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Examining discourses on the ethics and public understanding of cognitive enhancement with methylphenidate

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Ce mémoire intitulé:
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Résumé

L'émergence de l'utilisation du méthylphénidate (MPH; Ritalin) par des étudiants universitaires afin d'améliorer leur concentration et leurs performances universitaires suscite l'intérêt du public et soulève d'importants débats éthiques auprès des spécialistes. Les différentes perspectives sur l'amélioration des performances cognitives représentent une dimension importante des défis sociaux et éthiques autour d'un tel phénomène et méritent d'être élucidées. Ce mémoire vise à examiner les discours présents dans les reportages internationaux de presse populaire, les discours en bioéthique et en en santé publique sur le thème de l'utilisation non médicale du méthylphénidate. Cette recherche a permis d'identifier et d'analyser des « lacunes » dans les perspectives éthiques, sociales et scientifiques de l'utilisation non médicale du méthylphénidate pour accroître la performance cognitive d'individus en santé.

Une analyse systématique du contenu des discours sur l'utilisation non médicale du méthylphénidate pour accroître la performance cognitive a identifié des paradigmes divergents employés pour décrire l'utilisation non médicale du méthylphénidate et discuter ses conséquences éthiques. Les paradigmes « choix de mode de vie », « abus de médicament » et « amélioration de la cognition » sont présents dans les discours de la presse populaire, de la bioéthique et de la santé publique respectivement. Parmi les principales différences entre ces paradigmes, on retrouve : la description de l'utilisation non médicale d'agents

neuropharmacologiques pour l'amélioration des performances, les risques et bénéfices qui y sont associés, la discussion d'enjeux éthiques et sociaux et des stratégies de prévention et les défis associés à l'augmentation de la prévalence de ce phénomène.

La divergence de ces paradigmes reflète le pluralisme des perceptions de l'utilisation non médicale d'agents neuropharmacologiques Nos résultats suggèrent la nécessité de débats autour de l'amélioration neuropharmacologique afin de poursuivre l'identification des enjeux et de développer des approches de santé publique cohérentes.

Mots clefs: Neuroéthique, amélioration des performances, utilisation non médicale d'agents neuropharmaceutiques, méthylphénidate, représentations publiques

Abstract

The non-medical use of neuropharmaceuticals has sparked ethical debates. For example, there is mounting evidence that methylphenidate (MPH; Ritalin) is being used by healthy university students to improve concentration, alertness, and academic performance, a phenomenon known as cognitive enhancement. The different perspectives on the ethics of cognitive enhancement represent an important dimension of the social and ethical challenges related to such practices but have yet to be examined thoroughly. This thesis aimed to assess existing positive and negative reports in international print media, bioethics literature, and public health literature on the use of MPH to identify and analyze gaps in the ethical, social, and scientific perspectives about the non-medical use of MPH for cognitive enhancement in healthy individuals.

A systematic content analysis of discourses on the non-medical use of methylphenidate for cognitive enhancement identified divergent frameworks employed to describe the non-medical use of methylphenidate and discuss its ethical implications: The frameworks of "lifestyle choice", "prescription drug abuse" and "cognitive enhancement" are present in print media, bioethics, and public health discourses respectively. Important differences between frameworks include the description of the non-medical use of neuropharmaceuticals for cognitive enhancement, associated risks and benefits, discussion of ethical and social issues surrounding the phenomenon and the prevention strategies and challenges to the widespread use of

neuropharmaceuticals for cognitive enhancement.

Diverging frameworks reflect pluralism in perceptions if the non-medical use of neuropharmaceuticals for cognitive enhancement. At this time, unacknowledged pluralism and implicit assumptions about cognitive enhancement may impede public health interventions and ethics discussions.

Keywords: Neuroethics, cognitive enhancement, non-medical use of prescription drugs, methylphenidate, public understanding

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List of abbreviations

B: bioethics

CE: cognitive enhancement

DTCA: direct-to-consumer advertising

MPH: methylphenidate

NMPS: non-medical prescription stimulant

PH: public health

PM: print media

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Introduction

The non-medical use of neuropharmaceuticals is generating substantial debates in academic, medical and public health circles. A key motive for this non-medical use of neuropharmaceuticals is the enhancement of cognitive function in healthy individuals beyond normal human capacity. There is substantial evidence that methylphenidate, a drug typically prescribed to manage the symptoms of Attention Deficit/Hyperactivity Disorder (AD/HD) in children and adults, is being used by healthy university students to improve concentration, alertness, and academic performance. The ethics and public understanding represents an important dimension of the social and ethical challenges related to such practices and merit close scrutiny.

The research presented in this thesis aims to tackle some of the ethical issues related to cognitive enhancement by examining systematically discourses on this phenomenon. In particular, it analyzes existing positive and negative reports in the international print media, bioethics discourse and public health discourse on the misuse of methylphenidate. Underlying this project is the belief that close attention to current discourses could allow for the identification and analysis of divergences to enrich discourses. It is important to identify and analyze such gaps to move forward in the analysis of the ethical, social, and scientific perspectives about the non-medical use of methylphenidate for cognitive enhancement in healthy individuals.

Chapter 1 consists of a review of the literature on cognitive enhancement. The chapter first tackles the different definitional approaches to the non-medical use of neuropharmaceuticals for cognitive enhancement in

healthy individuals. The non-medical use of methylphenidate in university students for enhancement of academic performance illustrates a context for examining closer the ethics of cognitive enhancement. Chapter 1 proceeds with a cursory overview of the most prominent ethical and social issues surrounding the non-medical use of neuropharmaceuticals. Finally, the literature review examines the public understanding of neurotechnology as one of the major issues in the non-medical use of neuropharmaceuticals.

The methodological approaches used to carry out the research described in this thesis are the subject of Chapter 2. This chapter describes the methodology used to identify the relevant discourses (print media, bioethics literature and public health literature) on the non-medical use of methylphenidate for cognitive enhancement. The chapter on methodology also elaborates upon the systematic coding that lead to the identification and analysis of divergences in discourses on ethical, social and scientific issues surrounding the non-medical use of methylphenidate for cognitive enhancement.

The results of our research on the ethics and public understanding are presented in three sections. Chapter 3 is an article entitled "A second look at the ethics of cognitive enhancement" that was published in April 2007 in *Canadian Psychiatry Aujourd'hui*. This short article reviews the prevalence rates of the non-medical use of neuropharmaceuticals for cognitive enhancement of healthy individuals and introduces some of the ethical issues that arise for this phenomenon, in particular given the existence of diverging paradigms. This

chapter concludes by considering the potential impact of ethical issues upon future policy on cognitive enhancement and calls for broader social discussion.

Some of the first results of the analysis of discourses on the non-medical use of methylphenidate for the cognitive enhancement of healthy individuals are presented in Chapter 4. This brief communication entitled “Cognitive enhancement, lifestyle choice or misuse of Prescription Drugs? Ethics blind spots in current debates”. The three paradigms used to approach cognitive enhancement in different discourses on the phenomenon are described in detail. In addition, the publication identifies some important “ethics blind spots” which may complicate broader social discussion of cognitive enhancement.

Our complete discourse analysis on the non-medical use of methylphenidate for cognitive enhancement is the subject of the manuscript in Chapter 5. Entitled “Potential implications of determining discourses on the ethics of non-medical use of methylphenidate for performance enhancement” this article describes additional components of the different paradigms presented in Chapter 4 and explains why they diverge. The content examined in each discourse include the description of the nature of the non-medical use of methylphenidate for cognitive enhancement in healthy individuals, associated risks and benefits, ethical and social issues as well as prevention strategies and challenges to wider spread non-medical use of neuropharmaceuticals for cognitive enhancement. The paper concludes that disagreements between the paradigms could have important healthcare, ethics and social implications and consequences. As a result, they call for bioethics and the print media to

reinvigorate their commitment to public information and informed debate while medicine, healthcare and society prepare for potential broader non-medical use of neuropharmaceuticals for performance enhancement.

In light of the diversity in discourses on the non-medical use of neuropharmaceuticals for the cognitive enhancement of healthy individuals Chapter 6 expands upon the discussion of Chapter 5 to outline additional potential implications of diverging perspectives on cognitive enhancement. The general discussion begins by evoking some antecedents in the lifestyle use of psychopharmacology and their importance for future discussions about cognitive enhancement. Lessons for cognitive enhancement from the history of psychopharmacology include awareness of the importance of social context in the non-medical use of neuropharmaceuticals, adequate research into efficacy and safety of potential cognitive enhancers in healthy individuals and management of commercial interests. The discussion continues with the beginnings of a framework for a potential role for public health in the current context of enthusiasm for the non-medical use of neuropharmaceuticals. Finally, the discussion concludes by proposing engagement of the public in debates on the non-medical use of neuropharmaceuticals by healthy people.

Based on our research we believe that the ethical issues related to the non-medical use of neuropharmaceuticals for the cognitive enhancement of healthy individuals will be inescapable. It will be important for various stakeholders to engage in future debates, especially that this phenomenon becomes more prevalent.

Chapter 1: Background on the ethics and public understanding of cognitive enhancement with methylphenidate

The non-medical use of prescription drugs to enhance performance is a phenomenon growing in prevalence and raising ethical concerns. This chapter aims to examine the ethics and public understanding of the non-medical use of methylphenidate for cognitive enhancement in four parts. First, the different definitional approaches and terms used in discussing enhancement will be considered. Second, the chapter will introduce the non-medical use of methylphenidate as a context for studying the broader phenomenon of cognitive enhancement. Third, the ethical and social issues of cognitive enhancement will be discussed. Finally, public understanding will be evoked as an important ethical and social matter regarding cognitive enhancement. The chapter provides background information on the nature and ethics of non-medical use of methylphenidate for cognitive enhancement.

Definitional approaches

Semantic pluralism surrounds the non-medical use of neuropharmaceuticals in healthy individuals to increase performance. The bioethics literature has coined several terms to refer to cognitive enhancement such as "neurocognitive enhancement" [51], "neuroenhancement" [62], "cosmetic psychopharmacology" [72], and "cosmetic neurology" [35]. Due to the nature of prescription drugs, in the public health literature, we find terms like "illicit use of prescription medication" [84], "prescription abuse" [85] and "non-medical use of prescriptions" [82]. The medical literature has also used the term "lifestyle use" of prescription drugs [53]. In reporting on cognitive

enhancement, the print media has developed popular vocabulary reflected by phrases like “better living through chemistry” [163] and a “new kind of drug abuse” [75]. Some of these terms are potentially synonymous; however others carry with them subtle implications. The term “non-medical use” will often be used in this thesis because of its relative neutrality in reference to uses of pharmaceuticals for performance enhancement. The choice of this term is also meant to encompass features of three common definitional approaches i.e., “enhancement”, “prescription drug abuse” and “lifestyle use of prescription drugs”. We speak here of “definitional approaches” rather than definitions because current definitions carry theoretical assumptions notably about how the non-medical use of neuropharmaceuticals relates to healthcare.

Enhancement

The improvement of cognition can be associated with medicine in different ways therefore, before proceeding, it is important to delineate what the term “cognitive enhancement” can mean. A general definition of cognitive enhancement is the “amplification or extension of core capacities of the mind through improvement or augmentation of internal or external information processing systems” [124]. Collectively, these processing systems are known as “cognition” which is a “combination of skills, including attention, learning, memory, language, praxis (skilled motor behaviors), and so-called executive functions, such as decision making, goal setting, planning, and judgment” [153]. Cognitive function can be improved by both pharmacology and medical

devices [88]. Thus, in its purest state, cognitive enhancement simply signifies the improvement of cognitive function. However, improving cognition can have different goals and occur in different contexts. First, cognition can be improved as a medical goal which is the case of the treatment of Alzheimer's disease. For example, donepezil (Aricept) is given to older adults to improve long-term and short-term memory as well as working memory and recognition tasks [161]. Second, improving cognition can be considered an enhancement when the cognitive function of a *healthy* individual is modified with the goal of improving performance on a certain task [51]. Such improvements of cognition can inhabit the blurry region between what is considered to be a medical treatment and what is considered an enhancement [159]. This thesis will refer to cognitive enhancement essentially in the second context, i.e., to reflect the goal of performance enhancement in healthy individuals beyond "average" or "normal" capacity.

The dichotomy between treatment and enhancement exacerbates confusion about the appropriate terms to use in reference to the non-medical use of psychopharmacology performance enhancement. Often, the terms "treatment" and "enhancement" are used in opposition. As part of this distinction, an enhancement is "designed to produce improvements in human form or function that do not respond to legitimate medical needs" [68]. Consequently, this approach ousts improvements in the healthy from the boundaries of healthcare. According to this perspective, an enhancement can be defined as what is not medically necessary. By opposing the two terms,

medical necessity may be perceived as a uniquely scientific parameter. However, Wolpe suggests that, "what we consider disease intervention and what we do not (…) will conform to what the culture, or medical professionals, see as the proper objects of medical intervention" [159]. Accordingly, it may be more useful and somewhat clearer to consider treatment and enhancement as two poles on a continuum instead of mutually exclusive terms [68]. This more fluid perspective on the relationship between treatment and enhancement has yet to fully penetrate the writings of most ethicists who still consider that the two terms are difficult to distinguish in the case of performance enhancement but rely heavily on them to articulate their thinking [25, 35, 86]. Although this is often implied, no data exists to our knowledge showing that healthcare professionals and the public have such difficulty distinguishing treatment from enhancement in practical settings. This does not imply that scholars are wrong but that perhaps broader lenses would be needed.

Drawing a clear moral line between treatment and enhancement represents a monumental challenge given the different ethical and philosophical perspectives involved [107] but the distinction is still significant at many levels [159]. For reasons of medical insurance and reimbursement the healthcare system must have a clear definition of what constitutes a medical necessity. Sabin and Daniels have proposed models for equitable distribution of resources within a population based on "normal functioning" [120] and a "species-typical functioning" [43]. The goals of these models are to equally and justly distribute medical resources for medical needs such that enhancements are not covered by

the healthcare system. Inclusion or exclusion of improving performance in healthy individuals from healthcare could impact the responsibility of healthcare professionals. Healthcare professionals are often regarded as the "gatekeepers" to technologies with enhancement properties thus changes in the treatment-enhancement distinction could also modify the way these technologies are dispensed [35]. Lastly, a distinction is useful from an ethical standpoint to determine whether medicine, the law, public policy and ultimately society deem performance enhancement as beneficial for citizens [30, 100, 105]. While it may be easier to consider the treatment and enhancement as a spectrum as opposed to a clear distinction, there is interest in clarifying where improving the performance of healthy individuals lies for systemic, professional, and ethical reasons.

Prescription drug abuse

The use of prescription pharmaceuticals for reasons other than those medically intended represents a potentially growing health problem in Canada and the United States (US). In the wake of an increase in the abuse of neuropharmaceuticals Health Canada has defined "prescription drug abuse" as:

> use of pharmaceutical drugs with centrally acting reinforcing properties that is associated with increased risk for harm, as characterized by obtaining drugs from illegitimate sources, or risky patterns of use (excluding under-use), that deviate from accepted medical practice and/or scientific knowledge, or taking the drugs for purposes which are non-therapeutic [28].

Prescription drug abuse has been the focus of much scrutiny in recent years. As of 2005, 48 million Americans over the age of 12 admitted to using a prescription drug for a non-medical reason in their lifetime [94]. The classes of drugs abused varies but there is evidence that drugs that alter brain function like opioids (painkillers), central nervous stimulants (amphetamines) and depressants (antidepressants) are among the most abused [28, 94]. A report From the US National Survey on Drug Use and Health found that between 2002 and 2005, an annual average of 11.4 million individuals reported non-medical use of pain medication alone in the year prior to the survey [98]. This report also indicated that past year non-medical use of prescription pain medication was highest among young adults aged eighteen to twenty-five.

There are only few if any Canadian statistics on the prevalence of prescription abuse but some feel that there is still cause for concern given Canada's prevalent use of prescription drugs. In recent years, Canada has ranked fourth internationally for use of sedative-hypnotics and was among the top fifteen countries for the use of prescription stimulants [28, 64]. Studies have also identified patterns of adolescent and university student stimulant abuse in Canadian institutions [15, 103, 104]. The abuse of prescription stimulants is by no means restricted to Canada. It seems to be an emerging phenomenon on university campuses across North America as well as some other professional settings [5, 154].

Increased prevalence of the non-medical use of prescription drugs is a potential public health concern given its effects on the healthcare system. Non-

medical uses of prescription drugs have been associated with increased visits to the emergency room. An estimated 1.4 million visits to US emergency rooms are linked to prescription drug abuse [85]. One study positively correlated increases in the number of prescriptions for opiates with an increased number of drug-induced and drug-related emergency room visits in the US [157]. This data suggests that the use of prescription drugs for reasons unrelated to the health of an individual could strain healthcare systems. However some fear that prevalence of the non-medical use of prescription medication may not only be due to increased availability of these drugs but rather a lack of access to good healthcare [52]. As a result, certain types of conditions may be under-diagnosed potentially leading individuals to self-medicate which is thought to indicate that the non-medical use of prescription drugs is not inherently abusive or non-medical.

Distribution of controlled substances also represents a potential public health concern with regard to the non-medical use of prescription drugs. There is evidence that prescription medication is being diverted into illicit markets [60, 64]. Many studies have shown that prescription stimulants represent a class of drug that is often diverted [83, 84, 104, 155]. There are suspicions that wider availability of prescription drugs is contributing to increased prevalence of their non-medical use [157] but no definite link has been made to date. Other potential contributing factors to the spread of the non-medical use of prescription drugs include the low cost of prescription drugs relative to illegal drugs [85] and the emergence of Internet pharmacies [94]. There are reports

that prescription stimulants are being obtained on black markets [16, 75, 92, 101] as well as over the Internet [16, 97, 101, 119] for non-medical use with the goal of cognitive enhancement. The diversion of prescription drugs, especially those with properties favoring performance enhancement contribute to the perception that the non-medical use of psychopharmaceuticals for cognitive enhancement lies outside of healthcare.

Lifestyle use of prescription pharmaceuticals

The lifestyle use of pharmaceuticals is related to the non-medical use of pharmaceuticals for cognitive enhancement in its goal but differs from prescription drug abuse in its relation to medicine. A lifestyle drug is one "used for non-health problems or for conditions that lie at the boundary between a health need and a lifestyle wish" [55] and is administered by a healthcare professional. Examples of such conditions are social phobia, baldness and erectile dysfunction [77]. However, another view has been presented. Lifestyle drugs can also be used to treat "lifestyle illnesses" which are "diseases arising from lifestyle choices" [77]. Flower's review of lifestyle drugs, their primary clinical uses as well as their lifestyle uses [53] was based upon an editorial by Young outlining the four different types of lifestyle drug [162]. The first type is a class of drugs that is approved specifically for lifestyle use. For example, orlistat (Xenical) whose primary clinical use is in obesity is also used as lifestyle drug to promote weight loss in non-obese individuals. The second category is formed of drugs that have been approved for one indication but

produce other effects which can satisfy a lifestyle purpose sometimes qualifying as an off-label use. An example of such a drug is minoxidil (Rogaine) that can control hypertension but also re-grow hair. The third and fourth classes of drugs, illegal drugs and natural products, fall slightly outside the scope of this thesis as they are not prescription pharmaceuticals. Nonetheless, the examples in Flower's table illustrate the niche occupied by lifestyle drugs somewhere between treatment and enhancement.

Lifestyle drugs represent a lucrative market. Since 1990, twenty billion dollars have been invested in the research and development of lifestyle drugs. In 2002 the lifestyle drug market was estimated to be worth twenty billion dollars and was projected to grow to twenty-nine billion by 2007 [10]. The market for lifestyle drugs has gained significant importance over the last decade such that it has been suggested that the demand for lifestyle drugs may drive physicians into being "lifestyle consultants" [35]. However not all are convinced arguing that physicians and citizens may not let medical ethics be so easily overpowered by market pressures [44]. Whatever the changes come in the healthcare system as a result of the increased use of lifestyle drugs, they will have to tackle some important questions, notably the treatment-enhancement distinction.

Lifestyle drugs are generally viewed as a part of healthcare. Though the use if these drugs may border on enhancement they are still recognized as treatment. However, the treatment status of something like orlistat (Xenical) to

promote weight loss begs the question of whether lifestyle drugs are “turning natural expressions of human behavior into a ‘disease’ that requires- or would benefit from- drug treatment” [53]. This way, a lifestyle wish (e.g., being thin) is transformed into a medical necessity, a process often called “medicalization” [40, 55, 80]. On the contrary some also believe that medicalization has improved health over the years [51]. For example, the development of oral contraceptives, drugs that to not cure but prevent, has positively impacted family planning. Despite the positive impact, one concern looms in the light of medicalizing some aspect of human behavior. It is feared that lifestyle drugs, especially for the treatment of so-called lifestyle illnesses “remove[s] responsibility or control from the individual or society” [55]. Consequently, medicalization of human behavior may soften the consequences of a lifestyle choice like smoking because nicotine addiction can be controlled by medication and does not represent the health hazard it once did. A change in attitude toward lifestyle drugs has the potential to impact the ways healthcare providers use pharmacology. Lexchin maintains that it is not the role of a healthcare provider to deal with social injustices by prescribing drugs [77]. Continued use of lifestyle drugs is likely to call for the rethinking of medical necessity, public health policies, resource allocation and society’s role in the concept of health [55, 80].

