The Ethics of Neuroenhancement:
Smart Drugs, Competition and Society

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ABSTRACT

According to several recent studies, a big chunk of college students in North America and Europe uses so called 'smart drugs' to enhance their cognitive capacities aiming at improving their academic performance. With these practices, there comes a certain moral unease. This unease is shared by many, yet it is difficult to pinpoint and in need of justification. Other than simply pointing to the medical risks coming along with using non-prescribed medication, the salient moral question is whether these practices are troubling in and of themselves. In due consideration of empirical insights into the concrete effects of smart drugs on brain and behavior, our attempt is to articulate wherein this moral unease consists and to argue for why the authors believe cognitive enhancement to be morally objectionable. The authors will contend that the moral problem with these practices lies less in the end it seeks, than in the underlying human disposition it expresses and promotes. Some might ask, what is wrong with molding our cognitive capacities to achieve excellence, get a competitive edge, or, as the whim takes us? In all of these occasions, the usage of smart drugs serves a certain goal, a telos. The goal is, broadly speaking, this: outsmarting opponents in an arms race for limited resources and thereby yielding a competitive edge. In plain words: competition is valued higher than cooperation or solidarity. What is wrong with striving for this goal? The authors submit that the question whether people really want to live in a society that promotes the mentality 'individual competition over societal cooperation' deserves serious consideration. In developing their answer, the authors draw on an 'Ethics of Constraint' framework, arguing that widespread off-label use of smart drugs bears the risk of negative neural/behavioral consequences for the individual that might, in the long run, be accompanied by changing social value orientations for the worse.

Keywords: *Cognitive Enhancement, Cognitive Performance, Enhancement, Ethics of Restraint, Methylphenidate, Moral Theory, Neuro-Enhancement, Neuroethics, Neuroimaging, Personal Identity, Social Identity, Stimulant Abuse, Technoethics*

DOI: 10.4018/ijt.2015010101

INTRODUCTION: WHAT IS COGNITIVE NEUROENHANCEMENT?

By and large, cognitive neuroenhancement drugs (colloquially also referred to as 'smart drugs') is a label given to prescription drugs such as Ritalin that are taken with the intent of improving cognitive performance. Smart drugs improve cognitive function such as alertness, attention, concentration, and memory; and psychological function such as mood and sleep, with the intent to indirectly enhance cognitive performance. By taking these drugs, users hope for amplification and/or extension of core cognitive capacities in order to perform better at the task at hand.

"Ultimately, our drug use is a reflection of our society" so the authors of a recent *Nature* commentary tell us, "and should never be considered without the broader context of why healthy people choose to use the drugs in the first place" (Sahakian & Morein-Zamir, 2007). According to a recent study, one in seven healthy college students in Switzerland uses neuroenhancement drugs to enhance their cognitive capacities aiming at improving their academic performance (Maier et al., 2013). In a recent survey conducted in Canada, 15% of medical students admitted non-medical and/or off-label use of one or more pharmaceutical stimulants (Kudlow et al., 2013). Many other studies confirmed the widespread use of these drugs in the academic environment; not only students but also faculty members reported use of such substances (Maher, 2008).

It is important to note at the outset that there is a significant difference in the purpose of taking these drugs, compared to the drugs of the 1960s and 1970s such as LSD or marijuana, which have been taken recreationally with the intent to 'drop out', i.e., forgetting the hassle of everyday life; whereas neuroenhancers serve an opposite purpose, they are taken to become able to perform better than well in a world that asks for high-achievers.[1]

In what follows, we will approach the ethics of neuroenhancement from the perspective of the emerging field of *technoethics*—a term that has been coined by Mario Bunge (1977) in the late 1970s. Ever since, this fascinating and growing interdisciplinary research area aims at exploring ethical aspects of technology and its impact on society. Technoethics has been defined as dealing "with human processes and practices connected to technology which are becoming embedded within social, political, and moral spheres of life. It also examines social policies and interventions occurring in response to issues generated by technology development and use. This includes critical debates on the responsible use of technology for advancing human interests in society. To this end, it attempts to provide conceptual grounding to clarify the role of technology in relation to those affected by it and to help guide ethical problem-solving and decision making in areas of activity that rely on technology" (Luppicini, 2010). One of the key areas of technoethics is 'biotech ethics'; a subfield that is concerned with, "the use of biotechnologies [that] spread rapidly to medical research, health care, and industrial applications" (Luppicini, 2009). This key area of technoethics involves analyzing pressing ethical issues that arise from the application of neuroscientific research leading to growing possibilities of artificially enhancing human cognition. We have seen an unprecedented growth in medical technologies such as magnetic resonance imaging (MRI) and associated research investigating the function and anatomy of the human brain. Following something akin to Moore's law, this will only continuously increase in the future. Therefore, the examination of technoethics and more specifically, biotech ethics are becoming increasingly important and relevant to society.

In order to set the stage, some disclaimers regarding our take on cognitive enhancement are important: we are not concerned here with non-prescription drugs such as caffeine that can be regarded as 'soft enhancers', but with a narrow understanding of artificial, and, for that matter, 'unconventional' cognitive enhancement by means of psychopharmacological drug intervention with immediate and significant physiological effects on the brain.

When reflecting on moral issues of neuroenhancement, it has been argued that there may not be a difference in kind between caffeine and prescription smart drugs (Meyers, 2014); but this does not undermine the assumption that there might be a morally significant difference in degree. This is, in part, due to the fact that the efficacy of caffeine on more complex and cognitively demanding tasks is controversial (Dresler et al., 2013). Presumably, no amount of caffeine is going to make a decisive difference in performing cognitive tasks, whereas the use of psychostimulants could potentially tip the balance and enable the user to perform at a pace that would not have been achievable without artificial enhancement of this sort. In other words, caffeine is not going to elevate the peak of one's cognitive capacities, whereas pharmaceutical products have the potential to raise the level of the peak performance. This difference in degree, then, might well be a morally significant factor.

