generally considered as “soft enhancement” (Maier & Schaub, 2015)—sought to be well informed. Most students used CEDs with some knowledge of their safety and efficacy; some argued that they would never use a substance without being informed. But while simultaneous polydrug use was rare, most study participants had used CEDs without a prescription as well as more traditional recreational drugs—confirming research that off-label CED users are more likely than other drug users to report polydrug use (McCabe & Teter, 2007; cf. Hall et al., 2005; Schelle et al., 2015).

Conclusion

Rather than seeing their practices as drug abuse or misuse, our informants perceived and experienced CEDs as functional “tools” to achieve specific ends. They experienced both beneficial and adverse effects, and pursued strategies to maximize the benefits and minimize the harms. As students often expected substances to work as *smart drugs*, there is a need to provide evidence-based information on both their possible benefits and harms, as enhancement in one area of cognition can be detrimental to another (De Jongh et al., 2008; Smith & Farah, 2011; Husain & Mehta, 2011). The adverse effects experienced by individuals diagnosed with ADD/ADHD—some of whom reject the diagnosis—increase the likelihood of medications being diverted to their undiagnosed peers (cf. Poulin, 2007; Garnier et al., 2010; Vrecko, 2015)—an important consideration for policies that aim to reduce harm related to the (off-label) use of prescription drugs.

Finally, the perspectives of CED users deserve a more prominent place when discussing the ethics of pharmacological neuroenhancement (e.g. Schelle et al., 2014; Maier et al., 2015b). An open discussion between different stakeholders about the risks but also the perceived benefits of using pharmaceuticals and other drugs to enhance cognitive performance is vital to ensure that their use, when it occurs, happens in an informed and safe way. User participation in this discussion is therefore imperative.

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Author Biographies

Aleksi Hupli is a PhD candidate in Sociology at the University of Tampere. His PhD project focuses on the use of psychostimulants and cannabis for therapeutic and enhancement purposes in the Netherlands, Finland and the United States.

Gabija Didžiokaitė is a PhD candidate at Loughborough University Social Sciences Department. Her current work looks at practices of self-tracking, more specifically at use of calorie counting and diet tracking app MyFitnessPal.

Marte Ydema is a research master student at the University of Amsterdam. She has an interest in researching cognitive enhancement, which started during her Bachelor of Interdisciplinary Sciences, and continued to grow during her Research Master of Social Sciences at UvA.