The cursory overview of the terms “enhancement”, “prescription drug abuse” and “lifestyle use of prescription drugs” has illustrated how the subject

of cognitive enhancement spans the treatment-enhancement spectrum. It remains unclear which of these terms, if any, are most appropriate to describe the non-medical use of psychopharmaceuticals for cognitive enhancement seeing since each carries subtle implications. For example, the term "enhancement" implies that the effects elicited from the drugs in question are beneficial, that they will necessarily improve something. On the other hand, this term is also more goal-oriented and seen as the antithesis of a treatment. This also implies that enhancement is often viewed as unnecessary as we noted. The term "prescription drug abuse" carries a negative connotation inviting comparisons with the abuse of illicit (illegal) drugs which does not always intend to improve performance. Like "enhancement", "prescription drug abuse" situates the non-medical use of a neuropharmaceutical for performance enhancement outside medicine. The "lifestyle use of prescription drugs" reflects in part the goal of improving performance but requires a medical diagnosis of some kind of deficiency. Because of its reference to some kind of "normal" or "average" state, the lifestyle use of prescription drugs could involve the medicalization of some facets of human behavior. A first step in simplifying the vocabulary has been made by Merkel *et al.* who proposed a framework for determining proper use, misuse and abuse of psychopharmaceuticals [88]. Their assessment of the proper use of stimulants is relative to the presence/absence of symptoms in the context of Attention Deficit/Hyperactivity Disorder. They claim that the goal of enhancing performance corresponds to a "non-therapeutic use" of a stimulant which is similar to the term "non-medical use" (non-medical

is broader because the use of some pharmaceuticals medically are more complex than simple treatment) employed in this thesis. However, the authors do not indicate how one might procure a stimulant for a non-therapeutic use or whether it may be acceptable to do so. While the constellation of terms used in reference to the non-medical use of neuropharmaceuticals hinders semantic continuity, the multiple terms reflect a complex relationship between the goal of improving performance and the proper use of medical interventions as well as the complexity of this topic in a pluralistic society.

The non-medical use of methylphenidate for cognitive enhancement

Cognitive enhancement

The emergence of the cognitive enhancement of healthy individuals has been gradual. The phenomenon is generally associated with uses of prescription drugs that are not officially indicated called "off-label" uses. Table 1-1 lists some examples of drugs that were developed for the treatment of medical conditions but have been used for cognitive enhancement. In 2002, Yesavage *et al.* conducted a study where middle-aged licensed aircraft pilots were given donepezil, a cholinesterase inhibitor used in the treatment of Alzheimer's disease [161]. By monitoring the pilots' performance on a flight simulator, the investigators found that the pilots were able to better retain information when given the drug. Modafinil regulates sleep/wake cycles in patients suffering from conditions like narcolepsy and sleep apnea. However, 90% of prescriptions for modafinil are for off-label purposes, for example to increase alertness in people

suffering from jetlag [146]. Drugs seemingly unrelated to cognitive have also proven to elicit some kinds of enhancement. For example, Pitman *et al*. conducted experiments where propranolol, a blocker of the beta-androgenic receptor which helps to control hypertension, alleviated the severity of post-traumatic stress disorder (PTSD) [102].

Table 1-1: Primary medical uses and cognitive enhancement uses of some prescription neuropharmaceuticals

Medication	Primary medical use	Cognitive enhancement use
donepezil (Aricept)	Alzheimer's disease	Increase ability to retain information
modafinil (Provigil)	Narcolepsy/sleep apnea	Remedy jetlag
propanolol (Inderal)	Cardiovascular disease	Prevent post-traumatic stress

There may be ethical issues associated with the uses of these medications in the context of the illnesses they are intended to treat. However, performance enhancement is distinct from "off-label" uses by physicians because performance enhancement uses are neither medically prescribed nor supervised. As a result, use of cognitive enhancers in healthy individuals raises many ethical issues that will be discussed at length in the remainder of this chapter using the specific example of the non-medical use of methylphenidate, one of the most salient contemporary examples of cognitive enhancement.

Cognitive enhancement using methylphenidate

Perhaps the most compelling example of the non-medical use of psychopharmaceuticals for cognitive enhancement is the use of methylphenidate (Ritalin) by healthy students who do not suffer from Attention deficit/hyperactivity disorder (AD/HD). Recent studies have reported that this form of performance enhancement is a widespread reality affecting North American university campuses [5, 154]. Students are reportedly obtaining methylphenidate both illicitly (from friends and colleagues, black markets, Internet pharmacies) and licitly (feigning symptoms of AD/HD to obtain prescriptions) to improve attention, concentration and alertness in order to enhance their academic performance. Similar patterns of prescription use have recently been reported in a *Nature*-sponsored survey where 20% (N=288/1427) of respondents used drugs non-medically to improve concentration, focus and memory [79]. This phenomenon has received moderate attention from the print media but is being closely examined in bioethics and public health. Table 1-2 provides an overview of most of the studies examining the non-medical use of prescription stimulants in adolescent and university populations. Studies reporting the use of prescriptions stimulants specifically for enhancement purposes are identified in another table in Chapter 4. Table 1-2 also reflects the language used in each study to describe the use of the stimulants.

Table 1-2: Overview of public health studies on the prevalence of the non-medical use of prescription stimulants

Author	Year	Journal	Sample population	Study design	Prevalence
Babcock & Byrne[11]	2000	Journal of American College Health	283 students in a public liberal arts college	Self-report mail survey	16.6% (recreational use of methylphenidate)
Poulin[103]	2001	Canadian Medical Association Journal	13 549 students in grades 7, 9, 10 and 12	Self-report anonymous questionnaire	8.5% (non-medical stimulant use)
Low & Gendaszek[58]	2002	Psychology, Health & Medicine	150 undergraduates at a small college in the US	Self-report questionnaire	35.3% (illicit use of prescription amphetamines)
Teter *et al*.[140]	2003	Pharmacotherapy	Random sample of 2250 undergraduate college students	Self-report web survey	3% (past year illicit methylphenidate use)
Hall *et al*. [61]	2005	Journal of American College Health	381 undergraduates	Self-report questionnaire via web and writing	13.7% (illicit use of prescription stimulants)
McCabe *et al*. [82]	2005	Addiction	10 904 college students from 119 4-year colleges in the US.	Self-report mail survey	6.9% (lifetime); 4.1% (past-year); 2.1% (past month) (non-medical prescription stimulant use)
Teter *et al*.[141]	2005	Journal of American College Health	9 161 undergraduate students	Self-report web-based survey	8.1% (lifetime); 5.4% (past-year) (illicit use of prescriptions stimulants)

Prudhomme White [152]	2006	Journal of American College Health	1 025 random sample at a medium-sized university in New Hampshire	Self-report Internet survey	16% (abusing or misuse of prescription stimulants)
Teter *et al*.[142]	2006	Pharmacotherapy	4580 college students	Self-reported web-based survey	8.3% (lifetime); 5.9% (past-year) (Illicit use of prescription stimulants)
Novak *et al*.[96]	2007	Substance Abuse Treatment, Prevention, and Policy	4 297 adults 18 to 49 years old	Compiled national survey results	2% (past year non-medical use of prescription ADHD medications)
DeSantis *et al*. [45]	2008	Journal of American College Health	1 811 undergraduates at a large US university	Self-report survey and interviews	34% (illegal use of prescription ADHD medications)

Variability in the design of pubic health studies on the prevalence of the non-medical use of stimulants makes it difficult to assess the extent of the phenomenon. The studies in Table 1-2 show that prevalence rates for the non-medical use of prescription stimulants range from 2% [96] to 35.3% [58] in different American student populations and different patterns of use. This wide range may be due to the heterogeneous research methods used for each study. Samples sizes vary (e.g., random sampling vs. self-reporting) as well as the research tools used (e.g., questions in survey). Consequently, prevalence rates may be either over or underestimated. Many of the studies rely upon self-reporting which may influence response rates. The population concerned may demonstrate a strong response rate which may cause over reporting or may be reticent to respond because of associated negative perceptions (discussed earlier in this chapter) thus causing under-reporting. Evidence that prevalence rates my not be adjusted to current practices (or vice versa) is present in McCabe *et al*.'s study on the perceptions of university students on the non-medical use of prescription drugs [81]. McCabe *et al*. found that students overestimated the prevalence of the phenomenon with regard to a national survey in the US on the same subject. More concerted efforts may be needed to come to a closer estimate of prevalence but this does not deter from concurrent ethics scrutiny.

Methylphenidate

Methylphenidate hydrochloride (Ritalin) was synthesized in 1944 in the laboratories of the pharmaceutical company Ciba [99] and is currently a product

of Novartis. It is a mild stimulant of the central nervous system acting on the dopaminergic system [89]. The exact mechanism of action of the stimulant has yet to be elucidated but it has been found to have prominent effects on attention and concentration as well as some effects on motor activities. Methylphenidate is one of the most commonly used stimulants in the management of Attention Deficit/Hyperactivity Disorder (AD/HD) [160] due to its capacity to improve attention and reduce hyperactivity. Methylphenidate is indicted for both children and adults. Despite its prevalent use in children methylphenidate carries several contraindications and risks (Box 1-1) [29].

Box 1-1: Contraindications and risks of methylphenidate based on product label (Novartis Canada)

Contraindications	**Common risks**
Anxiety	Insomnia
Tension	Jitters
Agitation	Cardiac arrhythmia
Hyperthyroidism	Palpitations
Arteriosclerosis	Increase in blood pressure
Cardiovascular disease	Stomach pain
Hypertension	Vomiting
Glaucoma	Dizziness
Pheochromocytoma (tumor of the sympathetic nervous system)	Fatigue
Motor tics	Dry mouth
Tourette's syndrome	Dependence
Hypersensitivity to drug	**Rare risks**
	Stroke
	Seizure

Due to its abuse potential, methylphenidate is a Schedule II substance in the United States [136] and a Schedule III substance in Canada [1]. These types of substances cannot be possessed by individuals without permission, i.e., a prescription.

Debates around the use of methylphenidate have made the drug a familiar name in the ethics literature, medical field and the public sphere. Treating AD/HD with methylphenidate has evoked difficult dilemmas for

parents who appreciate the effects of methylphenidate on the behavior of their child but fear that the medication may negatively affect their child's development (e.g., slowing growth) [63, 137]. Others worry that demands upon children in terms of behavior and performance may be contributing to the rise in prevalence of AD/HD diagnosis and treatment with methylphenidate [46]. The treatment of AD/HD with methylphenidate has also been criticized as a quick fix for behavioral problems [41]. Already controversial in its medical use, methylphenidate continued to be a subject of interest when it was found to be a stimulant of choice for healthy individuals seeking to improve attention and concentration [11, 79, 142, 152]. Because of its use as treatment and enhancement, effects of methylphenidate make for a good context in which to study cognitive enhancement.

Attention deficit/hyperactivity disorder (AD/HD)

Attention deficit/hyperactivity disorder (AD/HD) is a medical condition and one of the most common childhood psychiatric disorders. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM) an estimated 3% to 7% of school-aged children have AD/HD with greater prevalence in boys. The condition is characterized by "a persistent pattern in inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at comparable levels of development" [9]. There are three types of AD/HD which are (1) the inattentive type, (2) hyperactive-impulsive type and (3) combined inattentive-hyperactive type with

the third type being most common [54]. Some studies have suggested that genetic factors and differences in cerebral structures influence behavior however social influences are also believed to play a crucial role in the onset of AD/HD[9, 138]. In recent years the AD/HD diagnosis has also been extended to adults although it is unclear whether adult AD/HD follows the exact same patters as in childhood [69]. Typical treatment for AD/HD includes a prescription stimulant such as methylphenidate (Ritalin) or amphetamines (Adderall). Behavioral therapy is often recommended to accompany pharmacological treatment however it is not always followed or available [41].

The diagnosis of AD/HD has evolved considerably in the last century. Symptoms of what is now considered AD/HD are said to have first been described by Sir George Frederick Still [139] at the turn of the twentieth century. It was only in 1968 that the American Psychiatric association created the first set of diagnostic criteria for a condition they called "hyperkinetic reaction of childhood (or adolescence)" which was present in the second edition of the DSM [6]. At that time the diagnostic criteria were simply "overactivity, restlessness, distractibility, and short attention span." In 1980 the condition was renamed "attention deficit disorder" [7]. While hyperactivity was recognized as a part of attention deficit disorder in the DSM III the revised version of 1987 added the hyperactivity component to the condition's name [8].

Since 1968 the diagnostic criteria have evolved considerably. Box 1-2 provides a brief summary of AD/HD diagnostic criteria currently being used. Two separate tests exist for the inattention and hyperactivity-impulsivity

components of AD/HD. Some examples of symptoms of inattentiveness include failing to give close attention to detail, having difficulty with organization and being easily distracted. Symptoms of hyperactivity-impulsiveness are seen in individuals who fidget, have difficulty engaging in quiet activities, talk excessively and have difficulty awaiting their turn [9].

Box 1-2: Diagnostic criteria for Attention-Deficit/Hyperactivity Disorder in the Diagnostic and Statistical Manual of Mental Disorders IV-TR
• Six or more of the symptoms of inattention or hyperactivity-impulsivity must be present. • The symptoms must have persisted for at least 6 months and be inconsistent with normal development. • Some of the hyperactive-impulsive or inattentive symptoms should be present before 7 years of age. • Symptoms should be present in two or more settings (e.g., school, work, and home). • There must be evidence that the symptoms are impairing in social, academic or professional activities. • Symptoms are not concurrent with any other psychiatric condition.

In the absence of clear biological markers for the diagnosis of AD/HD some effort has been made to quantify the diagnosis criteria to promote uniform diagnosis (e.g., minimum of six symptoms must be present in two environments). However, the criteria remain largely qualitative and have been criticized for serving "social or cultural purposes, such as bringing deviant or socially undesirable behavior under medical surveillance and control" [138]. The debate over the validity of diagnostic criteria for AD/HD is a concrete

example of the difficulty of establishing a clear treatment-enhancement distinction. The case of AD/HD and methylphenidate also provides an interesting context to study the ethical issues related to cognitive enhancement of healthy individuals given the prevalence of the non-medical use of AD/HD medications like methylphenidate.

Ethical and social issues surrounding cognitive enhancement

The previous sections of this first chapter have presented definitional approaches regarding the non-medical use of neuropharmaceuticals for cognitive enhancement illustrated with the example of methylphenidate use. Some types of modification of cerebral function for enhancement purposes are theoretically possible although evidence is scattered but whether they are ethical and socially acceptable is a pressing question. For several years the ethics of whether healthy individuals ought to enhance their cognition have been examined. In 2003, the US government published *Beyond Therapy* a report prepared by the Presidents Council on Bioethics which took a relatively conservative stance on the ethics of enhancement technologies [105]. Others like Caplan have challenged arguments against enhancement with the more liberal view that cognitive enhancement could positively contribute to society [30-32]. Recently, Greely *et al*. published a commentary in *Nature* urging society to respond to a growing demand for cognitive enhancement and reject "the idea that 'enhancement' is a dirty word" [59]. In their commentary, Greely *et al.* suggest that cognitive enhancers "should be viewed in the same general

category as education, good health habits, and information technology- ways that our uniquely innovative species tries to improve itself." In 2007 the British Medical Association examined the ethics of cognitive enhancement in a special report and asked many important questions [22]. Around the same time *Nature* sponsored an online survey to study cognitive enhancement practices [79]. This survey unleashed a flurry of correspondence showing that opinions on cognitive enhancement vary considerably [20, 47, 116, 123, 149]. There is far from any consensus regarding the ethics of enhancement. The ethical issues surrounding cognitive enhancement can impact individuals as well as the collectivity. The major ethical issues of enhancement will be described in the following section to illustrate the plurality of opinions on enhancement.

Authenticity, identity and personhood

Cognition enhancing treatments have been shown to have important effects in the treatment of neurodegenerative diseases likes Alzheimer's disease. The effects of cognitive enhancers have not been completely elucidated in healthy individuals yet the previous section of this chapter outlined some ways cognition of healthy individuals can be modified. Enhancing any part of an individual's cognition might also change their sense of self [22, 51, 57, 159]. This opinion reflects the belief that cognitive faculties like memory, mood and attention are integral parts of an individual's self. If indeed the identity of a healthy individual changes to a certain degree as a result of cognitive enhancement, the problem then is: which is the *authentic* individual? Is it the

enhanced individual or the unenhanced individual? A similar concern exists for parents of children with AD/HD [137]. Parents seem to be torn in determining whether the "real child" is that one that is able to "achieve their potential" with medication or the child whose behavior is not modified by methylphenidate.

Some authors maintain that enhancement changes an individual because it bypasses the struggles of life such that "by reducing or eliminating shortcomings, biotechnological enhancement fundamentally alters the essence of what it means to be an individual" [25]. In response to the idea that cognitive enhancement is an affront to human nature it has been stated that "conveniences have eroded our collective character and cheapened us" [35]. Others contend that enhancement for all would eliminate some of the diversity in personal experiences and promote homogeneity in the population, i.e., reducing the diversity of identities [26]. These concerns are typically countered by two arguments. First, changes in our cognition already occur with little worry about authenticity for "neither are we the same person after a glass of wine as before, or on vacation as before an exam" [51]. Second, fears of a homogeneous population are considered speculative since there are as many uses for cognitive enhancers as there are individuals [56].

Autonomy, individual rights and coercion

At first glance, cognitive enhancement of healthy individuals with neuropharmacology is largely elective. The term elective by no means reflects that performance enhancement is accepted or condoned but simply signifies

that an individual can choose to enhance their performance with a pill. However, as cognitive enhancement emerges and progresses in society the freedom individuals have to engage in or abstain from performance enhancement may diminish. As a result, discussions on the ethics of cognitive enhancement have raised the issues of autonomy and coercion in cognitive enhancement [22, 62, 86].

Considering the current framework for cognitive enhancement, individuals are left up to their own methods to procure cognitive enhancers. However, whether an individual's motivation for obtaining neuropharmacological agents for enhancement is autonomous or the result of coercion is currently under debate. Arguments in favor of autonomous choice explain that "cognitively intact adults have a fundamental right to make the decisions that govern their lives. Whether, and how, to enhance mental or physical functioning is one such choice" [25]. In this context, an individual's choice to enhance their cognition would be considered as voluntary self-improvement [32]. However, some stipulate that for such a decision to be truly autonomous, an individual must be aware of all risks associated with their cognitive enhancer of choice [35, 86, 153].

In contrast to the point of view that cognitive enhancement is an autonomous choice, potential sources of coercion on an individual's decision-making have been identified [51]. On the one hand, pressures to enhance could be required or imposed by a specific context or environment like the workplace, academia, and the military [4, 36, 51, 151]. This type of coercion is perhaps

likely if cognitive enhancement becomes more widespread [51]. On the other hand, pressures to enhance could be much more subtle. Environments, like in academia, can constitute situations where even slight gains in cognitive performance can translate into substantial benefits. Athletes face a similar kind of coercion in that even though sports competitions openly call for honesty and fair play, some athletes still use performance-enhancing drugs [36]. Interestingly, although individuals may experience coercion from peers, colleagues and employers, a ban on cognitive enhancers could equally limit the autonomy of individuals representing a type of legislative coercion [62].

Justice

The principle of justice is often evoked when discussing the ethics of the cognitive enhancement of healthy individuals. The chief concern is the equal distribution of neurotechnology with enhancement properties. Distributive justice is an important factor because cognitive enhancers:

> would be available only to the wealthy, or, if their cost were modest enough, to everyone but the poor. Those who were already relatively better off would gain the advantage of cognitive enhancement. The less well-off would fall further and further behind" [86].

In this fashion, cognitive enhancement would widen the gap between the "have" and "have-not". However, some ethicists suggest that this kind of gap already exists in the "natural distribution of capabilities and disabilities" [125] [86, 153]. Accordingly, it has been proposed that distributive justice of cognitive enhancers may help bridge the gap created by the natural attribution

of talents [125]. However, as we mentioned in the discussion of lifestyle drugs above, it may not be appropriate to try to correct social injustices with neuropharmacology [77] especially when valuable healthcare resources are involved.