We are also not concerned with a wider notion of enhancement including external technological and institutional structures that support and improve cognition such as education and training, which we take to be too wide of a notion of enhancement. Using the term enhancement regarding these kinds of external technological and institutional structures bears the risk of committing a fallacy of ambiguity. Here, the idea of enhancement is fundamentally different, involving long lasting educational traditions that serve not only the goal of immediate cognitive enhancement, but also aim to shape and educate people holistically. Compared to the immediate and potentially damaging effects of psychostimulants on the neural level, which might be described as deliberately induced invasive interventions, the features of external technological structures might be considered as non-invasive and intrinsic effects on the function and structure of the brain. However, this is not to ignore that the ethics of cognitive enhancement should also be considered more broadly (as for example done by Bostrom & Sandberg, 2009). Nevertheless, it seems that these issues need to be distinguished from cognitive enhancement by means of pharmacological drug interventions because these are different in kind from external and educational enhancement practices. In response to increased neural activity through repetition and practice, education and training approaches lead to strengthened synapses (on the cellular level) and neural networks (on the global level) involved in learning and memory, amongst others (e.g., Bernardinelli, Nikonenko, & Muller, 2014). Benefiting from neural plasticity changes requires a much longer time frame, but in turn leads to more stable and long lasting enhancing neural effects. Education and training subsumes the degree of scholarly effort compared to pharmacological enhancement. It does have an impact on the brain through repetition and practice; however this occurs over a much longer time frame compared to the almost immediate effect of stimulants on the brain.

So, what are we concerned with? The so called off-label use of smart drugs has to be distinguished from therapeutic interventions as its aim is not to cure and restore acquired abilities but to enhance the given; in other words, to become able to perform better than well. The debate over where to draw the line between therapy and enhancement is controversial but need not be solved here, since we will focus on cases that are clearly on the non-therapeutic side. In these instances, neuroenhancement drugs are used by people that do not suffer from reported cognitive impairment or other symptoms that would justify a prescription of these sorts of drugs. On the contrary, we are discussing cases in which drugs are taken in the academic environment involving people that, arguably, already perform cognitively above average. Nonetheless, a few remarks on the difference between therapy and enhancement might be helpful in wrestling with ethical issues that arise when the line between these dimensions gets blurry. Treatment, as we take it, does not override given capacities but permits them to flourish. The purpose that guides medical

treatment is thus to restore and preserve the natural human functions that constitute health. Needless to say that the question of what counts as normal human functioning is not merely an empirical question, and there is reasonable disagreement on the matter. This disagreement, however, does not undermine the assumption that medical treatment aims at promoting health and cure disease. Enhancement, on the contrary, aims at elevating cognitive capacities beyond the individual physiological and psychological limitations.

The following reflections explicitly focus on present-day actual methods of off-label use of psychostimulants and their known effects and side-effects, rather than speculating on possible future scenarios and hypotheticals. As cognitive neuroscience has advanced, the list of prospective internal, biological enhancements has steadily expanded (Farah et al., 2004). Hereafter, we will give an overview over how these drugs work, both physiologically in terms of brain functioning and psychologically in terms of subjective experience. Furthermore, we will discuss known side effects and health risks. In doing so, it will become clear that, for one, the effects of present-day available drugs are by far not as straightforward as it is often assumed; and they come at a high cost—possibly resulting in long-term effects on brain plasticity and personality (Urban & Gao, 2014). Whether or not this is a principled limitation of these drugs is subject for further empirical research. Michael Sandel writes: "When science moves faster than moral understanding, as it does today, men and woman struggle to articulate their unease" (Sandel, 2012, p. 93). For this reason, a solid understanding of the neuroscientific underpinnings of cognitive enhancement drugs is indispensable when evaluating their moral status; that is, both from the viewpoint of the individual user, and, maybe even more so—for reasons that will become clear later—from the perspective of a society that promotes or permits the use of these drugs.

GENERAL NEUROPHARMACOLOGICAL MECHANISMS OF METHYLPHENIDATE (RITALIN)

Methylphenidate (MPH) is a psychostimulant drug and a derivative of amphetamine. It is known under trade names such as Ritalin or Concerta and became the drug of first choice mainly prescribed for the treatment of attention-deficit/hyperactivity disorder ADHD (Greenhill et al., 2002; Morton & Stockton, 2000), but it may also be involved in the treatment of Alzheimer's disease (AD), Parkinson's disease (PD) or major depressive disorder (MDD) (Auriel, Hausdorff, & Giladi, 2009). MPH acts on the dopaminergic system of the brain. Its primary mechanism of action is the interaction with the presynaptic dopamine transporter (see Figure 1B). Stimulants such as MPH and cocaine (Volkow et al., 1999; Volkow et al., 2012) bind to the transporter and decrease the possibility of dopamine reuptake back into the presynaptic cell after dopamine release. Hence, the concentration of dopamine molecules in the synaptic cleft increases, leading to an increase of the postsynaptic dopamine receptor firing rate, which in turn significantly effects neuronal transmission and plasticity. In addition, MPH (and the structurally similar amphetamine) promotes the release of presynaptic dopamine (Calipari & Jones, 2014). In contrast to MPH, amphetamine also disrupts vesicular storage of dopamine, which might explain lower neurotoxicity features of MPH (Berman et al., 2008). MPH-induced effects of structural and synaptic plasticity are highly complex processes (Markowitz et al., 2006) and dependent on many factors such as regional localisation of the neuron, drug dosage, duration of MPH-usage (Kim et al., 2009; Russo et al., 2010) as well as ethnic background (Shumay et al., 2011) and genetic factors (Faraone et al., 2014). Assuming an inverted U-shaped dose/response curve of MPH effects, low as well as high drug levels may lead to impaired cognitive and executive performance, whilst moderate drug levels may improve these functions (Arnsten & Li, 2005; Urban & Gao, 2014).

After oral administration, the concentration of MPH peaks after one to two hours (Patrick et al., 1987). In order to evoke rapid dopamine release and the associated subjective effects of euphoria, MPH is often administered intravenously or it is crushed and taken intranasally by adolescent and adult substance abusers (Figure 1A) (e.g., Morton & Stockton, 2000; Shaw et al., 2008). As it easily crosses the blood-brain-barrier, high concentrations of MPH are present within the brain minutes after administration, resulting in subjective 'high effects' similar to cocaine. Due to its influence on the dopamine system, MPH-induced changes occur broadly along the projections of dopaminergic neurons terminating in the striatum, nucleus accumbens and frontal brain areas (Figure 1C). However, effects of MPH are multifaceted and emerging research is beginning to shed more light on the associated neurobiological and behavioral mechanisms.

Enhancing Effects of Methylphenidate (Ritalin) on Brain and Behavior?

A one-to-one mapping between circumscribed drug effects of MPH on a) a single neurotransmitter system, b) specific effects on brain activity or plasticity and c) selective effects on certain cognitive functions would represent an oversimplified assumption. On the level of neurotransmitters, for example, MPH is predominantly associated with the dopaminergic system. However, dopamine can interact with different subtypes of dopamine receptors resulting in very different neuronal effects, which again depend on the regional localization of the dopaminergic neurons (Robbins & Arnsten, 2009). Many other confounding factors need to be considered when planning and/or interpreting neuroimaging/behavioral studies investigating the effects of MPH (see Figure 1D), such as differentiating single-dose effects from effects of long-term use the individual baseline levels of neurotransmitters, as these were shown to have significant effects on behaviour and brain function. Using positron emission tomography (PET), it was shown that participants with an increased MPH-induced release of dopamine in the caudate nucleus were impaired on a learning task, whilst participants with low MPH-induced dopamine release improved (Clatworthy et al., 2009). Thus, the inverted U-shaped dose/response curve of MPH might be related to individual baseline levels of dopamine, which in turn might be predicted in future, more complex investigations by the genotype (Bilder et al., 2004). These and other factors (see Figure 1D), need to be considered when investigating the complex neurobiology underlying the multifaceted effects of stimulants such as MPH across individuals.

Regarding the abuse of MPH by individuals without a diagnosis of ADHD, the current literature contains inherent limitations and heterogeneity, specifically in terms of the tested cognitive abilities (e.g., working memory, attention, reward, wakefulness, etc.). With no standard battery of tests applicable, which might also lack sensitivity if adapted from clinical trials, it is difficult to compare effect sizes for different drugs across studies (Husain & Mehta, 2011). However, a systematic review investigating the non-medical use of prescription stimulant medication such as MPH, amongst others, in non-clinical/healthy (neurotypical) participants suggest moderate effects on measures for cognitive or motivational factors (Repantis et al., 2010). This review provided no consistent evidence for neuroenhancement effects—specifically the enhancement of attention—of MPH, but described a positive effect on spatial working memory. As this review finding seems not sufficient to justify the high (and still increasing) number of non-medical MPH users, the authors speculate about other, rather subjective enhancing effects. Supporting this assumption, another study showed that placebo effects for MPH significantly influenced subjective mood (feeling high and stimulated) in college students (Looby & Earleywine, 2011). Besides mood enhancing placebo effects, MPH-induced emotional changes and their possible positive effect on neural activity and cognition have not been investigated yet. Tentative

links between MPH-induced behavioral/neural changes and affective disorders are subject to debate. Repantis and colleagues concluded that "the lack of positive objective effects of MPH found in this review should be propagated so as to discourage people who consider using it to achieve an enhancement of cognitive capacities" (Repantis et al., 2010).

Instead, non-pharmacological enhancement strategies have been shown to be more efficacious compared to pharmacological interventions, such as physical exercise or meditation (see Dresler et al., 2013 for a detailed review): positive effects of non-pharmacological interventions such as meditation were reported on the behavioral level showing increased attentional capacities and cognitive flexibility (Moore & Malinowski, 2009; Zeidan et al., 2010), but also on the level of brain activity and plasticity. Interestingly, non-pharmacological techniques showed reduced neural activity in people who meditate compared to non-meditators, suggesting improved neural efficiency possibly via improved attention and impulse control (Kozasa et al., 2012). Corresponding to the described pharmacological effects of MPH on dopaminergic synapses, a PET study showed increased dopamine release during meditation (Kjaer et al., 2002). Moreover, non-pharmacological enhancement had positive effects on brain plasticity, such as increased volumes of gray matter in the hippocampus and orbitofrontal regions (Hölzel et al., 2011; Luders et al., 2009).