Natural talents set aside, the argument against the cognitive enhancement of healthy individuals based on unequal distribution is typically refuted by authors who evoke other injustices that are tolerated in our society. Other enhancements such as private tutoring and cosmetic surgery are not available to everyone but considered acceptable [51]. Moreover, Elliott has argued that:

> We live in a country where 46 million uninsured people cannot get basic medical care, while the rest of us spend a billion dollars a year on baldness remedies. It is not just the inequity here that is so impressive. It is the fact that we have gotten so accustomed to the inequity that we do not see it as obscene [30].

According to this point of view, distributive justice is not the ultimate ground for banning wider use of cognitive enhancers because society does accept other form of inequality. In addition, for some, equal distribution of cognitive enhancers does not ensure equal opportunities for all. A homogenous population of cognitively enhanced people would be competing for goods whose quantities remain unchanged and to which access is impeded by other socio-economic barriers thus solving one inequality but creating another [56]. However, this kind of situation may be avoided by the type of regulation that would govern access to cognitive enhancers [125] to allow for limited types of

enhancement. However, any type of regulation on cognitive enhancement must also consider the legal aspects related to the possession (which is illegal without a prescription) and distribution (also illegal to traffic prescription drugs on the black market) of neuropharmaceuticals with enhancing properties.

Fairness and cheating

The issue of fairness is distinct from distributive justice because is not related to access to cognitive enhancement but rather to the competitive aspects behind the demand for performance enhancement. With respect to competition, cognitive enhancement can be perceived as a shortcut in achieving a goal [26, 128]. By this measure enhancing one's performance with neuropharmacology can be perceived as "cheating" [35, 62] especially when enhancers are not used by the whole population whether it be due to lack of access or by choice. These so-called shortcuts draw upon the issue of authenticity discussed earlier in this section because they "might also be undermining the value and dignity of hard work" [51]. A typical response to this argument is that "[y]ou deserve to win a Nobel Prize if you discover the cure for cancer, whether or not you do so with the aid of cognitive enhancement drugs" [86]. Consequently, cognitive enhancers can be praised for allowing individuals to reach their goals and positively contribute to society in terms of innovation and productivity [2, 127].

Fairness as an ethical issue in cognitive enhancement has often evoked comparisons to sports competitions and whether it is different from steroid use in athletes. One point of view is that what makes taking steroids unfair toward

other athletes who do not is that these substances are clearly banned from most sporting events [125, 128]. For example, in the absence of rules against using methylphenidate to write an exam, this form of cognitive enhancement cannot be considered unfair [125]. Another aspect of cognitive enhancement that has created ethical dilemmas is that it could be used to surpass so-called normal performance. A study by Sabini *et al*. shows that participants considered cognitive enhancement for high-performing individuals unfair but acceptable for lower-performing individuals [121]. Again, as with the issue of distributive justice, future debates and regulation on cognitive enhancement would be needed to establish uses of cognitive enhancement that are fair and unfair.

Scientific data on the cognitive enhancement of healthy individuals

Some of the ethical discussion surrounding the cognitive enhancement of healthy individuals is based on the presumed efficacy and safety of cognitive enhancers in this population. As a result, Rose has expressed that:

> There is therefore no a priori reason — irrespective of ethical concerns or any other arguments — to suppose that, in the absence of pathology, pharmacological enhancement of such processes will necessarily enhance memory or cognition, which might already be 'set' at psychologically optimal levels [117].

It is not sufficient to presume that since these drugs produce an effect in patients that they will do the same in healthy individuals. Thus, it would be risky for cognitive enhancers to be used by healthy individuals without reliable data to support a significant benefit.

Some significant side effects are associated with the use of cognitive enhancers for medical reasons [49, 86]. For example donepezil can cause nausea, diarrhea, insomnia, fatigue, vomiting, muscle cramps, and anorexia. Consequently, some consider it unreasonable to expect an individual to incur any risk for a non-medical use of a neuropharmaceuticals "because the alternative is normal health" [35]. An earlier section of this chapter described how the cognitive enhancement of healthy individuals was related to prescription drugs abuse. Some of the drugs used for cognitive enhancement, like methylphenidate, have a high potential for abuse [148, 150] which represents another risk to evaluate [86]. The effects of neuropharmacology on healthy individuals may also pose an especially challenging task because "comparison to other comparably elective treatments such as cosmetic surgery, neurocognitive enhancement involves intervening in a far more complex system, and we are therefore at greater risk of unanticipated problems"[51].

Researching all the risks of the non-medical use of neuropharmaceuticals is a tall order for neuroscience. However, this information is imperative to ensure that healthy individuals are not being exposed to any undue risk. One challenge for the neuroscience and ethics communities is the lay perception that prescription drugs are generally safe [73, 101, 163]. Trust in prescription drugs comes from the perceived scientific rigor they must pass to be accepted. In the case of methylphenidate, safety is presumed because the drug is given to children which creates dangerous misunderstandings.

Broader implications

The cognitive enhancement of healthy individuals can have a large and lasting impact upon social practices and institutions. Whitehouse explains these social implications by the hypothesis that "we cannot change ourselves without disturbing that larger web of identities" such that "personality changes are by necessity a community event and should be undertaken as such" [153]. For example, Farah *et al*. proposed that "when we improve our productivity by taking a pill, we might also be undermining the value and dignity of hard work, medicalizing human effort and pathologizing a normal attention span" [51]. On the other hand, it can be argued that "[j]ust as some plants can never live too long, and some animals can never have too many offspring, humans can never have too much cognitive experience" [153] considering the moral good it can bring in helping individuals reach their goals. Whether the cognitive enhancement of healthy individuals becomes widespread or not, it must be done in a way that does not encroach on the liberty of individuals in a democratic society [62].

The fingerprint of each of the ethical issues discussed in this section can be seen in the potential future regulations around cognitive enhancement. For example, the authenticity of an individual could impact liability cases. For example if an individual commits a crime while under the influence of a cognitive enhancer, might they be able to argue that they are not responsible for their actions? Future regulation could value distributive justice or ban cognitive

enhancers altogether. Academic institutions could create official rules with regard to the use of cognitive enhancers during examinations. The numerous ethical issues discussed highlight that "[t]he question is therefore not whether we need policies to govern neurocognitive enhancement, but rather what kind of policies we need" [51]. The challenge is to first determine which regulatory bodies should govern policy on cognitive enhancement and then to encourage responses [112] that will clarify the ethical issues that have elicited so much debate.

Public understanding

The ethical issues discussed in the previous section have shaped professional, academic and public health debates on the non-medical use of methylphenidate for the cognitive enhancement of healthy individuals. As these issues are discussed and "basic neuroscience is translated into therapies, practices and policies" [135] it becomes increasingly important to address the public understanding of the potential applications of neurotechnology. There is presently little data on how the public perceives the use of neurotechnology much less cognitive enhancement specifically. According to the US National Science Foundation, the American public seems to be generally enthusiastic with regard to the use of biotechnology [106]. This enthusiasm may be a reflection of belief in a "technological fix" for biological problems and the public's faith in medicine [66]. However, a Brazilian survey on neuroscience literacy suggested that the public may know relatively little about basic

neuroscience [65]. This lack of neuroscience literacy which may lead to misinterpretations about how new neurotechnology can be applied and misapplied. This study also highlighted that some groups of participants who read newspapers and popular science magazines tended to have more general knowledge about that brain than those who didn't.

The media is a valuable source for the general public to learn health related information. It has been suggested that the impact of mass media upon the public is closely tied to personal experience and identity [132]. However, the type and degree of influence that the media may have on public understanding of health related information is a complex parameter to evaluate. Studies on the media are often approached in one of three ways in order to study either production of media reports, representation of information in media reports or reception of information by the media audience [132]. Studying the production of media reports sheds light upon why and how certain topics are covered. Some of the production of health reports in the media start with an understanding of what the audience is looking for. For example, the audience may be seeking accurate information regarding a certain health matter or novelty in the health field. Once a media report is produced, its representation in various forms can be studied to examine "discursive dominance of particular themes and constructions" in relation to "whether messages are likely to promote or damage health" [132]. Representation of a health topic may also vary as a function of its source (e.g., newspapers, special interest magazines,

television reports) potentially impacting audiences differently. The reception of media reports reflects how representations of a topic are perceived and understood by the public. Insight on how information is received by one or multiple audiences can ultimately affect how a media report is produced and represented [133].

A health topic need not be entirely new for it to be novel and relevant media report. With the use of media "templates" [132] in representations of health information, a recent occurrence can be portrayed as similar to a previous event that sparked debate in the media. This kind of "scandal narrative" [134] allows the audience to recognize a recurrent topic in a slightly different context. For example, in a study on UK media portrayals of banking children's tissue, Seale *et al.* found that "everything to do with body parts and tissues was incorporated into the organ retention template" [134]. A common media template in health reporting covers the dangers of modern life [132] which has started to include discussions of medicalization and associated uses of pharmaceuticals. The use of modafinil, a drug that is associated with cognitive enhancement, to regulate sleep is a topic related to this media template. Studies have found that media discourses on modafinil and sleep reflects increasing pressures to "pursue a healthy, successful and well-adjusted life in a modern world that is increasingly unfriendly towards 'natural' sleep rhythms" [133]. On one hand, modafinil is constructed as a "wonder drug" [156] and commodity that can help control sleep [42] whether for treatment or enhancement purposes.

Modafinil then gains interest as novelty. On the other hand, media discourses on this topic have also expressed cultural and social concerns about regulation of sleep cycles with modafinil especially for enhancement purposes [42, 156]. In turn, the apprehension about non-medical uses of this drug to cope with the demands of modern life portrays modafinil as scandalous. Though the reception of media discourses on modafinil and sleep remain to be examined the representation of this topic according to a media template which highlights both novelty and scandal may influence how the public perceives and understands the non-medial use of other drugs for performance enhancement.

The public is being exposed to increasing amounts of information about developments and applications of neurotechnology through media coverage. Cognitive enhancement, deep-brain stimulation and neuroimaging have all been featured in the print media [101, 108, 109, 114] and other means of communication like television and radio. In addition, the Internet is proving to be an emerging influence on the public understanding of neurotechnology [113]. Despite prevalent coverage the public may feel that they are not properly informed of advances in neurotechnology [106]. Indeed, media reports on emerging uses of neurotechnology are associated with overstating benefits through optimistic headlines [114, 118] and general reporting [109, 111, 114]. The media may also be prematurely predicting the impact of research results [131]. Enthusiastic media reports may foster misunderstanding in the public painting a: “skewed picture of biomedical research a picture that emphasizes

benefits over risks and predictions of unrealistic breakthroughs on a tempered explanation of the incremental nature of the advancement of scientific knowledge" [33].

The media plays a role in public understanding but it is also part off the commercialization of neurotechnology. According to some, the media is associated with a commercialization agenda which can lead to patenting issues, marketing pressures, commercialization pressures, and general hype [34]. Some consider media reports a form of direct-to-consumer advertising (DTCA). For example, Zuckerman considers that "medical news is actually unpaid advertising" [164]. A host of neuroproducts like natural neuroproducts, neuropharmaceuticals and neuroimaging services are being marketed to consumers over the Internet [113]. DTCA has been found to have profound effects upon the ways consumers perceive the utility of medical products [90, 91]. Some of these effects may be positive. For example, DTCA may promote lay empowerment [132] and informed decision-making in the public because information is reaching them directly. However, this is not likely to be the case when media reports "present medical information in a way that exaggerates disease risk and thus the value of the marketed products in reducing that risk" [130].

The media is potentially further implicated in the commercialization of neurotechnology simply in what they choose to cover. By choosing to cover developments in neurotechnology and indirectly marketing them, the media

may be contributing to a reorientation of research to develop products that can be commercialized [34]. Commercialization is likely to be an important issue in the future of the non-medical use of neuropharmaceuticals for cognitive enhancement depending, of course, upon the policies surrounding the phenomenon. Reporting on neurotechnology also works in the media's favor. When publishing research of interest to the public they increase interest in their publication, broadcast or website [23]. In turn, commercialization interests feed into "hype" around the results of neuroscience research therefore the media's translation of knowledge is not always at the root of hype surrounding neurotechnology. Interestingly, a study by Bubela and Caulfield of newspaper coverage on genetic research found that most of the basic information about the results of research was accurate [24]. Caulfield has argued that the hype generated by the media may be a "faithful portrayal of commercially influences research results" [33] and not exclusively sensationalist reporting by journalists themselves.

Public engagement is a good approach to promote public understanding of a subject, like the non-medical use of neuropharmaceuticals for performance enhancement, which can be defined in many ways. Public engagement can render the public more critical of reports on advances in neuroscience while extracting the different perspectives and interests of stakeholders. Schwartz and Woloshin have suggested ways for the public to be more critical of medical advertisement and by extension media reports on neurotechnology. These

strategies include being aware of research parameters like sample sizes and the timeframe of reported benefits and risks [130].

Possibly one of the most interesting suggestions for public engagement is the progression from unidirectional to multidirectional communication of neuroscience research. Science reporting is typically viewed as unidirectional in that research is processed by the media through knowledge translation which them produces a headline that the public reads [110]. A unidirectional discourse around science is often created because science can be considered a "discourse of experts" [110, 118]. However, public engagement regards science as a community inclusive of experts and non-experts [110]. When science becomes a community discourse the communication becomes multidirectional and thus a communication of "science to its publics and the communication of publics to their scientists" [118]. In the multidirectional concept of science not only is the public aware of the benefits and limits of research but they can also express opinions and concerns about its applications. As cognitive enhancement gains notoriety and possibly prevalence, public understanding and engagement will likely be an important task on the way to determining any kind of policy. This being said, this thesis addresses some of the key ethical and social issues of cognitive enhancement with a focus on current discourses.

Chapter 2: Methodological approaches

This research aimed to analyze discourses on the non-medical use of MPH to enhance cognitive and academic performances. We examined discourses on the non-medical use of MPH in the print media (PM), bioethics literature (B), and public health literature (PH) based on the work in Chapter 4 suggesting significant differences.

Sampling

We generated the print media sample for this study using *Factiva* and *LexisNexis Academic,* two databases designed for documentation research. *Factiva* specializes in business resources while Lexis-Nexis specializes in law resources. Both databases provide access to full-text news reports both print (newspaper, magazines and wire reports) and broadcast (transcripts of television and radio). We searched for English language newspaper articles published from 01/01/2000 to 11/14/2006 using guided news search options [109]. The start date of 2000 was chosen given the report of non-medical use of MPH in college students in the early 2000s [11]. The print media sample was restricted to newspaper articles in order to decrease variance in length and general interest. Magazine and news wire pieces may be much longer and tailored to a specific audience. Multiple keyword searches were used to identify articles discussing the non-medical use of MPH (Table 2-1). Keywords were searched in headline, lead paragraph(s) and general news (major papers) in both *Factiva* and *LexisNexis Academic* databases to maximize coverage. Bioethics and public health publications were sought using standard databases (Appendix

I). All articles yielded by the searches were carefully examined for relevance, the key criteria being the discussion of the non-medical use of MPH. Individual articles were the sampling units.

Table 2-1: Generation of sample for analysis of discourses on the non-medical use of methylphenidate

Discourse	Databases	Keywords	Articles (n)
Print media	Lexis-Nexis Academic Factiva	"ritalin" "methylphenidate" "smart drugs"	20*†
Bioethics literature	PubMed (bioethics limit) Expanded Academic	"ritalin & study aid" "cognitive enhancement"	14
Public health literature	PubMed Expanded Academic	"neuroethics" "stimulant abuse" "non-medical use" "illicit use"	7

* We found a single article repeated four times (N=23 articles) but kept the twenty distinct articles for analysis (except for the headline analysis since all 23 headlines were distinct.)
† Articles originated from USA (n=11), UK (n=6), Australia (2) and Canada (1).

Coding

The content of all articles was coded systematically using the QSR NVivo 7 software (Doncaster, Australia). The inductively-generated coding guide and grid were inspired by previous content analyses of print media [108, 109, 111] but adapted to our object of research, discourses on the non-medical use of methylphenidate. Previous content analyses have examined features of the media coverage on certain types of research such as genomics [111] and brain imaging [108, 109]. These studies had examined the general type and tone of the media articles in their sample. The type of article referred to the style in

which the information about scientific research is presented in the article. These studies noted whether the article was strictly informative or if the article contained some type of reflection or critique on the research presented. The tone of the article referred to the attitude adopted by the article with regard to the research reported upon. Tone was classified as positive (advantages), balanced (advantages and disadvantages), neutral (no advantages or disadvantages) or critical (disadvantages). However, in the present study, some of the sample consisted of original research rendering assessment of features like the type and tone of an individual article less applicable. Research articles are necessarily informative and reflective in that they must discuss the limits of their ideas and research, implications of their findings as well as future questions to investigate. Furthermore, these studies largely indicated the presence or absence of certain features but put less emphasis on qualitative analysis of these features. For example, the number of articles that had a positive tone was recorded but the topics that made the tone of the article positive were not. With the exception of the study by Racine, Bar-Ilan and Illes, the same is true for the ethical issues. The mention of ethical issues was quantified but whether the issue was favorably or unfavorably discussed did not figure into the data analysis of these studies. The coding guide used to in our study was designed to extract this type of qualitative feature.

Adaptation of the coding guide was pursued through multiple rounds of piloting and test coding on a sub-sample of 10 print media articles to ensure validity and robustness [95]. Key codes were derived through an inductive

process in which previously used coding categories for content analysis [111] were refined and adjusted to the context of non-medical use of MPH. This coding guide defined each category and provided both an explicit (upper limit) and implicit (lower limit) example of what each code could be applied to (Appendix II). After the initial coding of the whole sample by one member of the research team, two other members of the research team reviewed the content of each category to ensure reliability of coding by consensus and ensure that each code was within the limits established by the coding guide. The final coding structure included four major areas (Table 2-2): (1) description of the non-medical use of MPH; (2) workings and effects of MPH, including positive and negative effects associated with non-medical use of MPH; (3) description of ethical, social, and legal issues associated with non-medical use of MPH and (4) recommendations for the prevention of the non-medical use of MPH. Coding of the ethical, legal and social content was furthered by determining if the coded statements affirmed, negated, or remained neutral or ambivalent regarding the issue at stake.

Our goal for this study was to examine the representation of different ethical, social and legal issues surrounding the non-medical use of MPH. The statements coded from print media, bioethics and public health articles were subject to content analysis which is a "systemic, objective, quantitative analysis of message characteristic" [95]. We used basic descriptive statistics to report the frequency and distribution of various codes as an indication of which themes were emphasized in each discourse. However, examining various

representations of the non-medical use of MPH also required a qualitative analysis of content. Thus, we carried out a discourse analysis of our sample (print media, bioethics literature and public health literature) which is better suited to qualitatively typify different representations of a phenomenon [95]. In turn, comparison of coded statements was carried out within a discourse instead of within an individual article. As a result, sections of text were dissociated from each article and grouped with other statements pertaining to a certain theme (see coding guide). A similar organization of discourse content was carried out in studies on the representation of modafinil in the UK media [42, 156]. Structuring the discourse analysis in such a way allowed us to avoid associating a certain representation with the opinion or research of a particular journalist or author. However, previous studies have approached discourse analysis in different ways. Coveney *et al*. coded content into already established metaphors and media frameworks regarding modafinil to identify sub-themes whereas our study applied the same coding guide to each discourse in order to observe any framework constructed by the themes we identified. Coding of discourse content in the Williams *et al*. study on modafinil in the media concentrated largely on the language used (e.g., key words and phrases, vocabulary used to address reader, rhetorical styles and emotional overtones) in part to interpret how the media articles should be read. We analyzed language used to describe the non-medical use of methylphenidate but the themes we generated in our coding guide were more diverse in scope. Our approach

allowed to illustrate the nature of statements found within discourses and also to contrast discourses on the non-medical use of MPH.