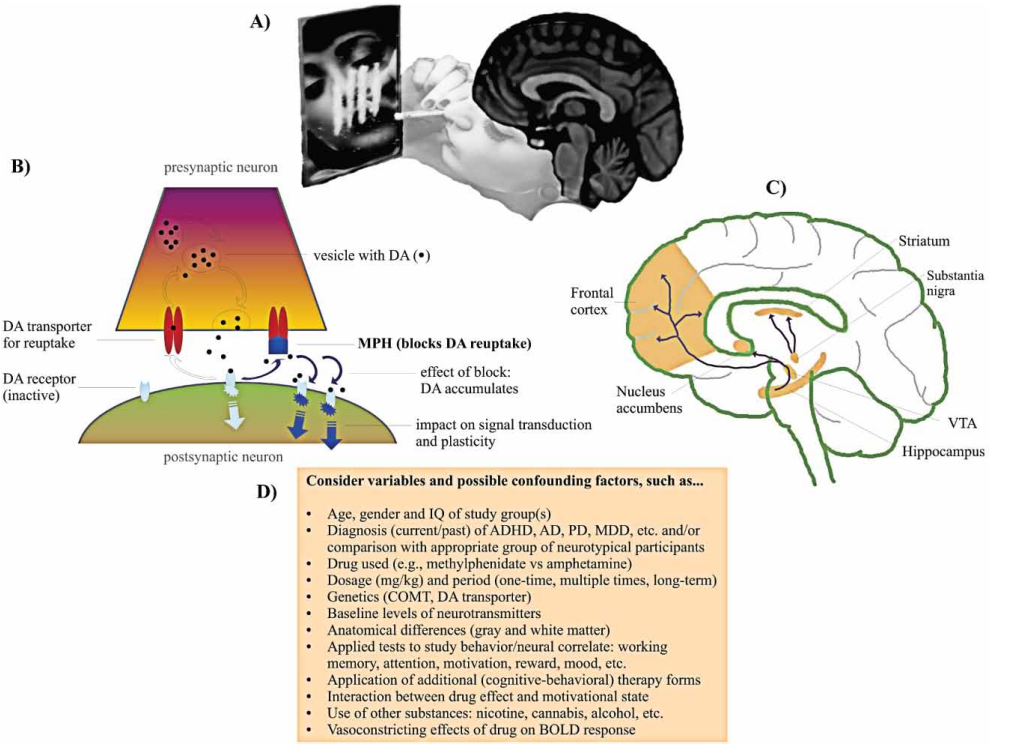
A straightforward conclusion about MPH-induced enhancing effects on neural activity and plasticity changes in healthy participants cannot be drawn yet. Instead, recent articles provide scientific support that pharmacological enhancement is accompanied by rather negative and long-term neural costs. In the article "Performance enhancement at the cost of potential brain plasticity: neural ramifications of nootropic drugs in the healthy developing brain" (Urban & Gao, 2014), the authors review and highlight the risks and concerns of pharmacological interventions (MPH, modafinil and ampakines) particularly in the healthy juvenile and adolescent brain. Pointing out the impossibility to predict the effect of a certain MPH dose on an individual (due to the inverted U-shaped dose-response curve of MPH in combination with individual fluctuations of dopamine levels, as discussed above), the authors point out that early life treatment with MPH may alter circadian rhythms, induce anxiety that persists into adulthood and impair object-recognition memory (see Urban & Gao, 2014 for details). Alternating dopamine levels during the particularly long maturation of the human prefrontal cortex might disrupt these processes and have powerful and lasting behavioral effects. The most replicated finding of alterations in the brain structure of children with ADHD include significantly smaller volumes of the dorsolateral prefrontal cortex, caudate, pallidum and abnormalities in frontal cortex areas (Frodl & Skokauskas, 2012; e.g., Makris et al., 2007; Seidman et al., 2005). These findings might be causally related to the underlying disorder, but might also be modulated by stimulant treatment. Whilst low dose MPH treatment in neurotypical adolescents might improve attention and decrease hyperactive behavior, behavioral inflexibility and impaired working memory might indicate some of the downside consequences (Urban & Gao, 2012). Behavioral flexibility is critically involved in interpersonal skills and also in substance abuse. Although some studies reported that early clinical ADHD treatment with stimulant medication had no long-term effects on substance abuse in adulthood (Volkow, 2012; Volkow and Swanson, 2008) or was associated with a reduction in subsequent substance abuse (Wilens et al., 2003), other prospective studies identify it as a risk factor for substance abuse (Lambert & Hartsough, 1998). Recent animal studies point out that early adolescent exposure to stimulants had consequences that persist into adulthood with gender-specific MPH effects (Shanks et al., 2015). Compensatory changes occurred on the cellular level due to MPH self-administration, which resulted in increasing susceptibility to abuse other dopamine releasing compounds such as amphetamines, independent of the pattern of administration (intermittent, which

is typically seen in healthy MPH users, or continuous) (Calipari & Jones, 2014). As MPH exhibits properties of both dopamine blockers and releasers and affects glutamatergic signaling as well, it can increase the probability to develop obsessive-compulsive or addictive behaviour, similar to which is seen in cocaine addicts (Kalivas & Volkow, 2011; Urban & Gao, 2014).

Understanding the neural long-term effects of pharmacological enhancement on the developing brain is key to reduce undesirable or maladaptive long-term effects such as rigid attention and behavioral inflexibility. Amongst others, the influence of age in individual responses to MPH seems to be of particular interest (Andersen, 2005). Turner and colleagues examined healthy elderly adult male volunteers receiving MPH (Turner et al., 2003). Whilst MPH had significant cardiovascular and subjective effects, no effects were seen in behavioral tests to objectify working memory, response inhibition and sustained attention. The results suggest clear age-dependent effects of MPH, with elderly subjects showing a lack of cognitive enhancing effects (Turner et al., 2003). Other studies in animals used multimodal magnetic resonance imaging (MRI) such as pharmacological MRI or diffusion tensor imaging (DTI) to assess long-term effects of MPH treatment (van der Marel et al., 2014). They observed MPH effects on the volume and myelination in the striatum of healthy rats. Interestingly, these effects were opposite in adolescent and adult rats, highlighting again the importance of further research in age factors when exposed to MPH, but do not suffer from ADHD.

Studying neural effects of MPH in humans using MRI are usually carried out and interpreted within the context of ADHD, which further hampers a simple one-to-one transfer of effects to casual users without ADHD. In a recent neuroimaging study, Mueller and colleagues investigated the effects of MPH on intrinsic functional connectivity using resting state fMRI (Mueller et al., 2014). They performed a double-blind, randomized, placebo-controlled study in 54 healthy male participants. Having in mind the various confounding factors such as gender or administration schedule (see also Figure 1D), the results demonstrate that MPH does not selectively affect brain regions involved in sustained attention or other executive functions. MPH induced more complex changes within networks of the resting brain, including cortico-cortical and cortico-subcortical connectivity of many other cognitive and sensory-motor networks. Interestingly, the authors linked MPH-induced changes of intrinsic connectivity, which include brain stem and midbrain regions, to typical side effects of MPH on the body. As MPH frequently causes gastrointestinal upset or nausea and nervousness, amongst others (Husain & Mehta, 2011; Yildiz et al., 2011), connectivity changes in brain areas involved in somatic regulation processes might be connected to these physical symptoms, which again underlines the multifaceted and still not well understood effects of MPH on the human physiology. In addition to resting state changes caused by MPH, blood oxygen level dependent (BOLD) functional MRI is increasingly used to study the differential effects of MPH on human brain function. For the interpretation of task-evoked neural activity changes (and resting state changes) in responses to a broad range of cognitive tasks in combination with MPH administration, several physiological parameters such as the regional cerebral blood flow need to be considered. Marquand and colleagues used arterial spin labeling MRI to measure these changes in healthy participants after administration of MPH, atomoxine and placebo (Marquand et al., 2012). MPH-induced effects showed a specific pattern of changes in regional cerebral blood flow. The authors were thus able to discriminate the neural effects of each drug and provided information about differential brain activity patterns. It should be noted that MPH increased the cerebral blood flow significantly in the caudate, substantia nigra and the thalamus, whilst the cerebellum showed relatively decreased blood flow compared to atomoxetine (Marquand et al., 2012). Thus, measures derived from BOLD-MRI might be significantly influenced by