Table 2-2: Coding structure used to analyze media, bioethics, and public health discourses on the non-medical use of methylphenidate (MPH)

Section 1: Description of non-medical use of MPH
1.1. Definitions and synonyms for non-medical use of MPH
Formal definition of non-medical use of MPH
Lay descriptions of non-medical use of MPH
Distinction between treatment and enhancement
1.2. Uses of MPH
Medical use
Cognitive and academic performance enhancement use
Recreational use
1.3. Aims of cognitive enhancement
1.4. Extent of non-medical use of MPH
Accepted
Frequent
Neutral
Questionable
Rare
1.5. Description of practices of non-medical use of MPH
When is MPH used non-medically
Who is using MPH non-medically
Where is MPH used non-medically
How MPH is procured for non-medical use
Black market
Buying pills from other students
Feigning symptoms of ADHD
Online pharmacies
Other
1.6. Types of non-medical uses reported
Methylphenidate
Other neuropharmaceuticals
Non neuropharmaceutical
Other
Section 2: Workings and effects of MPH
2.1. How MPH works
2.2. Physiological effects of non-medical use of MPH
Physiological negative effects of non-medical use of MPH
Physiological positive effects of non-medical use of MPH
2.3. Psychological effects of non-medical use of MPH
Psychological negative effects of non-medical use of MPH
Psychological positive effects of non-medical use of MPH
2.4. Unknown effects of non-medical use of MPH
2.5. Information on ADHD
Nature of ADHD

Prevalence of ADHD
*Section 3: Ethical, social and legal issues associated with non-medical use of MPH **
3.1. Abuse
3.2. Authenticity, identity, and personhood
3.3. Autonomy, individual rights, and informed consent
3.4. Cheating
3.5. Commercialization
3.6. Illegality
3.7. Injustice, access, and equality
3.8. Overprescription
3.9. Regulation and governance
3.10. Reliability of scientific research
3.11. Safety
3.12. Social meaning
3.13. Social integration and acceptability
Section 4: Prevention of non-medical use of MPH and related challenges
4.1 Solutions
4.2 Challenges

*Content under these codes was further analyzed into 3 coding options: (1) affirmation of the issue; (2) negation of the issue; (3) neutral or ambivalent stance regarding the issue with the exception of 'Regulation and governance' whose content was not suited for this kind of analysis and presented with recommendations for prevention.

Chapter 3: A Second look at the ethics of cognitive enhancement

A second look at the ethics of cognitive enhancement

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Cognitive enhancement can be defined as an emerging practice whereby healthy individuals improve their cognitive functions such as perception, attention, memory and reasoning with neuropharmacological agents that are otherwise used for the treatment of pathological conditions.

The emergence of cognitive enhancement has been gradual and is generally associated with the off-label use of prescription drugs.

Research has also indicated possible venues for cognitive enhancement. In 2002, Yesavage *et al*. conducted a study where middle-aged licensed aircraft pilots were given donepezil. By monitoring the pilots' performance on a flight simulator the investigators found that the pilots were able to better retain information when given the drug [7].

Studies have found that memory consolidation can also be influenced by beta-adrenergic blockers [4]. These drugs are being tested as inhibitors of memories to prevent the onset of post-traumatic stress disorder.

Modafinil regulates sleep/wake cycles in patients suffering from conditions like narcolepsy and sleep apnea. However, 90 per cent of prescriptions for modafinil are for off-label purposes- for example, to increase alertness in people without chronic sleep problems [6].

The emergence of cognitive enhancement

Perhaps the most compelling contemporary example of cognitive enhancement is the use of methylphenidate by students who do not suffer from attention deficit/hyperactivity disorder (ADHD).

Methylphenidate's effectiveness in controlling the symptoms of ADHD raised its popularity within the healthcare system. Its production increased by nearly 900 per cent from 1990 to 2000 in the Unites States [3]—making Ritalin a household name.

The rates of methylphenidate abuse and other ADHD medications reported by studies on the illicit use of prescription drugs among college students are variable. However, consensus exists as to their actual diversion. Recreation and experimentation aside, non-ADHD students are using methylphenidate to enhance concentration and alertness with the hope of achieving better academic performance [3, 5].

There is little evidence on the long-term effect of illicit methylphenidate use on a student's academic performance [3]. Nonetheless, the testimonials of users in the popular press hail methylphenidate as a "study aid" more potent and effective than coffee or energy drinks, which are now considered relics of the past.

Correlations between the stringency of admission criteria and the prevalence of methylphenidate abuse show that, in general, the higher the admission criteria, the more likely students will turn to cognitive enhancement [5]. The apparent social pressure on these students to perform, combined with the potential harm of drug abuse, fuels the ethical debate as this practice enters mainstream society.

A second look at the ethics of cognitive enhancement

A child with ADHD can benefit from treatments, and in turn, build the foundation of his education and future. How then is the cognitive enhancement of a "normally" functioning person justified?

The 'liberal' approach to this issue is typically based on autonomy and individual rights. Proponents of liberalism regard cognitive enhancement as a personal choice to self-improve, which does not infringe upon another's right to do the same or to abstain.

In this sense, the ethical reasoning behind cognitive enhancement is much like that which supports the socially accepted practice of cosmetic surgery. Hence, the liberal view of cognitive enhancement suggests that one can use technology and medicine as a morally justified means of self-achievement.

The 'conservative' (for lack of a better name) approach towards the debate on cognitive enhancement expresses concerns that the practice threatens "essential characteristics of what it means to be human" [1]. Alteration of cognition could disturb one's concept of 'self' [1, 2], thus creating a new or different person—an inauthentic self. Cognitive enhancement could also represent a form of cheating like the use of performance-enhancing drugs in sport. Other important issues include safety, dependence and public health.

Cognitive enhancement should be available to all according to the liberal approach. However, the conservative view cautions about distributive

justice and its impact on the common good because there could be as many uses for cognitive enhancement as there are individuals.

Furthermore, equal access to neuropharmacological agents would not ensure equal opportunities for all. A homogenous population of cognitively enhanced people would be competing for goods whose quantities remain unchanged and to which access is impeded by other socio-economic barriers.

The social integration and acceptance of cognitive enhancement is emerging. Perhaps future neuroscience research will support other possible cognitive enhancements. The time is therefore ripe to reflect upon the kinds of approaches needed to guide social practice.

In the present context, physicians are the gatekeepers to the drugs used for cognitive enhancement. The liberal approach might call to maintain the status quo or declare a free market laissez-faire attitude on cognitive enhancers.

On the other end of the spectrum, should the debate over cognitive enhancement be settled with a moratorium on research, development and prescription of drugs associated with cognitive enhancement practices? Then, the cure could become much worse than the disease.

Could future policies rest upon a middle ground between individual rights and autonomy on the one hand, and the common good on the other? Broad social discussion on the ethics of cognitive enhancement should resume so as to foster public appreciation of the upcoming medical, ethical and social challenges, and the immediate need for informed debates [8].

References

[1] Chatterjee, A. 2004. Cosmetic neurology: the controversy over enhancing movement, mentation, and mood. *Neurology* 63: 968-74.

[2] Farah, M.J., Illes, J., Cook-Deegan, R., et al. 2004. Neurocognitive enhancement: what can we do and what should we do? *Nature Reviews Neuroscience* 5: 421-5.

[3] Hall, K.M., Irwin, M.M., Bowman, K.A., et al. 2005. Illicit use of prescribed stimulant medication among college students. *Journal of American Colegel Health* 53: 167-74.

[4] Pitman, R., Sanders, K.M., Zusman, R.M., et al. 2002. Pilot study of secondary prevention of posttraumatic stress disorder with propranolol. *Biological Psychiatry* 51: 189-192.

[5] Teter, C.J., McCabe, S.E., LaGrange, K., et al. 2006. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy* 26: 1501-10.

[6] Vastag, B. 2004. Poised to challenge need for sleep, "wakefulness enhancer" rouses concerns. *Journal of the American Medical Association*291: 167-70.

[7] Yesavage, J.A., Mumenthaler, M.S., Taylor, J.L., et al. 2002. Donepezil and flight simulator performance: effects on retention of complex skills. *Neurology* 59: 123-5.

[8] Young, S.N. 2003. Lifestyle drugs, mood, behaviour and cognition. *Journal of Psychiatry and Neuroscience* 28: 87-9.

Chapter 4: Cognitive enhancement, lifestyle choice or misuse of prescription drugs? Ethics "blind spots" in current debates

Cognitive Enhancement, Lifestyle Choice or Misuse of Prescription Drugs? Ethics "Blind Spots" in Current Debates

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Abstract

The prospects of enhancing cognitive or motor functions using neuroscience in otherwise healthy individuals has attracted considerable attention and interest in neuroethics . The use of stimulants is one of the areas which has propelled the discussion on the potential for neuroscience to yield cognition-enhancing products. However, we have found in our review of the literature that the paradigms used to discuss the non-medical use of stimulant drugs prescribed for attention deficit/hyperactivity disorder (ADHD) vary considerably. In this brief communication, we identify three common paradigms – prescription drug abuse, cognitive enhancement, and lifestyle use of pharmaceuticals – and briefly highlight how divergences between paradigms create important "ethics blind spots".

Background

The use of prescription pharmaceuticals for reasons other than those medically intended, commonly called "prescription drug abuse" represents a potentially growing health problem. In the United States (US), 48 million individuals over the age of 12 have used[1] non-medically a wide range of prescription drugs from central nervous system (CNS) depressants and opioids to stimulants [10]. The documented non-medical use of prescription stimulants (e.g., methylphenidate) in particular has been found to range from 5% to 35% in surveys of North American young adult and adolescent populations [13]. Rates for non-medical use of stimulants to specifically improve academic performance range from 3% to 11% in college students (reviewed in Table 4-1). Similar patterns of prescription use have recently been reported in a Nature-

[1] In this paper, we use the term "non-medical use" to: (1) reflect the fact that the uses we refer to are not medically approved and (2) differentiate it from the prescription drug abuse and cognitive enhancement paradigms that we are discussing. We are aware that there are no neutral and value standpoint terminology on this issue.

sponsored survey where 20% (N=288/1427) of respondents reported having used drugs non-medically to improve concentration, focus and memory [9]. Methylphenidate was the most commonly used drug in that survey (62%; N=132/214). Potential contributing factors to the spread of non-medical prescription use include the low cost of prescription drugs relative to illegal drugs, the availability of drugs through several channels other than traditional prescription, and the emergence of on-line pharmacies [10]. Consequently, the non-medical use of pharmaceuticals has created a source of growing medical and ethical problems. Currently, various paradigms are employed to approach non-medical prescription use reflecting a wide range of views and ethical opinions.

Table 4-1: Brief review of studies reporting prevalence rates of lifetime non-medical prescription stimulant (NMPS) use and PS use specifically for cognitive enhancement (CE) in college student populations

Study	Sample population	NMPS use (%)	NMPS use for CE (%)*
Teter et al. Pharmacotherapy. 2006	4580 college students in a large Midwestern university	8.3	5.4 (enhance concentration) 5.0 (enhance studying) 4.0 (enhance alertness)
Prudhomme White et al. J Am Coll Health. 2006	1 025 students at the University of New Hampshire	16.2	11.0 (enhance concentration) 8.7 (enhance studying) 3.2 (enhance grades)
Teter et al. J Am Coll Health. 2005	9161 undergraduate students at the University of Michigan	8.1	4.3 (enhance concentration) 3.2. (enhance alertness)
Hall et al. J Am Coll Health. 2005	381 college students from the University of Wisconsin-Eau Claire	13.7	3.7 (enhance studying)
Graff Low & Gendaszek, Psychol Health Med. 2002	150 undergraduate students at a small, competitive college in the US	35.3	8.2 (enhance intellectual performance) 7.8 (enhance studying)

*Our own calculation based on data presented in the studies

The prescription drug abuse paradigm

Most public health studies on the nature and prevalence of non-medical use of prescription stimulants name the phenomenon "prescription drug abuse". This paradigm expresses concerns for the health of individuals engaging in those practices and highlights the health risks and potential for dependence associated with the non-medical use of drugs like methylphenidate. However this paradigm has a number of important drawbacks such as applying the harsh language of illicit drug abuse to pharmaceuticals while some of the actors and contexts involved are markedly different. For example, a black market does exist for prescription drugs but students also resort to feigning symptoms of attention deficit/hyperactivity disorder (ADHD) in order to obtain methylphenidate from doctors. Further, the strong stance against non-medical prescription use in the abuse paradigm may not fully convey the ambivalence in the medical and bioethics communities as well as in the general public regarding the ethics of this practice. In fact, competing paradigms (reviewed below) express some enthusiasm for the beneficial effects of non-medical use of pharmaceuticals [2, 3].

The cognitive enhancement paradigm

In the bioethics literature the term "prescription drug abuse" is rarely encountered and much of the discussion surrounding the non-medical use of pharmaceuticals is based on descriptions of the phenomenon as "cognitive

enhancement" or "performance enhancement" (e.g., President's Council on Bioethics in the US; discussion paper of the British Medical Association [2, 12]). In contrast to the first paradigm, this one incorporates the potential benefits of increasing cognitive function beyond ordinary or average capacities [1]. Because of this focus, the enhancement paradigm has highlighted the potential impact on the individual *per se* addressing issues related to identity and personhood (are we the same with or without performance-enhancement drugs), autonomy (will we be coerced into abusing prescription drugs to compete with others if enhancement practices become widespread), and the meaning of medicine (is it within the purview of medicine to enhance and not only treat). However, from a medical and scientific perspective, describing the phenomenon as "enhancement" does not resonate with the unknown risks of long term non-medical use of prescription drugs. Accordingly, this paradigm has generated many polarized debates framed as "to enhance or not to enhance" while paying less attention to the conditions under which enhancement of function could become ethically acceptable (e.g., obtaining evidence about long-term side-effects; assessing risks of dependence). Strikingly, the interdisciplinary bioethics community is not in tune with the more critical public health perspectives and this perhaps partly reflects why some enthusiastic portrayals of non-medical prescription drug use are encountered in the bioethics literature.

The lifestyle use of pharmaceuticals paradigm

Finally, the "lifestyle" paradigm constitutes a third and less technical paradigm is employed occasionally in the scientific literature but with greater emphasis in the public domain. The description of the non-medical use of prescription drugs as a "lifestyle choice" transforms "prescription drugs" into "lifestyle drugs". The lifestyle paradigm expresses the optimistic belief that pharmaceuticals can not only help individuals face illness but help them "be all that they can be" based on their own decisions and goals. Instances of this paradigm are found in the media where the non-medical use of stimulants like methylphenidate, for example, are designated as "better living through chemistry" [14] and methylphenidate dubbed a "study aid" [11], a "brain steroid" [5], and a "smart drug" [5, 11]. This paradigm thus expresses lay understandings of non-medical use of drugs and illustrates the current ambivalence regarding the medical and ethical nature of this practice. This is reflected in the provocative comparison of Ritalin to, "study tools, just like tutors and caffeine pills" [7]. The lifestyle paradigm suggests that the emerging non-medical uses of pharmaceuticals reflect an individual choice of citizens living in liberal democratic societies marked by medical consumerism. Accordingly, it is no longer necessary to "frequent the dark corners of campuses to come across a student drug that is fast growing in popularity" [11]. Though the lifestyle paradigm expresses the social acceptance that non-medical drug use is gaining outside the medical community, referring to

pharmaceuticals using metaphors like “miracle drug” [8] in the media is likely to convey inappropriately that non-medical prescription use is a safe and acceptable practice in spite of unknown risks. Hence, this paradigm is perhaps the most challenging for the medical and ethics communities because its view of the role of pharmaceuticals for self-achievement deviates from the common understanding of pharmaceuticals as treatment prescribed for illness.

Divergence between paradigms creates ethics blind spots

The existence of distinct paradigms for approaching the non-medical use of pharmaceuticals clearly shows the lack of consensus on the acceptability of the practice. However, paying attention to diverging paradigms can help identify some important “ethics blind spots”. On the one hand, favorably describing non-medical prescription use as “enhancement” and the use of methylphenidate as a “study aid” or a “lifestyle choice” may lead to the unintended dissemination of non-medically approved practices based on misinterpretations. The media in particular has adopted sensationalist language to describe the lifestyle impact of non-medical prescription use while bioethics scholarship has already heavily and optimistically labeled the practice “enhancement” without clear scientific evidence and knowledge of long-term risks. On the other hand, the lack of acknowledgment of growing public enthusiasm for non-medical prescription use could lead public health interventions astray. This is likely to happen if such interventions are based solely upon the prescription drug abuse paradigm and neglect the social

acceptance of non-medical prescription use found in the enhancement and lifestyle paradigms. Indeed, what may be viewed as problematic from a public health perspective (i.e., viewed as prescription abuse) may have already started becoming legitimate in the public domain (i.e., viewed as "cognitive enhancement" or a lifestyle choice). To better understand the ethics ofperformance-enhancement drugs at a social level, further research will be needed to determine which paradigm or which combination of paradigms reflects the views of stakeholders such as lay citizens, healthcare professionals, and public health authorities.

References

[1] Anonymous. 2007. Enhancing, not cheating. *Nature* 450: 320.

[2] British Medical Association. 2007. *Boosting your brainpower: Ethical aspects of cognitive enhancement.* British Medical Association: London, UK, 42 p.

[3] Chatterjee, A. 2007. Cosmetic neurology and cosmetic surgery: parallels, predictions, and challenges. *Cambridge Quarterly of Healthcare Ethics* 16: 129-137.

[4] Farah, M.J., Illes, J., Cook-Deegan, R., et al. 2004. Neurocognitive enhancement: what can we do and what should we do? *Nature Reviews Neuroscience* 5: 421-425.

[5] Garreau, J. 2006. 'Smart pills' are on the rise. But is taking them wise? *The Washington Post.* June 11: D01.

[6] Glannon, W. 2006. Psychopharmacology and memory. *Journal of Medical Ethics* 32: 74-78.

[7] Khan, M. 2003. Study drugs draw concern. *The Miami Herald* July 6: 1BR.

[8] Laurance, J. 2003. Abuse hits students looking for an exam kick. *The Independent* August 26: 5.

[9] Maher, B. 2008. Poll results: look who's doping. *Nature* 452: 674-675.

[10] National Institute on Drug Abuse. 2005. *Prescription drugs: abuse and addiction.* Research report series. National Institute on Drug Abuse: 12 p.

[11] Phillips, S. 2006 An espresso at three in the morning is just so last year. *The Times Higher Education Supplement* March 10: 18.

[12] President's Council on Bioethics. 2003. *Beyond Therapy*. President's Council on Bioethics/Harper Collins: Washington, D.C., 328 p.

[13] Wilens, T.E., Adler, L.A., Adams, J, et al. 2008. Misuse and diversion of stimulants prescribes for ADHD: A systematic review of the literature. *Journal of the American Academy of Child and Adolescent Psychiatry* 47: 21-31.

[14] Zernike, K. 2005. The difference between steroids and Ritalin is... *The New York Times* March 20: 3.

Chapter 5: Potential implications of diverging discourses on the ethics of non-medical use of methylphenidate for performance enhancement

Potential implications of diverging discourses on the ethics of non-medical use of methylphenidate for performance enhancement

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Abstract

There is substantial evidence that methylphenidate (MPH; Ritalin), is being used by healthy university students for non-medical motives such as the improvement of concentration, alertness, and academic performance. The scope and potential consequences of the non-medical use of MPH upon healthcare and society bring about many points of view. To gain insight into key ethical and social issues on the non-medical use of MPH, we examined discourses in the print media, bioethics literature, and public health literature. Our study identified three diverging paradigms with varying perspectives on the nature of performance enhancement. The beneficial effects of MPH on normal cognition were generally portrayed enthusiastically in the print media and bioethics discourses but supported by scant information on associated risks. Overall, we found ambivalence regarding ethical, legal and social issues related to the non-medical use of MPH for performance enhancement and its impact upon social practices and institutions. The exception to this was public health discourse which took a strong stance against the non-medical use of MPH typically viewed as a form of prescription abuse or misuse. Wide-ranging recommendations for prevention of further non-medical use of MPH included legislation and increased public education. Some positive portrayals of the non-medical use of MPH for performance enhancement in the print media and bioethics discourses could entice further uses. Medicine and society need to prepare for more prevalent non-medical uses of neuropharmaceuticals by fostering better informed public debates.

Background

The non-medical use of neuropharmaceuticals is generating substantial debates in medical and public health circles [7, 10]. A key motive for this non-medical use of neuropharmaceuticals is the enhancement of cognitive function in healthy individuals beyond normal human capacity [18, 19, 38]. There is substantial evidence that methylphenidate (MPH; Ritalin), a drug prescribed to manage the symptoms of Attention Deficit/Hyperactivity Disorder (AD/HD) in children and adults, is being misused by healthy university students to improve

concentration, alertness, and academic performance [51].

Methylphenidate is one of the most commonly used stimulants in the management of AD/HD symptoms [9, 52]. Academics and stakeholders have debated its prescription, and overprescription, making this stimulant a familiar name for healthcare providers and the public. However, the debate on performance enhancement differs in that MPH is now being used for reasons unrelated to AD/HD. Furthermore, performance enhancement is distinct from "off-label" uses by physicians because performance enhancement uses are neither medically prescribed nor supervised. Recent studies have reported that this form of performance enhancement is a reality affecting North American university campuses. Studies of prevalence rates show a range from 6.9% [30] to 35.3% [21] for prescription stimulant misuse in this student population. Closer examination of the motives behind the non-medical use of prescription stimulants yields rates from 3.2 % up to 11% for the specific goals of improving concentration, alertness and academic performance [38]. Consequently, some scholarly ethical debates on the non-medical use of MPH have surfaced notably because: "In contrast to the other neurotechnologies […] whose potential use for enhancement is still hypothetical, pharmacological enhancement has already begun."[18]

The scope and potential consequences of the non-medical use of MPH upon healthcare and society are wide-ranging and bring about many points of view and various discourses. In particular, media discourses can have important

consequences on the practice of frontier health intervention and human welfare by shaping ethical debates and influencing public acceptance of neurotechnological innovation [16, 41]. Accordingly, many fear that the public misunderstands the promises of neuroscience and their limitations [14, 44] based on exaggerated or unbalanced media accounts. Consequently, it is important to examine the debate on pharmacological performance enhancement in the public sphere. This paper reports the results of a study which aims to review and compare print media coverage with existing bioethics and public health discourses on the non-medical use of MPH for performance enhancement. We hope thereby to gain insights into key ethical and social issues of this emerging practice.