Figure 1. A) MPH abusers (without ADHD diagnosis) might crush and take the drug intranasally, resulting in fast and intense feelings of euphoria. B) Cellular effects of MPH on the dopaminergic synapse. One of the main consequences of MPH is the blockade of dopamine (DA) reuptake back into the presynaptic neuron. C) Dopaminergic pathway in the human brain. Dopaminergic cell bodies are located in the ventral tegmental area (VTA) and the substantia nigra. Dopaminergic neurons project to the nucleus accumbens, frontal cortex and striatum, respectively. D) Some confounding factors that need to be considered when interpreting/planning research studies on MPH effects. Please note that parts B) and C) illustrate simplified representations about processes at the dopaminergic synapse and dopaminergic pathways, respectively. MPH-induced effects of structural and synaptic plasticity are highly complex processes (Markowitz et al., 2006) and dependent on many factors such as regional localization of the neuron, drug dosage and time period of MPH-usage (Kim et al., 2009; Russo et al., 2010). Future research needs to further clarify the exact mechanism of MPH-induced functional and structural changes. Abbreviations: ADHD (attention-deficit/hyperactivity disorder), AD (Alzheimer's disease), DA (dopamine), PD (Parkinson's disease), MDD (major depressive disorder), COMT (Catechol-O-methyltransferase), BOLD (blood oxygen level dependent) (image by CW).



these vasoactive effects of MPH. Therefore, it will be important to consider the vasoactive effects of MPH in future studies investigating neural activity (during certain tasks or at rest) to disentangle its relationship to drug-induced neural activity changes.

Taken together, various confounding variables need to be addressed carefully and thoroughly in the field of MPH research, specifically with respect to increasing numbers of neurotypical individuals without an ADHD diagnosis abusing those stimulating drugs (ranging from parents taking Ritalin from their children to boost their energy level, students trying to improve their grades, professors trying to enhance their productivity, military personnel trying to increase vigilance, etc.; Farah et al., 2004; Husain & Mehta, 2011; Repantis et al., 2010). Currently, though, the scientific literature less confirms enhancing effects of MPH, but rather causes underlying concerns about negative long-term consequences of neurotypical individuals using/abusing MPH.

ETHICAL CONSIDERATIONS

After having shed some light on the neurobiological and behavioral consequences of psychostimulant drug use and pointing out to their limitations, as well as to apparent health risks, we will now turn to ask related moral questions that arise when considering the increasing off-label usage of these drugs. We will elaborate on some considerations as to why these practices can be seen as morally reprehensible. The reasons we will adhere to might seem obscure to some, for they inevitably, as science advances, arise from questions that were largely lost from view. These are "questions about the moral status of nature, and about the proper stance of human beings toward the given world. Since these questions verge on theology, modern philosophers and political theorists tend to shrink from them. But our new powers of biotechnology make them unavoidable" (Sandel, 2012, p. 94). Our attempt is to reflect on the attitudes and dispositions that prompt the personal and societal drive for neuroenhancement from a secular point of view.

By doing so, the ethics of neuroenhancement must take into account different settings in which these drugs are taken. There seems to be a morally significant difference between using these drugs in competitive settings like entrance exams to universities, or when used by surgeons and nurses who work long shifts. Whilst the former might be seen as an egocentric arms race for limited resources, the latter serves rather an altruistic goal of being better able to help others in need. It is for these differences in purpose, that there are no straightforward general answers to the ethics of neuroenhancement and any fruitful debate must address each situation in turn (Sahakian & Morein-Zamir, 2007). We concede with this point, and thus largely focus on situations that involve the use of these drugs in settings that can broadly be construed as competitive (i.e., situations that are characterized by individuals competing directly or indirectly for limited resources).

That being said, a moral predicament arises when non-medically indicated neuroenhancement is used to elevate cognitive abilities in order to gain an edge over competitors in situations where, one way or another, the setting in which smart drugs are used can be described as a competition for limited resources. This is clearly the case when students aim at lifting themselves above the norm, or as the case may be, from the top five to, say, the top one percentile in order to score higher on entrance exams or regular exams leading to better grades which then, in turn, lead to a higher likelihood of getting a more prestigious job after school. This, of course, involves some unfair advantage over unenhanced competitors. Take another example: in competitive chess (where on the highest level people make a living out of it), the usage of drugs that enable longer periods of concentration might provide a decisive edge over unenhanced players and result in winning an unfairly higher share of prize money.

Philosophers have taken issue with several versions of the fairness argument, since it seems not to be an inherent moral problem that comes with enhancement drugs, but rather a derivative

result of its uneven distribution. For example, it has been claimed that "the socio-economic unfairness argument is largely irrelevant to practices like sports, science, or scholarship, since people working in these fields would probably not have significantly different access to enhancements (Meyers, 2014)." We concede with this claim, however, we posit that this does not necessarily render the fairness problem as an insignificant issue. Even given the possibility that enhancers would be equally available for all, if some refuse to take enhancers themselves for health or moral reasons (or both), the disadvantage remains. Fair distribution and availability does not necessarily entail the willingness of all to use these drugs, and thus a measure of unfairness remains. In the case of professional sports where neuroenhancement might play a role, such as in chess, there is another reason for why these practices are morally reprehensible even if the fairness objection is answered. The reason is this: players that are winning because of artificial and invasive cognitive enhancement corrupt the idea of sportive competition as a societal activity that honors the cultivation and display of innate giftedness in combination with practice and training.

When considering neuroenhancement in a wider sense, it becomes apparent that the underlying idea is to provide a shortcut for success. For example, rather than cultivating appropriate healthy habits (schedule times for learning/sports/free time, sufficient amounts of sleep, healthy nutrition), and thereby achieving the ability to be able to take an exam well-rested and fresh, students might use Ritalin for compressed learning right before/at an exam. Thus, they gain a decisive time advantage. "Though there is much to be said for this argument," Michael Sandel writes, "I do not think the main problem with enhancement and genetic engineering is that they undermine effort and erode human agency. The deeper danger is that they represent a kind of hyperagency—a Promethean aspiration to remake nature, including human nature, to serve our purposes and satisfy our desires. The problem is not the drift to mechanism but the drive to mastery. And what the drive to mastery misses and may even destroy is an appreciation of the gifted character of human powers and achievements" (Sandel, 2007). Acknowledging the giftedness of life is to recognize that our talents and powers are not wholly our own doing, nor even fully ours, despite the efforts we expend to develop and to exercise them. Recognizing that not everything in the world is open to any use we may desire or devise leads to an ethics of constraint. An appreciation of the giftedness of life constrains the human desire for enhancing beyond the natural and conduces to a certain humility. The problem with ignoring this humility and surrendering to using every possible means of enhancing our cognitive capacities beyond what we have naturally been equipped with is that it endorses the superiority of molding our nature over beholding and accepting the given. The world is not just at our disposal. Why is this so? To give a theological answer would be the easy way out. Molding our nature at whim would be to confuse our role as humans with the role of God. However, a secular answer can be given as well: if due to pharmacological advances the wish of some to change their acquired capacities comes true, it will become difficult to view our capabilities at least to some degree as gifts for which we are indebted, rather than as achievements for which we are responsible. Hereafter, we will flesh out in more detail how this would transform our moral landscape and societal value orientations to the worse.

WINNING ISN'T EVERYTHING, IT'S THE ONLY THING: COMPETITION OVER COOPERATION

In further elaborating on why neuroenhancement is morally objectionable, it seems important to ask for the reasons as to why people seek to artificially enhance their cognitive capacities in the first place. By reasons we do not mean here the concrete purpose to enhance one's capacities, say, for a particular exam, but more generally the reasons for why people consider

these methods to achieve their goals more easily—or achieve goals they would otherwise maybe not have been able to achieve at all.

As a matter of fact, in most of the eastern and western world (certainly in liberal societies), we live in meritocratic societies. That is to say, greater effort leads to higher achievements—at least in principle. The more we put into our formal education, say, the better we score on tests, the higher the likelihood of getting a well-paid job, and thereby climbing up the societal ladder. It seems natural and legitimate that we try everything to improve our chances to get our share of limited resources. However, if this is a prevalent feature of how we cope with meritocracies, then this comes with a pivotal amount of social pressure resulting from the inevitable competition. Resources are limited and so, for example, if you are on the job market, every job in your field that is taken by someone else is one less opportunity for you.

Now, the question we want to submit to reflection is whether the widespread use of neuroenhancement drugs increases the social pressure for people that refuse to take these drugs. This, then, leads to the underlying question of whether we should care more about competitiveness or cooperation as a form of solidarity being a bearing component of what Karl Popper called "open societies" (Popper, 1947). What is, or rather should be a more salient feature of a liberal society, competition or cooperation? In addressing this question, we are not asserting that 'competition versus cooperation' is the only available option for any society; neither are we suggesting that cooperation is the default position. Although, arguments based on evidence from neuroendocrinology and evolutionary neurobiology have been made indicating that bonding and cooperative behavior are vital for human survival, and as such form the basis of morality (Suhler & Churchland, 2011).

In what follows, we will outline why we believe that the deepest moral objection to enhancement lies less in the concrete goal that it seeks (elevating cognitive capacities), than more in the human disposition it expresses and promotes. Widespread use of neuroenhancement, so we claim, contributes to changing the expectations society has for cognitive performances and thereby putting pressure on those who refuse to comply, as a consequence of which three core values of liberal societies are subtly transformed: humility, responsibility and solidarity. The moral thread of artificially enhancing our cognitive capacities, then, comes from the pursuit of misguided ends, since it reflects and endorses a hyper-competitive society that values the output highest—even if this is achieved by wilfully acting against solidarity, cooperation and humility as qualities of character that have been building blocks of liberal societies. Important in this regard is to emphasize again that the neuroenhancement drugs in question are not a source of recreation but become a bid for compliance—a way of answering a competitive society's demand to improve our performance in order to be able to keep up with, and ultimately outsmart, competitors in an arms race for limited resources. This demand for hyper-performance then animates the impulse to rail against the given. Here is where the deepest source of the moral trouble with enhancement lies.

Take two examples. "Winning isn't everything; it's the only thing!"—is a well-known quotation in sports, attributed to the UCLA football coach Henry Russell Sanders. While the shift in the purpose of sports from recreation and health to winning competitions is legitimate and to some extent the nature of professional sports, it is widely accepted that this does not justify any means to achieve this end. This is not only for the reason that it is unfair to outperform opponents by using doping in sports, but also because sports resembles an important part of society and thus reflects and influences to some degree the underlying values in society—the way we want to structure and organize our daily lives with each other. Imagine we would allow the usage of neuroenhancement in sports where applicable, why should it then be illegitimate, one might ask, if a chess player was allowed to use smart drugs to perform above an accomplished skill level or for a student not to be permitted using these drugs to score better

exams? The way we manage the usage of drugs in one sphere of our daily life does naturally influence the way we see it in other domains.

This leads us to a second more salient example. Academia as a microcosm of society is a highly competitive endeavor, resembled in the wrestle for positions, tenure, promotion, journal space and the "publish or perish" mentality, grants, funding, fellowships, awards, honors and prizes; in short, the competition for academic survival, for fame and fortune. Like in sports, the academic output serves not only a purpose in itself, the acquisition and dissemination of knowledge, but also a purpose to maintain one's position, to compete for grants, or whatever it may be. This resulted in the widespread use of smart drugs in academia (Sahakian & Morein-Zamir, 2007). Granted that it might increase the scholarly output as well, it also subtly transforms the expectations scholars have of one another. For example, expecting collaborators being able to work longer hours, be more prolific and enable themselves to walk the extra mile. Natural human limitations as to how long one can concentrate, for example, become less acceptable when fewer people refuse to take widely available smart drugs, thus giving in to social pressure. That is, the given is less accepted when it becomes more a matter of choice than of chance. In fact, in sports this already starts happening when unenhanced players are accused by their teammates of "playing naked"—it is not too difficult to foresee this happening in academia as well. If, say, winning the competition for grants becomes the ultimate goal and almost any means is justifiable, then this transforms not only the values inherent in academia itself, but in the long run also affects society at large. In a society in which winning is everything, there is hardly any room for humility and solidarity. In like manner, if smart drugs become commonly accepted in academia, unenhanced scholars will find themselves "playing naked." This is at odds with the admittedly humanistic conviction that human nature is not a mere object at our disposal, open to any use we may desire, but a gift for which we should be thankful. Here it becomes pivotal to bear in mind the earlier mentioned difference between treatment in order to restore lost abilities and enhancement aimed at elevating our performance beyond the given.