Methods

This research aimed to analyze discourses on the non-medical use of MPH to enhance cognitive and academic performances. We examined discourses on the non-medical use of MPH in the print media (PM), bioethics literature (B), and public health literature (PH) based on previous work suggesting significant differences [38].

Sampling

We generated the print media sample for this study using the *Factiva* and *LexisNexis Academic* databases consisting of full-text news, business, and law resources. We searched for English language newspaper articles published

from 01/01/2000 to 11/14/2006 using guided news search options [37]. The start date of 2000 was chosen given the report of non-medical use of MPH in college students in the early 2000s [3]. Multiple keyword searches were used to identify articles discussing the non-medical use of MPH (Table 5-1). Keywords were searched in headline, lead paragraph(s) and general news (major papers) in *Factiva* and *LexisNexis Academic* databases. Bioethics and public health publications were sought using standard databases. All articles yielded by the searches were carefully examined for relevance, the key criteria being the discussion of the non-medical use of MPH. Individual articles were the sampling units.

Table 5-1: Generation of sample for analysis of discourses on the non-medical use of methylphenidate

Discourse	Databases	Keywords	Articles (n)
Print media	Lexis-Nexis Academic Factiva	"ritalin" "methylphenidate" "smart drugs"	20*†
Bioethics literature	PubMed (bioethics limit) Expanded Academic	"ritalin & study aid" "cognitive enhancement" "neuroethics" "stimulant abuse" "non-medical use" "illicit use"	14
Public health literature	PubMed Expanded Academic		7

* We found a single article repeated four times (N=23 articles) but kept the twenty distinct articles for analysis (except for the headline analysis since all 23 headlines were distinct.)
† Articles originated from USA (n=11), UK (n=6), Australia (2) and Canada (1).

Coding

The content of all articles was coded systematically using the QSR NVivo 7 software (Doncaster, Australia). The inductively-generated coding guide and grid were inspired by previous content analyses of print media [36, 37, 39] but adapted to our object of research. Adaptation of the coding guide was pursued through multiple rounds of piloting and test coding on a sub-sample of 10 print media articles to ensure validity and robustness [32]. Key codes were derived through an inductive process in which previously used coding categories for content analysis [39] were refined and adjusted to the context of non-medical use of MPH. This coding guide defined each category and provided both an explicit (upper limit) and implicit (lower limit) example of what each code could be applied to. After the initial coding of the whole sample by one member of the research team, two other members of the research team reviewed the content of each category to ensure reliability of coding by consensus and ensure that each code was within the limits established by the coding guide. The final coding structure included four major areas (Table 5-2): (1) description of the non-medical use of MPH; (2) workings and effects of MPH, including positive and negative effects associated with non-medical use of MPH; (3) description of ethical, social, and legal issues associated with non-medical use of MPH and (4) recommendations for the prevention of the non-medical use of MPH. Coding of the ethical, legal and social content was

furthered by determining if the coded statements affirmed, negated, or remained neutral or ambivalent regarding the issue at stake.

Given our goal of examining different ethical, social and legal issues surrounding the non-medical use of MPH, we used basic descriptive statistics to report the frequency and distribution of various codes. Data is reported to illustrate the nature of statements found within discourses and contrast discourses on the non-medical use of MPH.

Table 5-2: Coding structure used to analyze media, bioethics, and public health discourses on the non-medical use of methylphenidate (MPH)

Section 1: Description of non-medical use of MPH
1.1. Definitions and synonyms for non-medical use of MPH
Formal definition of non-medical use of MPH
Lay descriptions of non-medical use of MPH
Distinction between treatment and enhancement
1.2. Uses of MPH
Medical use
Cognitive and academic performance enhancement use
Recreational use
1.3. Aims of non-medical use of MPH
1.4. Extent of non-medical use of MPH
Accepted
Frequent
Neutral
Questionable
Rare
1.5. Description of practices of non-medical use of MPH
When is MPH used non-medically
Who is using MPH non-medically
Where is MPH used non-medically
How MPH is procured for non-medical use
Black market
Buying pills from other students
Feigning symptoms of ADHD
Online pharmacies
Other
1.6. Types of non-medical use of MPH reported
Methylphenidate
Other neuropharmaceuticals
Non neuropharmaceutical
Other
Section 2: Workings and effects of MPH
2.1. How MPH works
2.2. Physiological effects of non-medical use of MPH
Physiological negative effects of non-medical use of MPH
Physiological positive effects of non-medical use of MPH
2.3. Psychological effects of non-medical use of MPH
Psychological negative effects of non-medical use of MPH
Psychological positive effects of non-medical use of MPH
2.4. Unknown effects of non-medical use of MPH
2.5. Information on ADHD
Nature of ADHD

Prevalence of ADHD
*Section 3: Ethical, social and legal issues associated with non-medical use of MPH **
3.1. Abuse
3.2. Authenticity, identity, and personhood
3.3. Autonomy, individual rights, and informed consent
3.4. Cheating
3.5. Commercialization
3.6. Illegality
3.7. Injustice, access, and equality
3.8. Overprescription
3.9. Regulation and governance
3.10. Reliability of scientific research
3.11. Safety
3.12. Social meaning
3.13. Social integration and acceptability
Section 4: Prevention of non-medical use of MPH and related challenges
4.1 Solutions
4.2 Challenges

*Content under these codes was further analyzed into 3 coding options: (1) affirmation of the issue; (2) negation of the issue; (3) neutral or ambivalent stance regarding the issue with the exception of 'Regulation and governance' whose content was not suited for this kind of analysis and presented with recommendations for prevention.

Results

Portrayal of non-medical uses of MPH

We first examined how the non-medical use of MPH for performance enhancement was portrayed in the media in comparison to scholarly bioethics and public health discourses. We found that a wide-array of terms was used in the print media, many of which conferred a sense of familiarity and efficacy (e.g., "study aid", "study tool") regarding this form of MPH use (Box 5-1). In the media, typical statements regarding the non-medical use of MPH for performance enhancement described it as a lifestyle choice or a form of illicit

street drug (e.g., “better living through chemistry”) while the formal term of “cognitive enhancement” was found almost exclusively in bioethics discourse. Public health discourse negatively described this practice as a form of illicit prescription drug misuse or abuse (Table 5-3). In addition to the reported non-medical uses for performance enhancement (20 PM; 14 B; 7 PH), which was a selection criteria, other uses of MPH were generally discussed including medical uses to treat AD/HD (16 PM; 5 B; 5 PH) and recreational uses (6 PM; 1 B; 7 PH).

The headlines used to present the articles reflected the diverging views found in print media, bioethics and public health discourses (see again Table 5-3). Features of print media headlines included presenting the non-medical use of MPH in the present tense as a current practice (N=16/23); describing MPH as a study aid (N=10/23); featuring cautionary messages (N=9/23); mentioning that this is a new or more prevalent practice (N=8/23); describing this practice as a form of abuse (N=7/23). Bioethics headlines typically described non-medical neuropharmaceutical use as “enhancement” (N=8/14) and public health papers as a form of abuse or misuse (N=7/7). The term cognitive enhancement was seldom encountered in print media and never in public health discourse. In terms of risk and benefit statements, the risk of addiction was present in all discourses while the print media presented a wider array of risks. In comparison to the prescribing information provided by Novartis (Ritalin®, Novartis Pharmaceuticals Corp., East Hanover, NJ, USA; Dorval, Québec, Canada; Frimley/Camberley, Surrey, UK; North Ryde, NSW, Australia) for MPH in the

US, Canada, UK, and Australia (where the articles originated), most of these risks were common risks and few of the uncommon and rare side effects were featured.

Box 5-1: Lay designations of methylphenidate used non-medically for performance enhancement in the print media*

"study aid" [35] (9)
"brain steroid" [26] (4)
"smart drug(s)" [45] (4)
"Vitamin R" [35] (4)
"poor man's cocaine" [2] (3)
"study tool(s)" [26] (2)
"new chemical aid" [26](1)
"smart pill(s)" [20] (1)
"cramming drug" [15] (1)
"wonder drug" [42] (2)
"academic steroids" [35] (1)
"steroids of academia" [33] (1)
"legal speed" [28] (1)
"kiddie speed" [27] (1)

*Number of occurrences of specific designations indicated in parentheses

Analyzed articles typically described: (1) who is using MPH non-medically (e.g. college students; 18 PM; 8 B; 6 PH); (2) when MPH is used non-medically (e.g., during final exams; 13 PM; 0 B; 3 PH); (3) where MPH is used non-medically (e.g., college campuses and high schools; 11 PM; 5 B; 4 PH). Details were also reported, notably in print media, on how students were securing MPH for non-medical uses, i.e., by buying pills from other students

(14 PM; 1 B; 3 PH); by feigning symptoms of ADHD (5 PM; 0 B; 2 PH); through black markets (5 PM; 0 B; 1 PH); through Internet pharmacies (4 PM; 0 B; 0 PH) and by stealing pills (3 PM; 0 B; 1 PH). Medical information on what ADHD is (3 PM; 2 B; 0 PH) and information on ADHD such as statistics on occurrence (3 PM; 1 B; 1 PH) were generally rare.

The extent and social acceptance of non-medical uses of MPH was described in divergent ways particularly in the print media (PM). We found contrasting statements that this practice was: (1) "accepted" (6 PM; 0 B; 1 PH); (2) "frequent" and "widespread" (16 PM; 8 B; 5 PH); (3) the subject of ambivalent opinions (6 PM; 0 B; 0 PH); (4) "debatable" and "concerning" (10 PM; 1 B; 3 PH); and (5) rare and anecdotal (6 PM; 0 B; 0 PH).

Given its focus on enhancement, it was not surprising to find that the bioethics literature in particular featured alternate forms of performance enhancement rather than solely the use of MPH (20 PM; 14 B; 7 PH). The bioethics literature discussed enhancement by means of other pharmaceuticals (0 PM; 8 B; 0 PH); traditional forms of enhancement such as caffeine and nutritional supplements (1 PM; 6 B; 0 PH) as well as other forms of enhancement (e.g., transcranial magnetic stimulation (0 PM; 4 B; 1 PH). Further, bioethics discourse alluded to the treatment-enhancement dichotomy, often judged to be blurry or misleading (2 PM; 9 B; 0 PH) to understand the implications of non-medical use of MPH.

Table 5-3: Portrayal of the non-medical use of methylphenidate in print media, bioethics and public health supported by examples of article headlines as well the occurrence of reported risks and benefits indicated in parentheses (n).

Print media	*Portrayal as a "Lifestyle choice":* "better living through chemistry" [54]; "short cut in learning"; "new kind of drug abuse" [26]. *Examples of headlines:* "Students taking danger drug to help with exams"; "'Smart pills' are on the rise. But is taking them wise?"; "New campus high: Illicit prescription drugs". *Reported risks*:* Physiological addiction (8); palpitations (7); psychological addiction (6); heart attack (5); unspecified cardiac risks (4); loss of appetite (4); hallucinations (4); stroke (2); tremors (2); increase in blood pressure (2); weight loss (2); vomiting (2); dizziness (2); seizures (2); withdrawal symptoms (2); require increasing amounts of drug (1); cardiac arrhythmia (1); overdose (1); changes in brain cell chemistry (1); fatigue (1); death (1); dry mouth (1). *Reported benefits**:* Boost concentration (8); increase focus (7); increase energy (3); increase alertness (1); reduce appetite (1); eliminate jitters (1); filter out distractions (1); increase motivation (1); accumulate more information in less time (1); increase confidence (1); increase organization (1); increase retention of information (1); think more rationally (1); general feeling of well-being (1); make you feel smarter (1); make mundane tasks seem fun (1); enhance studying (1); do work faster (1); maintain high performance level (1); boost brain activity (1).
Bioethics	*Portrayal as "Cognitive enhancement":* " 'neuroenhancement' (…) This term includes the use of drugs and other interventions to modify brain processes with the aim of enhancing memory, mood and attention in people who are not impaired by illness or disorder" [23]. *Examples of headlines:* "Neurocognitive enhancement: what can we do and what should we do?" and "Cosmetic neurology: The controversy over enhancing movement, mentation, and mood". *Reported risks*:* Addiction (3); toxicity (1). *Reported benefits**:* Improve attention (4); improve memory (4); improve performance (2); increase focus (1); improve concentration (1); improve planning (1); think faster (1); stabilize mood (1); promote creativity (1).
Public health	*Portrayal as "Abuse", "misuse", "illicit drug use":* "Ritalin (Novartis Pharmaceuticals Corp., East Hanover, NJ) has received the most attention in medical literature, little information is available regarding which specific stimulants are used illicitly by college students" [48]. *Examples of headlines:* "Student perceptions of methylphenidate abuse at a public liberal arts college" and "Stimulant medication use, misuse, and abuse in an undergraduate and graduate student sample". *Reported risks*:* Addiction (2); cardiovascular implications (1); withdrawal symptoms (1); increase in blood pressure (1); headache (1); overdose (1); blocking veins if injected/snorted (1); panic episodes (1); aggressive behavior (1); suicidal or homicidal tendencies (1). *Reported benefits**:* Decreases fatigue (2); increases energy (1); increases dopaminergic activity (1); maintain high performance level (1); increase alertness (1).

*Coded as physiological/psychological negative effects **Coded as physiological/psychological positive effects

Ethical, legal and social issues of non-medical use of MPH

There were generally wide-ranging views on the ethical, legal, and social issues related to the non-medical use of MPH. Table 5-4 provides a comprehensive summary of the issues identified and their diverse interpretations (column 1) as well as illustrative examples of statements (column 2). For most issues, both statements that an issue was important and rebuttal statements could be found across discourses. One notable exception was the issue of overprescription of MPH, which seemed to be affirmed by all discourses and only negated once. Bioethics discourse was comprehensive in its coverage of ethical and social issues. However, some issues were not discussed in our sample of print media and public health discourses. These are authenticity, identity and personhood; autonomy, individual choice and informed consent; injustice and inequalities. Our study design did not allow assessment of the ratio of arguments but we can observe that some issues appeared to be more commonly negated in bioethics discourse (e.g., authenticity, identity and personhood; autonomy, individual choice and informed consent), see sections 2 and 3 of Table 5-4 for examples.

Table 5-4: Frequency, distribution, characterization and representative examples of ethical, social and legal issues associated with the non-medical use of methylphenidate (MPH) for performance enhancement in print media (PM), bioethics (B) and public health (PH) discourses.

Frequency, distribution and characterization of ethical, social, and legal issues (Frequency in PM, B, PH indicated in parentheses)	Representative examples of ethical, social, and legal issues
1. Abuse	
Affirmation (11, 1, 5): MPH is a drug with high abuse potential (PM, PH). Diversion of MPH to healthy people for cognitive enhancement can be considered an abuse or misuse of the drug though there is confusion as to which one it is (PM, PH). This use of MPH is analogous to abuse of illicit drugs (B, PH).	" 'There is no question Ritalin is being misused by college students,' Shaw said". (PM)[15] "Despite its wide margin of safety, MPH is thought to have high abuse potential." (PH)[4]
Negation (1, 1, 1): The use of MPH for cognitive enhancement is not an abuse of the prescription; it is a study tool (PM, B, PH).	"Moreover, the government would have difficulty maintaining that enhancing cognition was an abuse, especially given the legality of caffeine and nicotine." (B) [31] "The majority of students who reported misuse or abuse were not concerned about the misuse and abuse of prescription stimulants, and a number of students thought that they should be more readily available." (PH) [49]
2. Authenticity, identity and personhood	
Affirmation (0, 5, 0): Cognition enhanced by MPH is authentic and belongs to the person (B).	"And if we are not the same person on Ritalin as off, neither are we the same person after a glass of wine as before, or on vacation as before an exam." (B) [18]
Negation (1, 12, 0): By using MPH for cognitive enhancement, individuals are being deceptive about their abilities and cheapen the value of life experience (PM, B).	" 'I think it's deceptive. A GPA is what employers and graduate schools use to select students. It is supposed to be indicative of your natural academic ability,' said Ramin Baghai, 25, a master's of business administration student at Massachusetts Institute of Technology." (PM) [25]
3. Autonomy, individual choice and informed consent	

Affirmation (0, 5, 0): The choice whether to enhance cognition with MPH (or not) is a matter of individual liberty (B).	"In a culture with strong libertarian undercurrents, many believe that if individuals are given adequate information about potential side effects, they should be free to make their own decisions." (B) [12]
Negation (0, 10, 0): Individuals may feel coerced into enhancing their cognition with MPH because of social pressure to do so or they may feel that their individual liberty is stifled by a ban (B).	"Use by some people will result in pressure on nonusers to become users, or else to accept what amounts to a handicap in the social competition." (B) [50]
4. Cheating	
Affirmation (5, 8, 0): Using MPH for cognitive enhancement creates an unfair playing field and thus can be regarded as cheating (PM, B). It is a quick fix for hard work and contributes to the medicalization of human effort (B).	"Some students who don't use the drug say their pill-popping classmates have an unfair edge and consider use of the pills a form of cheating." (PM) [25] "The academic or professional milestones attained by those with biotechnologically-enhanced cognition may be tainted, affecting the individual's sense of achievement." (B) [8]
Negation (3, 3, 0): Using MPH for cognitive enhancement is no more unfair than hiring private tutors and using other technologies that help cognition (PM, B). Cognitive enhancement can accelerate or optimize a task but is not a substitute for the work involved (B).	"You deserve to win a Nobel Prize if you discover the cure for cancer, whether or not you do so with the aid of cognitive enhancement drugs." (B) [31]
5. Commercialization	
Affirmation (1, 7, 0): There are economic motivations encouraging non-medical use of cognitive enhancers (PM, B).	"Today, the possibilities of pharmacological enhancement and lifestyle-related use are multiplied in conjunction with the intensification of marketing by pharmaceutical companies." (B) [40]
Negation (0, 1, 0): Interests of pharmaceutical companies are not part of the debate of whether there is something wrong with enhancement (B).	"Pharmaceutical companies may be evil incarnate. And we may be putty in their pecuniary little hands. But that has nothing at all to do with the question of whether there is anything wrong with

	pursuing enhancement." (B) [11]
6. Illegality	
Affirmation (8, 2, 0): There are legal issues associated with the possession and consumption of MPH for cognitive enhancement (PM, B).	"And since the drug is classified as a controlled substance, possessing or distributing it without a doctor's prescription is a felony." (PM) [42] "Some worry that tomorrow's lawyers, doctors and business professionals are committing felonies before they have even begun practice." (PM) [31]
Negation (3, 1, 0): MPH is a legal drug and can be used for cognitive enhancement (PM, B).	"So where people once took illegal drugs like cocaine to escape or stimulate creativity, they now take legal drugs to focus better and achieve more." (PM) [54] "But as noted earlier, cognitive enhancement drugs may be perfectly legal (because they are dietary supplements, have FDA approval for an enhancement indication, or are prescribed for off-label use)." (B) [31]
7. Injustice and inequalities	
Affirmation (0, 10, 0): Unequal access to MPH for cognitive enhancement exacerbates inequalities between social groups e.g. rich/poor, insured/uninsured (B).	"The entire population would move upward in terms of cognitive ability, but the disparities created by natural talent and luck would remain." (B) [31] "Moreover, most Americans would probably agree that the financial burden associated with enhancement procedures should not be distributed - through increased insurance premiums or allocation of limited federal resources - among members of society." (B)[8]
Negation (0, 6, 0): Fear of creating or amplifying social inequalities is not a valid ground for prohibiting cognitive enhancement with MPH as society already tolerates other social injustices such as public versus private schools (B).	"Unequal access is generally not grounds for prohibiting neurocognitive enhancement, any more than it is grounds for prohibiting other types of enhancement, such as private tutoring or cosmetic surgery that are enjoyed mainly by the wealthy." (B) [18]
8. Overprescription	
Affirmation (9, 2, 4): MPH has been	"Heiligenstein says that the fact that

overprescribed in recent years. High rates of prescription contribute to the abuse/misuse of MPH (PM, B, PH).	students are giving away supplies means they didn't need them in the first place or, at least, not in the dosages prescribed." (PM) [35] "There has been a trend in the increased abuse and misuse of stimulant medications by students, which likely, as suggested by others, has been influenced by increased production of and prescriptions written for stimulant medications, particularly methylphenidate." (PH) [49]
Negation (1, 0, 0): MPH is not overprescribed; ADHD is being recognized and treated more readily (PM).	"Dr. Lenard Adler doesn't think it's a problem. Medco's report 'highlights that we're starting to do a better job of heightening recognition of adult ADHD and more individuals are coming in to get treated, but undertreatment is still vastly more of a problem as compared to overtreatment,' says Adler, the director of the Adult ADHD program at NYU." (PM) [28]
9. Reliability of scientific research	
Affirmation (0, 0, 0): None	N/A
Negation (2, 4, 1): MPH's long-term safety and effect on normal cognition remain to be scientifically proven so judgments about whether the practice is permissible cannot be made (PM, B, PH).	"There is therefore no a priori reason — irrespective of ethical concerns or any other arguments — to suppose that, in the absence of pathology, pharmacological enhancement of such processes will necessarily enhance memory or cognition, which might already be 'set' at psychologically optimal levels." (B) [43] "Stimulant medications are intended to improve academic performance, although studies have not shown long-term academic benefits from their use." (PH) [22]
10. Safety	
Affirmation (3, 2, 2): MPH is a safe drug or is viewed as safe because it has been officially approved and its side effects are minimal (PM, B, PH).	"Heiligenstein says that part of the problem is a perception that prescription drugs, as opposed to "street" drugs, are safe because they have been officially

	approved." (PM) [35] "And most of the drugs we're talking about are far less harmful than nicotine." (PM) [54]
Negation (2, 11, 2): MPH is a prescription drug and may reveal previously unanticipated side effects if used outside of a prescription (PM, B, PH).	"Brain-based enhancement involves intervening in a complex and poorly understood system, and the likelihood of unanticipated problems is consequently higher." (B) [17] "Although prescribed use of methylphenidate appears to be relatively safe, misuse or abuse of any stimulant medication can have adverse, if not deadly, consequences." (PH) [49]
11. Social meaning	
Affirmation (11, 9, 5): The non-medical use of MPH is a response to the pressure of a competitive society (PM, B, PH). The non-medical use of MPH is changing society's values by prizing achievement over hard work (PM, B). People will not learn how to cope with problems but rather seek quick fixes (PM). It could make society more efficient and productive if everyone was enhanced (B). It is a public health problem (PH).	"Ritalin acts as a quick fix for problems that are the product of the rapid-fire culture and the hurried society in which we live." (PM) [5]
Negation (1, 2, 0): Students have always used stimulants to help them perform; this practice is no different (PM). Only the result counts (B).	"Short of misappropriating someone else's work, the value of the results is what counts. Nor is this an objectionable case of the ends justifying the means; no harm is produced by exceptional ability or serendipitous discovery, except perhaps envy, which arguably is generated by any achievement, including one that is earned by hard work." (B) [31]
12. Social integration and acceptability	
Affirmation (11, 13, 0): Misuse of MPH has changed social practices becoming a "fact of life" (PM, B). Enhancement using MPH is considered as trivial as a more	"Ritalin makes repetitive, boring tasks like cleaning your room seem fun," said Josh Koenig, a 20-year-old drama major. "I equate it in my mind with a really strong cup of coffee." (PM) [53]

"traditional" method like coffee (PM). Enhancement is a very old social practice (e.g. coffee and alcohol) and the use of psychopharmacology is only a new form (B).	
Negation (5, 0, 0): Misuse of MPH has not changed social practices that already permit individuals to practice enhancement by other means. MPH is not any more dangerous than these other methods. Use of MPH for enhancement is regarded as progress (PM).	"No one's going to say 'Don't smoke cigarettes before the SAT.'" (PM) [54]

*All descriptions are based on a summary of content found in discourses

Recommendations for prevention of non-medical use of MPH and related challenges

A wide range of solutions were proposed to prevent further non-medical use of MPH (Table 5-5). Bioethics discourse called for restrictive legislation on MPH and other potential performance enhancing drugs in healthy people by criminalizing non-approved uses. However, opposing recommendations, such as favorably legislating these drugs (e.g., government subsidies for those who cannot afford the drugs) were presented. The print media and public health discourses, on the other hand, promoted changing the habits of healthcare professionals in diagnosis and prescription compliance and also informing students and university staff about the misuse of prescription drugs and its risks.

Several challenges were highlighted regarding the prevention of non-medical use of MPH (Table 5-5). These included the logistical complexity and legitimacy of enforcing a ban and the detrimental impact of a ban on patients who need the drugs to function. The most emphasized challenge was the sense of security that individuals have with regard to prescription drugs, i.e., even non-medical uses because they are approved by a governmental health agency.

Table 5-5: Proposed recommendations to prevent non-medical use of methylphenidate (MPH) and challenges associated with prevention.

A. Proposed recommendations to prevent non-medical use of MPH

Print media	Bioethics	Public health
Diagnosing ADHD more carefully [24, 35, 42] Supervising of students with stimulant prescriptions[2, 25] Teaching students effective study skills and stress management [5, 35] Informing students and staff of the dangers of abusing prescription drugs [2, 15, 25, 26]	Criminalizing non-approved uses of medications [18, 31, 50] Prohibiting prescription of drugs for lifestyle purposes by doctors [31] Obliging manufacturers to declare safety data for unapproved uses to the FDA [31] Subsidizing cognition enhancing drugs to allow equal access [23, 31] Establishing a "ceiling" as the maximum cognitive enhancement permissible [31, 50]	Ensuring prescription compliance and responsible prescription practices [4, 49] Prescribing preparations that are less easily abused [46, 47] Identifying persons who are liable to abuse medication [4] Educating healthcare providers dealing with university populations as to the abuse potential of stimulants [47, 49]

B. Identified challenges in the prevention of non-medical use of MPH

Print media	Bioethics	Public health
Logistical problems of enforcing a ban. [1, 35, 42] Perceived safety of MPH makes convincing students about its dangers more difficult [20, 35] Abundance of MPH in healthcare system [24] Misuse of MPH bypasses traditional sources of information on indications and risks when taking a prescription medication [35]	Difficult to propose a ban on cognitive enhancers because of their routine use in treatment [23, 31, 50] Ban is liable to encourage a black market and be just as coercive as social pressure [23, 31, 50] FDA has little experience in assessing social cost/benefit of a drug and thus is unfit to take charge of such regulation [50]	None identified

Discussion

This study examined discourses on the non-medical use of MPH by college students in the print media, bioethics literature, and public health literature. We found that there were three distinct paradigms used to describe the non-medical use of MPH: the "lifestyle paradigm" in the print media; the "cognitive enhancement paradigm" in bioethics; and the "prescription drug abuse paradigm" in the public health literature. These paradigms were reflected notably in the headline content across discourses and the statements used to describe the non-medical use of MPH (Table 5-3). The lifestyle paradigm is also well illustrated in the print media's use of lay designations to describe the non-medical use of MPH (Box 5-1) and the enthusiastic terms used to describe its potential enhancement effects (Table 5-3). We observed diverging claims about the frequency and acceptability of non-medical MPH use. The print media provided overall detailed descriptions of who, where, and when MPH was used non-medically and also how students were procuring it. The ethical discussion surrounding the non-medical use of MPH was without surprise more comprehensive in the bioethics literature but overall showed signs of fundamental ambivalence except in the public health literature where there was a clear stand against non-medical uses of MPH. Recommendations ranging from calls for legislation to increased public education were identified in all three sources of discourse but challenges were only identified and discussed in the print media and in the bioethics literature.

Limitations

As with most qualitative research, some aspects of our study limit the generalization of the results. First, the small sample size and limited sample composition, in spite of broad searches and use of multiple databases, are not exhaustive of all discourses on non-medical use of MPH. The results of this small study should accordingly be viewed a preliminary step to fulfill this goal. Second, the scope of the study was limited to a few countries, mostly because of the available sources of the literature. Third, the specific case of the misuse of MPH was examined even though there are other drugs that are misused in similar ways. However, this choice is supported by the apparent draw of MPH for performance enhancement as reported in a recent survey published in Nature [29]. Fourth, the reported statements in the print media articles are an amalgamation of opinions from people interviewed by journalists and do not necessarily reflect the opinions of journalists. Accordingly, the print media content should be viewed as what was available to the public through this channel rather than the voice of journalists per se.

Disagreements between paradigms could have important healthcare, ethics, and social implications and consequences

The dissonance we observed between paradigms used to describe and evaluate the non-medical use of MPH for performance enhancement could have profound healthcare, ethics and social implications and consequences. Each paradigm carries forward a distinct view of the acceptability of MPH non-

medical use. Speaking of a “lifestyle choice”, a “cognitive enhancement”, or a “prescription misuse” matters for scholarly biomedical ethics as well as for public debate and healthcare. Another major source of disagreement is the unbalanced presentation of the potential positive and negative effects of MPH across discourses. In the print media especially, a great number of potential adverse effects (Table 5-3) are mentioned most often without qualification or quantification. In contrast to the risks, the positive effects are discussed using sensational terms like “wonder drug” or “smart drug” (Box 5-1). Such discourse implies miracle-like effects and portrays the practice in a light that does not reflect our limited scientific and medical knowledge of the effects of non-medical MPH use [6]. Furthermore, the reported positive effects in the print media are largely based on anecdotes and are typically not contrasted with scientific data about the effects of MPH on the healthy brain. Given these features, some interpretations found in print media as well as bioethics discourse could contribute to the unintended dissemination of the non-medical use of MPH for performance enhancement. However, if public health discourses prematurely condemn this practice as a form of drug abuse, future public health strategies risk being ill-equipped to tackle the enthusiasm and interest for cognitive enhancers found in other discourses. The divergences underpinning the three paradigms we identified show the lack of consensus on the non-medical prescription drug use. Likewise, ethical statements, especially in the print media are often ambivalent making it difficult for the public to assess the implications of this practice.

Bioethics and the print media could reinvigorate their commitment to public information and informed debate

Bioethics discourse and, to some extent, the print media, contain discussions on the ethics of the non-medical use of MPH. Our results show, that the coverage of the phenomenon in these discourses brings about potential sources of confusion. For instance, there is a wide range of uncertain claims about the prevalence and risks of the practice. The bioethics literature is also marked by the enhancement paradigm it employs. The term "cognitive enhancement" implies that using MPH non-medically is indeed effective and yields a beneficial enhancement (in contrast to the prescription drug abuse paradigm).

The print media conveys in many respect more sociological details and context (e.g., who, how, when and where) regarding the non-medical use of MPH for performance enhancement. However, this may have unexpected consequences such as increasing the prevalence of the practice. In fact, the combination of consumption details and student testimonials with positive portrayals of the performance enhancement potential of MPH in the print media may incite individuals to engage in the practice. Even though the social and ethical context of performance enhancement with MPH differs in many respects from those of illicit drug abuse (drug addiction) it is interesting to compare discussions on these two phenomena. For example, the Australian Press Council has produced guidelines that go as far as recommending avoidance of reporting "stories that might excite the interest of young people in

drug experimentation, including the naming of dangerous drugs". The recommendations for reporting on addictive drugs also state that "the harmful effects of any particular drug should not be exaggerated or minimized"; and that we should "avoid detailed accounts of consumption methods, even though many young people are generally familiar with them." The recommendations also "guard against any reporting which might encourage readers' experimentation with a drug, for example highlighting the 'glamour' of the dangers involved" [13].

There are potentially some important lessons about reporting on non-medical uses of MPH and other pharmaceuticals that can be gleaned from the guidelines put forth by the Australian Press Council. The guidelines urge responsible reporting in ways that clearly contrast with the glamour conveyed about cognitive enhancers, the detailed consumption accounts, and the debatable reporting of potential benefits and risks. Though the case of using neuropharmaceuticals to enhance cognitive performance is clearly not the same as illicit drug abuse, these guidelines could translate into avoidance of narratives and salient practices related to non-medical MPH by students as well as other forms of non-medical use of prescription drugs. This represents a strong stance that could appear paternalistic and an interference with good reporting practices but the onus of responsible reporting does not lie exclusively upon journalists. All stakeholders need to consider their role and responsibilities in the construction of news about non-medical uses of pharmaceuticals for performance enhancement. For instance, healthcare

providers being interviewed on this topic may want to be vigilant about the opinions they express to journalists about non-medical practices especially regarding risks and benefits. For example, a clinical psychiatrist was quoted as saying that "Caffeine is fine. This is better (…) Students are able to accumulate more information in a shorter time frame. These drugs keep you awake longer. They minimize fatigue and help maintain a high performance level" [25]. Drug companies are prohibited from marketing off-label uses of their medications. Perhaps healthcare professionals should be careful with their public comments on non-medical uses of pharmaceuticals. Public health agencies must also be aware of enthusiastic media reports on practices potentially having an impact on public health if they want to counterbalance unwarranted messages in the media and better inform the public and stakeholders. These are some initial venues to explore to improve the commitment to public information and informed debate on non-medical uses of prescription drugs for enhancement purposes.

Medicine, healthcare, and society need to prepare for broader and more prevalent non medical uses of pharmaceuticals

In our study, public health discourses on enhancement raised many concerns about the non-medical use of MPH for performance improvement because of its potential health consequences. The prevalence of this practice with MPH, which ranges from 3.2% [47] to 11% [49], is concerning since it involves use of a controlled substance by individuals outside of the intended

clinical context. This trend has the potential to prepare the path for the general acceptability of non-medical uses of pharmaceuticals. Accordingly, societies could be faced with serious public health challenges before the ethics of this practice is properly discerned and publicly debated. We did note that wide ranging solutions were suggested to prevent the expansion of the non-medical use of MPH for enhancement purposes (Table 5-5). Development of legislation on non-medical uses and distribution of prescription medications were common suggestions as well as the education of healthcare professionals and the public about the dangers of misusing prescriptions. The latter recommendations mirror those put forth recently to tackle the widespread illegal provision of human growth hormone (hGh) in the US [34]. These recommendations focus mostly on the illegal distribution of hGh by manufacturers but also highlight the ethical responsibilities of healthcare professionals. Though the stakeholders in cognitive enhancement with neuropharmaceuticals are different than in hGh, there appears to be similar problems with fraudulent distribution online and trafficking of MPH among students [29, 35]. Prevention of these kinds of distribution, stricter prescription practices, better patient prescription compliance and effective, balanced information to the public could help decrease prevalence and social integration of the practice in the absence of medical, social, and ethical consensus about its acceptability. Regulatory bodies and policy makers could begin examining the hGh recommendations as well as their associated challenges to model potential action with regard to the emerging practice of the non-medical use of MPH. However, before any new

policies are made there clearly needs to be a broader debate on the non-medical uses of neuropharmaceuticals in order to sort through the ambivalence with regard to ethical and social issues.

References

[1] 2004. A new form of drug abuse. *The Plain Dealer*.

[2] Adams, L. 2005. How Ritalin became poor man's cocaine; Warnings over increasing adult abuse of children's drug, in *The Herald*.

[3] Babcock, Q., Byrne, T. 2000. Student perceptions of methylphenidate abuse at a public liberal arts college. *Journal of American College Health* 49: 143-5.

[4] Barrett, S.P., Darredeau, C., Bordy, L.E., et al. 2005. Characteristics of methylphenidate misuse in a university student sample. *Canadian Journal of Psychiatry* 50: 457-61.

[5] Bayer, K. 2004. Students taking danger drug to help with exams, in *The Express*.

[6] Bray, C.L., Cahill, K.S., Oshier, J.T., et al. 2004. Methylphenidate does not improve cognitive function in healthy sleep-deprived young adults. *Journal of Investigative Medicine* 52: 192-201.

[7] British Medical Association. 2007. *Boosting your brainpower: Ethical aspects of cognitive enhancement*. British Medical Association: London, UK. p. 42.

[8] Bush, S.S. 2006. Neurocognitive enhancement: ethical considerations for an emerging subspecialty. *Applied Neuropsychology* 13: 125-36.

[9] Butcher, J. 2003. Cognitive enhancement raises ethical concerns. Academics urge pre-emptive debate on neurotechnologies. *Lancet* 362: 132-3.

[10] Canadian Centre on Substance Abuse. 2007. *Prescription Drug Abuse FAQs.* Canadian Centre on Substance Abuse. p. 10.

[11] Caplan, A., Elliott, C. 2004. Is it ethical to use enhancement technologies to make us better than well? *PLoS Medicine* 1: e52.

[12] Chatterjee, A. 2004. Cosmetic neurology: the controversy over enhancing movement, mentation, and mood. *Neurology* 63: 968-74.

[13] Australian Press Council. 2001. *Reporting Guidelines: Drugs and drug addiction.*

[14] Decety, J., Jackson, P.L., Sommerville, J.A., Chaminade, T., Meltzoff, A.N. 2004. The neural bases of cooperation and competition: An fMRI investigation. *NeuroImage* 23: 744-751.

[15] Diaz, J. 2001. Ritalin grows as 'cramming drug' at U.S. colleges; Medicine can have serious side effects, in *The Seattle Times*.

[16] Diefenbach, G.J., Diefenbach, D., Baumeister, A., et al. 1999. Portrayal of lobotomy in the popular press: 1935-1960. *Journal of the History of the Neurosciences* 8: 60-9.

[17] Farah, M.J. 2005. Neuroethics: the practical and the philosophical. *Trends in Cognitive Science* 9: 34-40.

[18] Farah, M.J., Illes, J., Cook-Deegan, R., et al. 2004. Neurocognitive enhancement: what can we do and what should we do? *Nature Reviews Neuroscience* 5: 421-5.
[19] Flower, R. 2004. Lifestyle drugs: pharmacology and the social agenda. *Trends in Pharmacoogical Sciences* 25: 182-5.
[20] Garreau, J. 2006. 'Smart pills' are on the rise. But is taking them wise?, in *The Washington Post*.
[21] Graff Low, K., Gendaszek, A.E. 2002. Illicit use of psychostimulants among college students: a preliminary study *Psychology, Health & Medicine* 7: 283-287.
[22] Hall, K.M., Irwin, M.M., Bowman, K.A., et al. 2005. Illicit use of prescribed stimulant medication among college students. *Journal of American College Health* 53: 167-74.
[23] Hall, W. 2004. Feeling 'better than well'. *EMBO Reports* 5: 1105-9.
[24] Hupp, S. 2006. Students abusing ADHD drugs: Prescription pills easy to get, youths, health workers say, in *The Indianapolsi Star*.
[25] Khan, M. 2003. Study drugs draw concern, in *The Miami Herald*.
[26] Laurance, J. 2003. Abuse hits students looking for an exam kick. *The Independent*.
[27] Lawrence ,J. 2004. 'Kiddie speed' for exam boost. *Sunday Mail*. Queensland, Australia.
[28] Lite, J. 2006. Who needs a dealer…when you have a doctor? New Yorkers are just saying yes to prescription abuse. *Daily News*. New York.
[29] Maher, B. 2008. Poll results: look who's doping. *Nature* 452: 674-5.
[30] McCabe, S.E., Knight, J.R., Teter, C.J., et al. 2005. Non-medical use of prescription stimulants among US college students: prevalence and correlates from a national survey. *Addiction* 100: 96-106.
[31] Mehlman, M.J. 2004. Cognition-enhancing drugs. *Milbank Quarterly* 82: 483-506.
[32] Neuendorf, K.A. 2002. *The Content Analysis Guidebook*. Thousand Oaks, CA: Sage Publications.
[33] O'Regan, N. 2005. Want to be clever? Don't take 'smart drugs'. *Irish Independent*.
[34] Olshansky, S.J., Perls, T.T. 2008. New developments in the illegal provision of growth hormone for "anti-aging" and bodybuilding. *Journal of the American Medical Association* 299: 2792-4.
[35] Phillips, S. 2006. An espresso in the morning is just so last year, in *The Times Higher Education Supplement*.
[36] Racine, E., Bar-Ilan, O., Illes, J. 2005. fMRI in the public eye. *Nature Reviews Neuroscience* 6: 159-164.
[37] Racine, E., Bar-Ilan, O., Illes, J. 2006. Brain Imaging: A Decade of Coverage in the Print Media. *Science Communication* 28: 122-142.

[38] Racine, E., Forlini, C. In press. Cognitive enhancement, lifestyle choice or misuse of prescription drugs? Ethical blind spots in current debates. *Neuroethics*.

[39] Racine, E., Garreau, I., Doucet, H., et al. 2006. Hyped biomedical science or uncritical reporting? Press coverage of genomics (1992-2001) in Québec. *Social Science & Medicine* 62: 1278-1290.

[40] Racine, E,. Illes, J. 2006. Neuroethical responsibilities. *Canadian Journal of Neurological Sciences* 33: 269-77, 260-8.

[41] Racine, E., Waldman, S., Palmour, N., et al. 2007. "Currents of hope": neurostimulation techniques in U.S. and U.K. print media. *Cambridge Quarterly of Healthcare Ethics* 16: 312-6.