Another problem that comes with neuroenhancement is our capacity to act freely, for ourselves, by our own efforts, and to consider ourselves praiseworthy and responsible for our achievements. It is, for example, one thing to memorize chemical formulas for an exam in medical school as the result of disciplined studying, and another thing to having been able to memorize them with the help of neuroenhancement drugs. Of course, this is not an all-or-nothing matter; but as the role of enhancement increases, our admiration for the achievement fades. We might even say that the moral unease in these cases comes with a diminished agency of the person whose achievement is enhanced. The more students rely on neuroenhancing drugs, the less the objectified performance represents a measure of personal achievement. Accordingly, neuroenhancement might pose a threat by eroding human agency, undermining human freedom and transforming moral responsibility. Why is this so? Consider again the widespread use of cognitive enhancement drugs leading to what we earlier referred to as the problem of hyperagency. If molding our nature by means of neuroenhancers becomes acceptable, responsibility expands to disconcerting proportions. That is, a student being too tired or occupied to study all day and night and thus reducing the likelihood to score an A in the exam is hold to be responsible for poor time management. Additionally, the student becomes responsible of not having taken artificial measures enabling to study all night.

In other settings the problem of responsibility explosion becomes even more evident. Take a surgeon that has to perform a long and exhausting operation and makes a mistake that, maybe, could have been avoided by taking cognitive enhancement drugs. It is easy to see how this might change expectations of human abilities that were perfectly acceptable before the invention of these drugs. This might lead

to transforming attributes of both personal and social identity.

How Cognitive Neuroenhancers Might Transform Personal and Social Identity

In this section, we will sketch some issues as to how the widespread acceptance of cognitive enhancement drugs bears the risk of changing, for one, how we see ourselves in a group of relevant others (here personal identity is at stake), and also, how others see us within a group of relevant others (here social identity is at stake).

How do I see my personal identity in a group of relevant others? Let's assume for the moment that I am in a group of newly admitted medical students at the University of Nebraska's College of Medicine. Soon I find out that my fellow students don't shy away from taking Ritalin in order to increase their academic performance. I have, for both moral and health reasons, not been able to convince myself to take these drugs and shortly thereafter find myself becoming an outcast—this not only because my academic performances are lower than the performances of my peers, but also because I am not taking part in using cognitive neuroenhancers, and thus implicitly refuse to subscribe to the group's ethos. This is an expression of my personal values conflicting with the values that are governing the group which might lead to peer-group pressure.

Let's take the perspective of the group and evaluate my social identity. How do others see me within the group? It seems, that there is a great societal risk that comes both from the expectation to achieve excellence in order to be socially accepted in such a group, as well as from the social pressure to subscribe to values that others share. That is, not only will I see myself as an outcast, but also will others see me as an outcast. It doesn't take much to imagine how this might look like a little further down the road.

Let's say my fellow students and I both get through medical school and residency with comparable results. Although my peers have presumably due to their regular consumption of neuroenhancers scored slightly better overall. Not only will it become difficult for me to compete for jobs with them now, but also, if I continue to refuse taking these drugs, I might be no longer able to compete with my colleagues once I got a job. If a significant amount of, say, surgeons are able to work longer hours, perform operations with greater ability of concentration due to artificially enhancing their cognitive capacities, I might soon find myself coming under pressure for failing to offer an explanation as to how my underperformance comes about. "As social acceptance of other enhancements increases, and if these are available at a reasonable price," Bostrom and Sandberg tell us, "it is possible that social support for people who refuse to take advantage of enhancements will diminish" (Bostrom & Sandberg, 2009, p. 329).

NARRATIVE AND MORAL CHARACTER

To take what has been said in an even wider notion, we will now turn to some reflections on how a society that endorses the use of cognitive neuroenhancers might change their moral values and become less governed by solidarity and more by competition.

As Alsdair MacIntyre (1981) has famously argued, our lives are structured in the form of narratives. Both how we see ourselves and how we are seen by others is, in large part, the degree to which our lives fit into a coherent whole.[2] Narratives are, to some extent, teleological in that they are guided by some vision of the future—some variety of ends and goals. However, narratives also provide an outlook of an uncertain future. The unpredictable and teleological natures of narratives coexist, so that we never know what will happen next in our lives, but nonetheless our lives have a shape which guides us towards our future. We make sense of our lives only through the stories of which we find ourselves a part, and so we can only understand a society through the stock of stories that it tells. As Noam Chomsky would

attest, this stock of stories becomes more and more a story of competition; thereby a change in viewing others as competitors rather than as collaborators becomes inevitable. It, then, becomes natural and even praiseworthy to strive for competition at any cost. But what happens to those, arguable in fact to most of us, who are not hyper-competitive in nature? Hypothesizing an individual having difficulties to make sense of their life in light of hyper-competitive societal demands, this person is "complaining that the narrative of their life has become unintelligible to them, that it lacks any point, any movement towards a climax or a telos" (MacIntyre, 1989, p. 103). The unity of a personal narrative requires a unity of character, an understanding of how a person could at various points be a character in different narratives. "The narrative of any one life is part of an interlocking set of narratives" (MacIntyre, 1981, p. 218); and the unity of an individual life is the unity of a narrative embodied in that life. It is the notion of a quest towards particular goals, in which obstructions are encountered and dealt with, and in so dealing, the goals of the quest come to be fully understood. Thus, the virtues are to be understood as those dispositions which enable us to achieve the goods internal to practices and to engage in the overall quest for the good. The good life, then, is "the life spent in seeking for the good life for man, and the virtues necessary for the seeking are those which will enable us to understand what more and what else the good life for man is" (MacIntyre, 1981, p. 218).When the good life is seen as a way in which our moral character fits the society in which we live in, then the ascription of moral character, arguably, stands as it were at the top of the self-constitution ethical pyramid. It matters whether my character, as MacIntyre argued, is that of the 'Aesthete', the 'Therapist', or the 'Bureaucratic Manager' (MacIntyre, 1981). The latter character appears even more disenchanted and locked into Max Weber's "iron cage" in a post-2008 global recession world that puts more and more importance on winning competitions for limited resources. Here, we would suggest the character of the 'Libertarian Wall Street Trader', which is characterized by hyper-competitiveness, egoism pure and simple, with the addition that our contemporary dominant characters simply chalk up their costs and trillions of dollar debts to future generations. Crucial in MacIntyre's understanding of persons as characters in enacted narratives are the inevitable consequences of moral behavior. "[P]ossessing only the resources of psychological continuity, we have to be able to respond to the imputation of strict identity. I am forever whatever I have been at any time for others—and I may at any time be called upon to answer for it—no matter how changed I may be now. There is no way of founding my identity—or lack of it—on the psychological continuity or discontinuity of the self" (MacIntyre, 1981, p. 251).