[42] Reinink, A. 2001. Colleges eye ways to curb Ritalin abuse. *Denver Post*.

[43] Rose, S.P. 2002. 'Smart drugs': do they work? Are they ethical? Will they be legal? *Nature Reviews Neuroscience* 3: 975-9.

[44] Rose, S.P.R. 2003. How to (or not to) communicate science. *Biochemical Society Transactions* 31: 307-312.

[45] Ross, S. 2006. Students turn to smart drugs for exam help. *The Scotsman*.

[46] Teter, C.J., McCabe, S.E., Boyd, C.J., et al. 2003. Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. *Pharmacotherapy* 23: 609-17.

[47] Teter, C.J., McCabe, S.E., Cranford, J.A., et al. 2005. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *Journal of Americal College Health* 53: 253-62.

[48] Teter, C.J., McCabe, S.E., LaGrange, K., et al. 2006. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy* 26: 1501-10.

[49] White, B.P., Becker-Blease, K.A., Grace-Bishop K. 2006. Stimulant medication use, misuse, and abuse in an undergraduate and graduate student sample. *Journal of American College Health* 54: 261-8.

[50] Whitehouse, P.J., Juengst, E., Mehlman, M., et al. 1997. Enhancing cognition in the intellectually intact. *Hastings Center Report* 27: 14-22.

[51] Wilens, T.E., Adler, L.A., Adams, J., et al. 2008. Misuse and diversion of stimulants prescribes for ADHD: A systematic review of the literature. *Journal of the American Academy of Child and Adolescent Psychiatry* 47.

[52] Wolraich, M.L., Wibbelsman, C.J., Brown, T.E., et al. 2005. Attention-deficit/hyperactivity disorder among adolescents: a review of the diagnosis, treatment, and clinical implications. *Pediatrics* 115: 1734-46.

[53] Zeilbauer, P. 2000. New Campus High: Illicit Prescription Drugs, in *The New York Times*. New York.

[54] Zernike, K. 2005. The difference between steroids and Ritalin is... *The New York Times*.

Chapter 6: General discussion

This thesis examined discourses on ethics and public understanding related to the cognitive enhancement of healthy individuals with neuropharmaceuticals. This was examined using the specific example of cognitive enhancement with methylphenidate in healthy university students. Recent studies have reported that the use of methylphenidate for performance enhancement is prevalent in North American university campuses and is beginning to spread to professional environments as well. The example of non-medical methylphenidate use for cognitive enhancement has been discussed in both lay and academic discourses providing some material for comparison of perspectives.

Chapter 3 provided a brief look at the emergence and ethics of cognitive enhancement. Given important issues like safety, fairness, distributive justice and the social integration of cognitive enhancement, this article suggested broad social discussion to encourage thinking about future policy.

Chapter 4 presented observations on how the phenomenon was portrayed in different discourses. The content of lay and academic discourses on the non-medical use of methylphenidate for cognitive enhancement was examined to characterize its portrayal. We found evidence of three distinct paradigms that describe the non-medical use of methylphenidate for cognitive enhancement: the “lifestyle paradigm” in the print media; the “cognitive enhancement paradigm” in bioethics; and the “prescription drug abuse paradigm” in the public health literature.

Chapter 5 expanded upon the observations of Chapter 4 by further analyzing the differences in discourses on the non-medical use of methylphenidate by college students for cognitive enhancement present in the print media, bioethics literature, and public health literature. The results of this discourse analysis showed that there are important differences in perspectives. The print media used lay designations to describe the non-medical use of methylphenidate (e.g., smart pill) and enthusiastic terms used to describe its potential enhancement effects (e.g., wonder drug). Our discourse analysis revealed diverging claims about the frequency and acceptability of non-medical methylphenidate use. The print media provided overall detailed descriptions of who, where, and when methylphenidate was used non-medically and also how students were procuring methylphenidate for such uses. The ethical discussion surrounding the non-medical use of methylphenidate was most comprehensive in the bioethics literature. Overall, we found signs of ambivalence regarding issues like the fairness and justice of cognitive enhancement. In contrast, there was a clear stand against non-medical uses of methylphenidate in the public health literature. Recommendations ranging from calls for legislation to increased public education were identified in all three sources of discourse but challenges were only identified and discussed in the print media and in the bioethics literature.

The results of this thesis bring to the forefront a number of themes that merit further discussion. One of our key findings was that there are gaps between different paradigms regarding the future of non-medical uses of

neuropharmaceuticals for cognitive enhancement. These discrepancies can create ethics "blind spots" with important ethical consequences. Any of these discourses taken individually provides an incomplete perspective of cognitive enhancement making a comprehensive ethical analysis difficult. Another obstacle is the lack of agreement on fundamental aspects (e.g., the portrayal of cognitive enhancement, risks and benefits of the non-medical use of methylphenidate for cognitive enhancement and key ethical issues) which complicates interdisciplinary analysis. Most importantly, diverging discourses often ignore important topics. First, the history of neuropharmacology in psychiatry has shown the importance of social context in relation to neuropharmacology, the thorough investigation of efficacy and safety as well as the commercial interests that surround the use of neuropharmaceuticals. Second, given the potential for broad demand for cognitive enhancement, public health approaches need to be examined. Finally, potential avenues for future work on cognitive enhancement are proposed. Accordingly, this general discussion aims to address these four topics to set a basis for further reflection upon the non-medical use of neuropharmaceuticals for cognitive enhancement.

Lessons for enhancement from the history of neuropharmacology

Antecedent in use of neuropharmacology

Cognitive enhancement of healthy individuals has some roots in the development of pharmacological therapy in psychiatry. The use of substances to alter mental states is an old practice rooted in both medicine and cultural

tradition. For example, the effects of alcohol, opium and hemp are present in the historical accounts of many ancient cultures and may be viewed as crude forms of cognitive enhancement [129]. The use of drugs based on a biological understanding of mental illness is a fairly recent practice in psychiatry beginning in the mid 19th century with morphine for the treatment of neuralgic pain. Later, in the early 20th century barbiturates, more specifically phenobarbitol, were the all-purpose psychiatric drugs [12]. Up until the mid 20th century, psychiatrists were hesitant to use medication other than as a last resort [14]. However, in the 1950s, the discovery of an effective antipsychotic, chloropromazine (Thorazine), gave psychiatry its first blockbuster drug [14]. Establishing a link between the biological and the behavioral provided new avenues for treatment in psychiatry.

The possibility to treat mental illness biologically set the tone for an increase in demand for psychiatric drugs and contributed to the interest in modifying mental states with neuropharmacology. This can be illustrated by production and prescription of neuropharmaceuticals in recent years. For example, from 1990 to 2000 production of methylphenidate (Ritalin) increased nearly 900%. The production of amphetamines (Dexedrine and Adderall) increased 5 767% in the period between 1993 and 2001 [61]. The production of other neuropharmaceuticals experienced similar increases. Between 1993 and 2001 the number of antidepressant prescriptions in the US rose 400% from 6.8 million to 35.0 million [37]. In a profile of the consumption of prescription drugs in Québec, the Régie de l'assurance maladie du Québec (RAMQ) showed

that in 2000, 19.4% of individuals under 64 years old covered by the drug plan had prescriptions for drugs acting on the central nervous system [3]. The 2000 percentage represents a 4.6% increase from 1998.

As explained in Chapter 1, the treatment-enhancement distinction for some psychiatric conditions is not always clear since the divide between health and some common disorders can be blurry (e.g., depression and AD/HD). The burgeoning market for lifestyle drugs, as described in Chapter 1, encourages consumers to reach their potential with pharmaceuticals. This is not to say that there is a proven direct link between the rise of prescriptions and cognitive enhancement. However, one study uncovered that a high rate of diversion existed for stimulants used in the treatment of AD/HD [104] and many other types of prescription drugs are being diverted to black markets in Canada [60]. Thus, contextual factors like availability, desirability and market interests in lifestyle drugs may have begun to shape the landscape for a phenomenon like cognitive enhancement.

The wider use of psychiatric drugs to treat mental illness brought neuropharmacology to new populations but also unveiled more of the risks associated with them. The subsequent popularity of psychiatric drugs such as the anti-anxiolitic meprobamate (Miltown) in the 1950s and 1960s, the anti-depressant fluoxetine (Prozac) in the 1990s and the stimulant methylphenidate (Ritalin) in the 2000s brought neuropharmacology to a broader public. Yet with each breakthrough came debates about the continued use of these drugs. In the 1970s meprobamate was thought to be addictive which lead to a US Senate

investigation on the addictive potential of benzodiazepines [144]. In the early 1990s, research linked fluoxetine to suicidal thoughts in depressed patients causing a media backlash [72]. Intermittent debates, beginning in the late 1980s, about the side effects of methylphenidate spurred several unsuccessful lawsuits and more media involvement [122]. The debate surrounding the risks of the medical use of methylphenidate in AD/HD is ongoing [46, 138]. These issues alerted the public to the risks associated with neuropharmacology but enthusiasm for it persisted despite findings about serious side effects like addiction.

Importance of these lessons for cognitive enhancement

History may be repeating itself in the case of cognitive enhancement of healthy individuals with neuropharmaceuticals. Our results indicate that using MPH for enhancement is already considered an integral part of social practice in some discourses. They also show that some media reports like the ones examined in Chapter 5 consider MPH comparable to "traditional" methods of enhancement that are acceptable such as consuming caffeine. Combined with praise of methylphenidate as a "miracle drug", this perceived social integration can build fervor for cognitive enhancement. Scientific data on the effect of cognitive enhancers on healthy individuals is currently scarce as will be explained later. Enthusiasm for cognitive enhancement without sufficient data to support it may invite similar situations to those in the history of neuropharmacology where the important side effects were discovered following

widespread use. However, such unfortunate situations may also be prevented by learning from the examples of meprobamante, fluoxetine, and methylpenidate.

What we have learned?

One important lesson that the medical and ethics communities have learned from prior experience with neuropharmacology is the importance of foresight. The abuse potential of benziodiazepines was recognized by media reports and lay sources in the late 1960s. It was only in 1975 that some benzodiazepines became Schedule IV substances in the US [78]. In 1979, almost two decades after meprobamate treated America's anxiety problems the US Senate intitiated its investigation on the "Use and Misuse of Benzodiazepines" [144]. In contrast to discussion about the effects of benzodiazepines, official inquiries into the ethical and social dimensions of cognitive enhancement have begun early. Governmental and academic institutions in the UK have spearheaded initiatives to examine the future of enhancing the cognition of healthy individuals. In 2005, the UK government launched The ForeSight Programme as a way to address future social and economic challenges with new technologies. Cognitive enhancement with neuropharmaceuticals was on the agenda for this project [67]. In 2007 the ethics department of the British Medical Association issued a report entitled *Boosting your brainpower: ethical aspects of cognitive enhancement.* In Québec, the *Commission de l'éthique de la science et technologie* (CEST) is studying recent increases in the use of neuropharmaceuticals and the ethics of their extended

use for enhancement. The CEST is interested in which values are involved in using neuropharmacology for enhancement, how to ensure informed consent and whether it is a public or private matter.[2] The CEST's report is slated for release at the beginning of 2009. The bulk of prevalence studies on the abuse of methylphenidate are recent dating from 2000. Now that some recent information about the phenomenon is available it is timely to move forward with further ethical analysis. These reports have begun to tackle this task and some topics need particular attention like the importance of social context, safety and efficacy, and commercial interests associated with cognitive enhancement of healthy individuals.

Importance of social context

When debating the merits and risks of a phenomenon like the non-medical use of methylphenidate for cognitive enhancement, it is imperative to be aware of the social context in which it emerged. The rise of meprobamate to treat anxiety was linked to, "an era of unprecedented prosperity but also of uncertainty: suburban bomb shelters, duck-and-cover drills, expansion, a baby boom" [144]. Similarly, the rise of methylphenidate has been associated with a change in "societal pressures and public attitudes toward attention and behavior problems in children and adults" [46]. Ethical reflection upon cognitive enhancement should involve a concurrent awareness of its social context to better understand the nature of the phenomenon and make recommendations

[2] http://www.ethique.gouv.qc.ca/Avis-sur-la-neuropharmacologie.html: December 4, 2008.

accordingly. The importance of social awareness is illustrated by Kramer's statement in his book *Listening to Prozac:* "The operational definition of wellness must be in relation to the demands an goals of society, here and now" [72]. Not only does social context first modulate the definition of health on the treatment-enhancement spectrum but it also affects other issues. For example, coercion of individuals to use cognitive enhancers is often cited as an issue in boiethics [51, 62, 86]. It was also identified as an important issue in the results of the discourse analysis presented in Chapter 5. However, the nature of coercion is vague without an indication of what causes this coercion and what stakeholders stand to gain. Both of these aspects are partly shaped by social context. Accordingly, before building a framework for cognitive enhancement, it is important that ethical discussion be guided by an awareness of its social context. However, this could pose a real challenge given the favorable opinions of influential bioethicists who emphasize the role of personal choice and individual rights in the choice to enhance cognition [59]. Gaining insights into the context of a non-medically approved and possibly socially sanctioned practice like cognitive enhancement will be challenging.

Efficacy and safety

The use of methylphenidate for cognitive enhancement as discussed in Chapter 5 raises important issues in terms of efficacy and safety which merit discussion in the broader debate on cognitive enhancement. Society's relationship to technology has already been discussed. However, it is also

important to note that interest in new technologies arise from society's assumption that they are valuable. Unfortunately, this "over-valuation" [115] may sometimes be independent of scientific evidence. To date, the benefits of cognitive enhancement for healthy individuals appear to be based on media reports and a few scientific studies. Furthermore, Lanni *et al*. argue that:

> From a pharmacology point of view the fact that a drug is clinically used to treat an attention disorder or a cognitive problem does not necessarily mean that a high level of the relevant molecule would produce a high performance in a normal individual [74].

Before rallying behind cognitive enhancement and most definitely before any kind of regulation or approval is put forward, current scientific data must be assessed and interpreted carefully.

There are few studies on the effects of cognitive enhancers on healthy individuals¸. It is important to describe in some detail the findings of these studies to capture how the results may be limited in their potential to be generalized and support favorable opinions toward the cognitive enhancement of healthy individuals. For example, Elliott *et al.*'s often-cited, double-blind, placebo-controlled study involved twenty-eight healthy male volunteers. Subjects were asked to perform a series of cognitive tasks focusing on spatial working memory and planning as well as attention and fluency. The results did show that methylphenidate improved performance on spatial working memory and planning but not on attention and fluency tasks. In addition, they showed that methylphenidate did not enhance performance tasks that had already been

learned [48]. The study conducted by Mehta *et al*. investigated changes in regional cerebral blood flow to also indicate that methylphenidate enhances spatial working memory. This study was on ten right-handed healthy male volunteers [87]. Barch *et al*. obtained results similar to Elliott *et al.* and Mehta *et al*. finding that amphetamine enhanced the spatial working memory of twenty-two healthy controls [13]. Contrarily to the three previous studies, Bray *et al*. reported that methylphenidate did not enhance the cognition of sleep-deprived individuals. Ten young healthy males and ten young healthy females were asked to perform four cognitive tasks testing short-term memory, attention, motor speed and motor flexibility after a period of sleep-deprivation [21]. Farah *et al*. examined the effect of Adderall upon creativity, a component of cognition stimulants are suspected of stifling. In this double-blind, placebo-controlled trial on sixteen young healthy volunteers they observed that the drug indeed enhanced creativity. However, the amount of enhancement depended upon the baseline performance of individuals: lower-performing individuals were more enhanced than high-performers [50]. These five studies indicate that stimulants have the potential to enhance certain elements of cognition but are not universal enhancers. The conflicting and fragmented results of these few studies provide very limited support for the enthusiastic portrayals of cognitive enhancement.

The studies mentioned above are preliminary steps in terms of assessing the benefits of using neuropharmaceuticals for cognitive enhancement in healthy individuals but there are many points that need further clarification.

First, these studies need to be reproduced to confirm their results with uniform tasks to facilitate comparison and show robust beneficial effects. Second, the sample sizes must be larger and more diverse to generate data that could be generalized. Third, the sample populations must be more heterogeneous. Farah *et al*.'s study showed that the effect of a cognitive enhancer may vary indicating that there may be an "enhancement ceiling". If this is the case, then this kind of technology may be less valuable than some expect because it would not be as powerful as originally thought. Also, variable efficacy would result in certain types of individuals being unable to enhance themselves thus perpetuating the debates on justice because of unequal access. Fourth, cognitive enhancement could become a long-term habit. For example, the survey on cognitive enhancement conducted by *Nature* revealed that respondents used cognitive enhancers on daily, weekly and monthly bases in almost even proportions [79]. Given potential chronic use of cognitive enhancers, their long-term effects must be assessed. Presently, for treatment with methylphenidate lasting more than four weeks, it is strongly recommended that the treating physician regularly reevaluate the prescription for methylphenidate [29]. Another question arising from long-term use is the abuse potential of methylphenidate. In the laboratory setting, methylphenidate has been shown to have an abuse potential [39, 71, 147, 148]. Possibly the most interesting aspect of the data needed to support enhancement is how this kind of research can be ethically conducted on healthy individuals. Not only do researchers need to think of ways to prove the efficacy and safety of cognitive enhancers but they are also presented with the challenge

of doing it within current research ethics frameworks, namely in justifying potential risks and adverse effects in healthy individuals .

Commercial interests

Cognitive enhancers for healthy people create a potentially lucrative market for holders of their patents. Therefore commercial interests behind enhancement need to factor into discussions about its future. Our results show that commercialization of cognitive enhancement products was an important issue in the bioethics literature yet it is not emphasized in two of major reports to date (e.g., the British Medical Association and the UK ForeSight project). Given the profits that stand to be generated from expanded use of cognitive enhancers in healthy people, issues of commercialization should be addressed. This is particularly true given that public discourses can be shaped by such interests as described in Chapter 1.

The pharmaceutical industry will have a big stake in the cognitive enhancement of healthy individuals with pharmaceuticals and consequently it is important that research and marketing be managed transparently. Drug companies have previously received harsh criticism for allegedly exploiting the blurry line between treatment and enhancement in order to sell their products [30]. As discussed in Chapter 1, this allegation may be related to the growing market for lifestyle drugs where some lifestyle preferences are considered healthcare. It is unclear how this kind of marketing has influenced consumption of pharmaceuticals for enhancement thus far but it is likely to play an important

role in the future. Since cognitive enhancement as it is discussed in this thesis will involve healthy people, pharmaceutical companies may consider ways of responsibly researching and marketing cognitive enhancers.

Two topics come to mind when reflecting upon transparency in the pharmaceutical industry. The first topic is relative to research. As with any pharmaceutical it is important to adequately elucidate the risks of taking the medication. The case of refecoxib (Vioxx) is a cautionary tale about the necessity of researching and reporting risks. In 2005 Adderall, a stimulant used to control the symptoms of AD/HD was pulled from the Canadian market, "due to safety information concerning the association of sudden deaths, heart-related deaths, and strokes in children and adults taking usual recommended doses of Adderall® and Adderall XR®" [27]. A report later recommended that the stimulant be put back on the market due to lack of evidence that Adderall posed more risk for sudden death than any other stimulant [76]. However, a study by Cheng *et al*. shows that the sudden withdrawal of Adderall caused concern among patients and their families [38]. This example does not mean to imply that Shire hid the cardiac risks of Adderall. Rather what it suggests is that given the elective nature of cognitive enhancement it is unclear why such risks be incurred by healthy individuals. Thus, pharmaceutical companies need to be certain that they can stand by claims of risk or lack thereof associated with marketed cognitive enhancers and this process needs to be honest and independent from commercial pressures.

In addition to risk, the benefits need to be realistically communicated and the complexity of this is well exemplified by the new generation of selective serotonin reuptake inhibitors used as antidepressants. An important and authoritative review by Kirsch *et al*. reported that out of thirty-five clinical trials for antidepressants examined, "overall effect of new generation antidepressant medications [was] below recommended criteria for clinical significance" [70]. Furthermore, the effect of the antidepressants was shown to vary depending upon the initial severity of the depression being treated. These findings suggest that antidepressants which are currently on the market may not be as efficacious as thought to be yet they are still being used in patients. Another study examined the publication of results from clinical trials on antidepressants registered with the US Food and Drug Administration (FDA) [145]. Turner *et al*. reported that out of seventy-four clinical trials registered with the FDA the results of 31% of the studies remained unpublished. In conjunction to the recommendation made above about elucidating the efficacy of cognitive enhancers on healthy people, the data resulting from this research needs to first be divulged regardless of the results being positive or negative. Whichever the case, the results also need to be divulged realistically to avoid overstating efficacy and understating risks. Such issues in reporting the results of clinical trials might be taken into consideration when marketing cognitive enhancement products to give a fair and honest depiction of benefits.