The way in which we see ourselves fitting into the demands of society is important and inevitably shapes the way in which others see themselves fitting in. Thus, personal and social identity extended into moral character in the unity of one's moral life has implications for the freedom and well-being of all other human beings and, down the road, for society as a whole. The feeling of being intimately linked to a set of shared values is something we seek for its own sake, not as a means to some further end. When seeing society first and foremost as an organized competition, by contrast, our shared values become primarily pragmatic and strategic; enabling us to better compete with others for limited resources, its primary value becomes instrumental. The unrestricted quest for competitiveness might then change social values towards more selfishness and reduced cooperation.

CONCLUDING REMARKS

It is tempting to think of enhancing our cognitive capacities to gain a competitive edge as a legitimate way of expressing the ideal of freedom allowing us to get more than our fair share in a meritocracy. However, the social costs of this are likely to outweigh the benefits. We should bear in mind that by changing our nature to fit

society—rather than trying to create a society that fits our nature—we may inadvertently subjugate ourselves to the brute ideal of 'survival of the most competitive' at any sacrifice. Rather than encouraging a hyper-competitive society, we would do well to aspire and promote a more humanitarian society allowing for and accepting the limitations of innate human cognition. This involves the recognition and appreciation of the fact that our talents and limitations are not subject to our absolute control or entirely our own doing. In this sense, none of us can be exclusively responsible for their success or failure. This is an important insight but no general disproof of meritocratic societies. To the contrary, "it saves a meritocratic society from sliding into the smug assumption that the rich are rich because they are more deserving than the poor. Without this, the successful would become more likely than they are now to view themselves as self-made and self-sufficient, and hence wholly responsible for their success. Those at the bottom of society would be viewed not as disadvantaged, and thus worthy of measure of compensation, but simply as unfit, and thus worthy of eugenic repair" (Sandel, 2012, p. 103). Such a society, more and more driven by choice, and less and less by chance, would become harsh, less forgiving and undermine the solidarity that we have with the less gifted due to recognizing the measure of contingency when pondering our own capabilities.

The vision of ungluing our cognitive limitations from the given has something appealing to it as it resembles our quest for freedom and might even be deeply rooted in the human urge to strive for perfection. However, it is also intelligible to view the wish of enhancing ourselves beyond the given differently. "It can be seen," Michael Sandel says, "as the ultimate expression of our resolve to see ourselves astride the world, the masters of our nature. But that vision of freedom is flawed. It threatens to banish our appreciation of life as a gift, and to leave us with nothing to affirm or behold outside our own will" (Sandel, 2007, p. 99f.).

A crucial question when reflecting on the ethics of neuroenhancement is this: do we really want to live in, and promote, a society where people aspire to enhance their cognitive capacities to answer and thereby reinforce the increasing societal demands of competition—thus becoming what Nietzsche called the "Übermensch"? Taking artificial enhancement drugs raises the worry of, as it were, 'pharmacologization' of the entire life course, or as Healy (2008) puts it short and to the point: "Birth, Ritalin, Prozac, Viagra, Death." We propose that instead, we would do better to adhere to a certain degree of humility considering our place in nature and to accept our natural limitations. By doing so, we would refrain from abandoning solidarity and view our joint human quest as cooperative rather than competitive.[3]

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ENDNOTES

1. It goes without saying that this is no attempt whatsoever to justify or endorse the recreational use of LSD or any other drugs for that matter. It is simply to point out the difference in purpose of using these substances.
2. In contemporary analytically minded philosophy of mind and action, the notion of narrativity plays a fundamental role in the constitution of personhood and personal identity. In this tradition, Marya Schechtman is a leading proponent of a narrative view on personal identity. In her latest book *Staying Alive*, Schechtman develops the 'Person Life View' which holds that persons are defined in terms of the characteristic lives they lead, and seen as unified loci of practical interaction (Schechtman, 2014).
3. We are grateful to Niall W. Duncan and Rocci Luppicini for valuable feedback on earlier versions of this paper.

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Christine Wiebking obtained her B.Sc. in Biology at the Braunschweig University of Technology and her M.Sc., specialized in Neurobiology, at the Otto-von-Guericke University of Magdeburg (Germany). She obtained her Ph.D. at the Free University of Berlin and worked as Ph.D. and postdoctoral fellow at the Institute of Mental Health Research in Ottawa (Canada). Christine has conducted several brain imaging studies in healthy as well as psychiatric participants using functional magnetic resonance imaging (fMRI) (Wiebking, C. et al. (2010) World J Biol Psychiatry), magnetic resonance spectroscopy (MRS) (Wiebking, C. et al. (2014) Neuroimage), and positron emission tomography (PET) (Wiebking, C. et al. (2014) Hum Brain Mapp). Her research focuses on neural activity specifically during interoceptive awareness and its connection to biochemical and emotional processes in humans. In order to identify and understand the complex neural processes that underlie such conditions, these mechanisms are investigated also in patients suffering from emotional disorders such as major depressive disorder. The combination of different imaging methods–neural activity using fMRI and biochemical information using MRS and PET–is of particular interest to advance our knowledge of underlying neural mechanisms as well as to help improving possible treatment strategies.