Responsible marketing is an important topic in the commercialization of pharmaceuticals. Marketing of pharmaceuticals sometimes "widens the

boundaries of illness [and] grows the markets for those who sell and deliver treatments" [93]. Some have called such creation of new medical conditions "disease mongering" [93]. One example of a condition that was allegedly mongered is that of social phobia. The antidepressant paroxetine (Paxil) obtained FDA approval after it was used off-label to treat this disorder. However, critics were skeptical about the way a normally shy person may be diagnosed with social phobia now that there seemed to be a biological treatment for it [14]. Another example of alleged disease mongering is restless leg syndrome. Originally a dopamine agonist used in the treatment of Parkinson's disease, ropinirole (Requip) was found to be effective in calming an impairing urge to move one's legs [158]. Again, it is difficult to determine whether an individual who feels the urge to move their legs has restless leg syndrome or is jittery. Whether cognitive enhancement of healthy individuals will be considered a part of health or sickness is still unclear. Ultimately, access to cognitive enhancement would likely alter what is considered to be health and wellness. In the future, should enhancers be available to consumers, the need for cognitive enhancement would have to be carefully framed and communicated in order to fit the definition of health of the time.

Proper description of the benefits of cognitive enhancers is essential if they are to be available to the public. Markets for lifestyle drugs are growing. Some of the pharmaceuticals used for enhancement such as methylphenidate are only available through prescription. However, the public is increasingly exposed to drugs with enhancing properties. One route of this exposure is

direct-to-consumer advertising (DTCA). DTCA of prescription drugs has been linked to more requests for advertised pharmaceuticals and more prescriptions [91]. Currently, DTCA of prescription drugs is prohibited in Canada but permitted in New Zealand and the United States [90]. Therefore if cognitive enhancers are only available through physicians Canadians may be somewhat less exposed to the effect of DTCA. However, they are not likely to be shielded from DTCA present on the Internet or during radio and television broadcasts originating from countries where DTCA is permitted. There is a significant amount of neuroproducts marketed online ranging from neuroimaging services to neuropharmacology [113]. Research indicates stimulants are available online without a prescription [126]. For example, a recent Google search simply using the term "buy Ritalin online" yielded 407,000 hits. Out of the first one hundred hits, sixty of them were to online pharmacies selling the stimulant. The results in Chapter 5 show that some university students who use methylphenidate obtain it from online pharmacies. Racine *et al.* identified some important issues associated with obtaining neuroproducts over the Internet. First, gaps in regulations "leave the DTCA field open to questionable practices" such as the presentations of enthusiastic testimonials combined with the overstatement of health-related effects of natural neuroproducts which have not been scientifically tested and possibly the understatement of risks and insufficient information about contraindications [113]. Second, neuroproducts bought over the Internet bypass healthcare providers and consumers may therefore be lacking information as well as medical supervision. Last, there is a concern for

neurological and psychiatric patients which may also be extended to people seeking enhancement. These populations may be vulnerable in a venue where they have the opportunity to self-diagnose and self-medicate without medical supervision. In the future the Internet could play a larger role in the marketing and selling of cognitive enhancers emphasizing the need to properly research and realistically represent their effects to the public.

A potential role for public health

Many ethical and social issues are associated with the non-medical use of neuropharmaceuticals for cognitive enhancement of healthy individuals but it is unclear whether this phenomenon is currently a matter of public health or not. The 2007 report on enhancement from the British Medical Association discussed whether a role for public health was timely but did not conclude on the subject. Results of Chapter 5 showed that the relevance of public health interventions in the future of the cognitive enhancement of healthy people is a matter of perspective (and semantics). The lifestyle and enhancement paradigms, which focus on the benefits of cognitive enhancement, would most likely not consider cognitive enhancement a matter of public health but an individual's prerogative. On the other hand, the prescription drug abuse paradigm which compares the non-medical use of methylphenidate for cognitive enhancement to a form of illicit drug abuse might suggest public health action. A closer look at cognitive enhancement practices with

methylphenidate (and other neuropharmaceuticals) may reveal the need for public health interventions.

The prescription abuse paradigm considers the non-medical use of methylphenidate for cognitive enhancement to be happening outside of the confines of medicine. Several aspects of Health Canada's definition of prescription abuse are present in the way methylphenidate is used for cognitive enhancement. For example, the non-medical use of methylphenidate is associated to the increased risk for harm, obtaining drugs from illegitimate sources, risky patters of use, deviation from medical practice and non-therapeutic use [28]. With regard to cognitive enhancement with methylphenidate, the major concern is the last aspect of the definition, the non-therapeutic use of a drug and how it leads to the other elements like obtaining the drug from illegitimate sources and risky patterns of use. Consequently, doctors are potentially being eased out of their role as "gatekeepers" to these types of drugs as suggested by Chatterjee [35]. Unfortunately, it is not well-known if all healthcare providers are aware of the prevalence of the non-medical use of methylphenidate and other neuropharmaceuticals for enhancement or if they would feel concerned at all. A survey of general practitioners on the subject of enhancement with pharmaceuticals in the *Scandinavian Journal of Public Health* indicated they may not. Bergstrom and Lynöe showed that general practitioners were not open to the use of prescriptions for enhancement purposes [18]. This position is reflected by only 17.6% of general practitioners being in favor of enhancing concentration of

healthy individuals as opposed to 32.7% approval in the general public. General practitioners were more willing to improve mood (22.8%) but less willing to improve memory (8.7%). However, both general practitioners and the general public are unwilling to have society fund the use of pharmaceuticals for the enhancement of healthy individuals. These results reflect that healthcare providers may generally not be aware of the prevalence of the non-medical use of pharmaceuticals for enhancement and that they potentially perceive enhancement to be outside the boundaries of medicine. As discussed in Chapter 1, the medical field may consider cognitive enhancement to be outside of the realm of healthcare yet some aspects of the phenomenon may call for public health interventions. This creates puzzling situation where healthcare providers' view of cognitive enhancement as a non-medical practice curtail a fuller analysis of its public health implications.

Mainstream healthcare may be more involved in the cognitive enhancement of individuals than it appears at first glance or that is openly acknowledged. Chapter 5 presented evidence that methylphenidate was obtained using a host of methods. Some, like trafficking among students, black markets, Internet pharmacies and theft may not directly involve the healthcare system. However, there were also reports of students feigning symptoms of AD/HD in order to obtain legitimate prescriptions. Healthcare providers could therefore be involved in the phenomenon without knowing it because students could seek cognitive enhancement under the auspices of feigned mental illness. Further, the British Medical Association's report on cognitive enhancement

recognizes that “Modern-day healthcare also includes some interventions where the aim is more explicitly to improve aspects of quality-of-life” citing examples such as oral contraception, and hair-loss treatments [22]. However, even when the pills are obtained on the black market they still, most likely, were paid for by a patient’s health insurance. Consequently, the use of medical personnel and financial resources for cognitive enhancement of healthy individuals could be putting a strain on healthcare systems. Viewed in this light, users of cognitive enhancers may actually be inviting public health action by slowly grafting their needs to medicine by using medical resources and expanding the goals of medicine.

The last point to consider about the role of public health in cognitive enhancement has more to do with the “public” aspect of public health. Though the decision to use a cognitive enhancer may be up to the individual, the effects of the enhancement loom much larger. The choices of individuals may be impacting collective practice which makes the subject of cognitive enhancement a public matter. In Chapter 5, one of the important ethical issues evoked in all discourses was the changing of social practices and institutions due to cognitive enhancement. The non-medical use of methylphenidate for cognitive enhancement by healthy individuals has been perceived to be promoting competition and favoring of quick fixes to enhance performance. If social practices are indeed tending toward valuing cognitive enhancement, important issues of autonomy and coercion may come to the forefront. Discussions about cognitive enhancement in the workplace have begun [4,

151]. Unlike previous public health efforts like the reduction of smoking and obesity, the social changes brought forward by cognitive enhancement could be difficult to modify since they reside mainly in the mood and behaviors of individuals.

Public health action for the prevention of the non-medical use of pharmaceuticals for cognitive enhancement faces some important challenges. It is important that healthcare professionals become more aware of the non-medical use of pharmaceuticals for cognitive enhancement. However, data from the US National Institutes of Health shows that over 40% of physicians have difficulty addressing the subject of prescription abuse with their patients. For physicians, the subject of prescription abuse appears to be even more difficult to tackle than stigmatized conditions like depression and alcoholism [94]. The burden of responsible management of prescriptions may well fall on healthcare professionals and patients alike but the reality is that physicians have little or no control over what is done with prescriptions when patients leave their offices. The *Ministère de la Santé et des Services Sociaux* has been promoting the proper use of medications in Québec with its campaign "Using Medication: If and as required!".[3] The concern, of course, is whether any amount of education on the harms of prescription abuse for lifestyle purposes can trump social pressures to perform at the root of the need for enhancement. Lastly, in raising awareness among the public with regard to cognitive enhancement

[3] http://publications.msss.gouv.qc.ca/acrobat/f/documentation/2004/04-999-43a.pdf
Access date: December 7, 2008.

public health faces a possible conflict of values. On one hand, public health action aims to prevent practices that are potentially harmful to the public's health like taking a pharmaceutical without a prescription. On the other hand, raising awareness may inadvertently promote forms of cognitive enhancement of healthy individuals. Public health interventions will need to carefully consider whether they will decide to play a role in cognitive enhancement. If they do they will be faced with the decision of which strategy would benefit the public in a context where the phenomenon of cognitive enhancement with neuropharmaceuticals progresses.

Future of enhancement

This general discussion has outlined some topics that merit further reflection to help elucidate the future directions of ethical discussion of the cognitive enhancement of healthy individuals with neuropharmacology. So far the directions have included awareness of social context, further research into efficacy and safety of neuropharmaceuticals in healthy people, transparency in commercialization and a possible role for public health. It is unclear how further discussion of these points will impact actual practices. However, it would be unfortunate if scholarship resulting from meaningful ethical deliberation remained academic. As mentioned in the previous section there is a risk of promoting cognitive enhancement of healthy individuals by bringing the public's attention to it. However, censoring information about cognitive enhancement may not be any more beneficial. On the contrary, making

information about the ethics of cognitive enhancement available to stakeholders may add new dimensions to current discourses.

There are various stakeholders that could positively contribute to the ethical deliberation on cognitive enhancement and several reasons why their input would be beneficial. The general public represents a large and diverse group but before tackling the general public as a large group, it can be broken up into stakeholders. For the phenomenon of the non-medical use of methylphenidate these stakeholders include (at least) university students, parents of university students, healthcare providers, professors and educators, researchers, the media, the pharmaceutical industry, community groups and policy makers. Hardly any research exists regarding stakeholder perspectives on cognitive enhancement, a phenomenon gaining considerable prevalence. Examining stakeholder discourses would add richness and depth to deliberations on cognitive enhancement notably the issues of social pressure and the acceptability of the phenomenon. Blakemore has argued that gathering stakeholder perspectives contributes to the "empowerment of people to participate in public discussion and debate about where science should go and how technology should be applied" [19]. In the wake of an aging population, cognitive enhancement of otherwise healthy individuals may be an important component for the "mental wealth" of future societies which includes "mental capital" and "mental well-being" [17]. In fact, the motivation behind the UK ForeSight project is to examine the mental capital, i.e., cognitive and emotional resources, as well as the mental well-being i.e., ability of an individual to

realize their potential while working productively and creatively, of the aging population. In Chapter 5, different discourses yielded various recommendations for ways to prevent the non-medical use of methylphenidate for cognitive enhancement. These recommendations involved the participation of many of the aforementioned stakeholder groups. For example, it was suggested that healthcare providers modify prescription practices, the public comply with prescriptions, students learn more effective study habits instead of using cognitive enhancers and policy makers introduce legislation to ban or legalize enhancers. Therefore, if policy makers are to implement some of these recommendations it may be suitable to start engaging the stakeholders that are involved in such approaches.

Strategies to prevent the further non-medical use of methylphenidate for cognitive enhancement were suggested. However, what is needed is broader public discussion before the implementation of these interventions to avoid ineffective, hasty or inadequate approaches. Several models for public engagement already exist and may provoke broader public discussion on cognitive enhancement. The UK is one of the countries at the avant-garde in engaging the public in science discussions. The UK government has done several surveys to assess the public's general science knowledge and to develop broader public discussions. One government taskforce for the promotion of public engagement even made it mandatory for holders of public funds to involve the public in activities relative to their research. However, after a series of events like the spread of AIDS, outbreaks of mad cow disease and debates

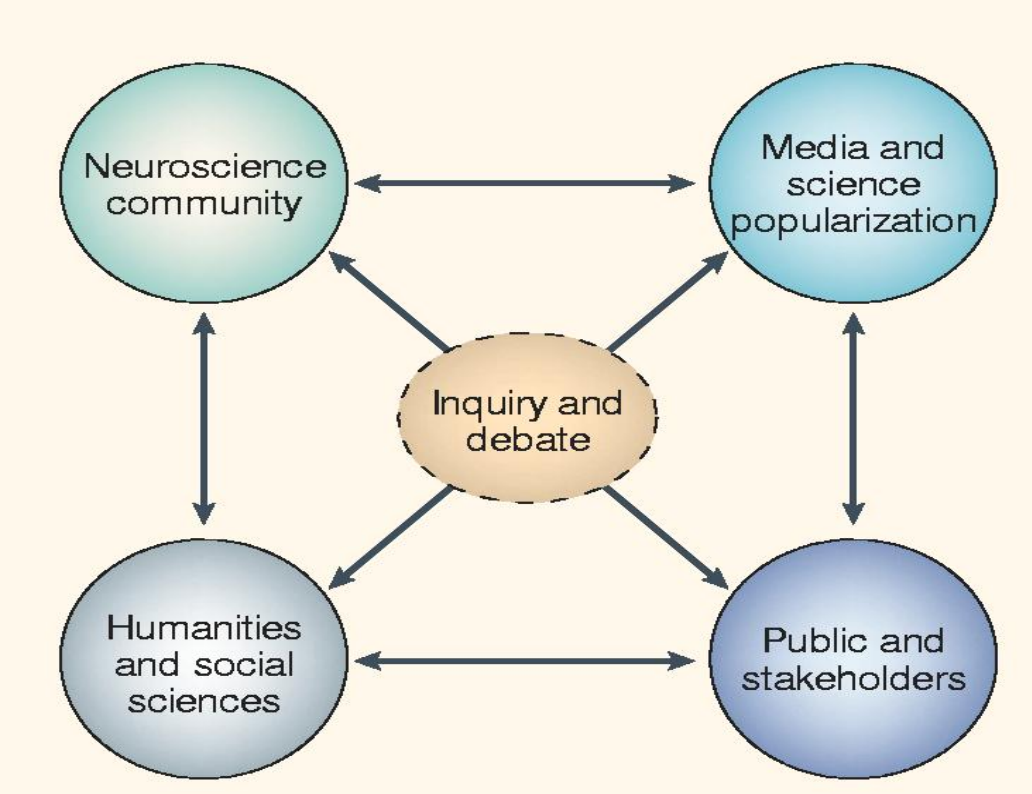
over genetically modified foods the UK public became distrustful of science. A marketing pole done in 1996 showed that scientists were among the most mistrusted professions just above journalists and politicians. The survey also showed that the public was especially critical of scientists with commercial ties [19]. Another survey from 2000 showed that there has been a shift in attitude producing a "crisis of confidence in science among the public" but that this crisis has "produced a new mood for dialogue" [19]. The UK public now participates in events like SciBars, discussions held in bars or cafés lead by leading experts in scientific topics of interest. A similar model is used by the Bar des Science in Québec[4] and more recently the Canadian Institutes of Health Research (CIHR). The CIHR Café Scientifique sessions are held all over the country[5]. Similar events have been organized by the Groupe de Recherche en Éthique Biomédicale (GREB) at the Université de Montréal namely a citizen's conference on the genome[6]. While venues like SciBars offer a good opportunity to instruct the public they are not necessarily being engaged during deliberative processes.

Public engagement is more than just informing the public. It is listening to public voices to make a difference. Racine *et al*. have proposed a model where inquiry and debate on a given scientific development is at the center of a multi-dimensional communication between the scientific community,

[4] http://www.bardessciences.qc.ca/ Access date: December 15, 2008.
[5] http://www.cihr-irsc.gc.ca/e/34951.html Access date: December 8, 2008.
[6] http://www.bioethique.umontreal.ca/GREB_PROD/index_fichiers/Page480.htm : Access date: December 15, 2008.

humanities and social science, the media as well as the public and stakeholders [108]. With this model, knowledge about advances in neuroscience, or any other branch of science, does not end when it reaches the public. Instead, public perceptions and opinion are fed back up the chain of knowledge to instruct the scientific community about what the public has understood about its work. Possibly the most interesting aspect of this model is that not only is there dialogue between scientist and the public but across other groups involved. For example, the humanities and social sciences can weigh in on scientific question but they can also examine the media's coverage of it and the public's appreciation of the questions. The multi-directional aspect of this model makes it an interesting way to engage stakeholders in ethical discussion of a phenomenon like cognitive enhancement which impact many groups.

Figure 6-1: Racine *et al.*'s multi-dimensional model for communication in neuroscience



This model is one of the many models proposed to set the stage for more deliberative ways to engage the public in science discussions. There are a few concrete examples that can provide guidance on how multi-directional approaches could be implemented. For example the "Citizen Voices Forums" organized by the *Philadelphia Inquirer* is a model created by the National Issues Forums and the Kettering Foundation [143]. During these forums, citizens from different stakeholder groups assemble and form working groups. Each group generates its own set of recommendations for a range of policy options on a certain scientific issue. The process is a deliberation in opposition

to a debate because no winner emerges from these forums. Instead, everyone involved participates and gains a better understanding of how other groups experience the scientific issue at hand.

The models for public engagement outlined above may be interesting options for public engagement on the subject of cognitive enhancement. More interaction between stakeholders may foster understanding of some of the topics mentioned earlier in this discussion. For example, students could express the social pressures they are facing which contribute to a perceived need for enhancement. Scientists and healthcare professionals could explain the current state of knowledge about the efficacy and safety of cognitive enhancers to populations who use them. Scientists and healthcare professionals can also join forces with the pharmaceutical industry to promote transparency. Dialogue between stakeholders could be complementary to public health actions. Enhanced communication between stakeholders may even impact media reporting on cognitive enhancement providing a richer and broader spectrum of perspectives. Broader public discussion and multidirectional communication approaches will not solve all issues. However, they hold the promise of extending current discussion beyond academia to ensure that democratic processes shape the future uses of neuroscience and neurotechnology.

Conclusion

Discourses on the non-medical use of neuropharmaceuticals for the cognitive enhancement of healthy individuals are complex. The extent of this complexity becomes clearer when looking at the number of ethical and social issues that are raised by this phenomenon. Such issues can have effects at an individual level when considering potential changes in personhood and autonomy. They can also have broader implications on social practices and institutions such as healthcare and education. Noticeable differences in discourses may create "ethics blind spots" when we could actually benefit from concerted deliberation of the ethics of cognitive enhancement. However, identifying divergence between discourses may be a first step in fostering this kind of deliberation.

It is important to note that the materials examined in this thesis reflect mainly a North American perspective of the non-medical use of neuropharmaceuticals for the cognitive enhancement of healthy individuals. Chapter 6 stressed the importance of social context in relation to a phenomenon like this one. While the results of this thesis are highly relevant locally, they may not be applicable per se at an international level where perspectives are likely to differ. Varying concepts of health, distinct patters of pharmaceutical use, and cultural and social underpinnings of ethics are some of the potential variables. Hence, further understanding of the emergence and importance of the non-medical use of neuropharmaceuticals for the cognitive enhancement of healthy individuals may become clearer when international contexts are better examined.

The results and general discussion of this thesis on the ethics and public understanding of the non-medical use of neuropharmaceuticals for cognitive enhancement have created a lengthy task list for the future of bioethics. Public understanding and public engagement were discussed extensively in Chapters 1 and 6, respectively. Future research could be directed at assessing the public's current understanding of the non-medical use of neuropharmaceuticals for cognitive enhancement. Asking relevant questions like whether the public considers the non-medical use of neuropharmaceuticals as prescription abuse or a lifestyle choice or even whether they feel pressured to engage in performance enhancement may help resolve some of the ethical issues evoked in academic and lay discourses. Data from public understanding research would help determine what kind of public health action is appropriate in the wake of a phenomenon that is likely to gain prevalence in a context of increased pressures for performance.

References

[1] Controlled Drugs and Substances Act. 1996.
[2] 2007. Enhancing, not cheating. *Nature* 450: 320.
[3] Régie d'assurance maladie du Québec (RAMQ). 2002. Portrait quotidien de la consommation médicamenteuse des personnes de 64 ans ou moins. Les 9 juin 1996, 7 juin 1998 et 11 juin 2000.
[4] Appel, J.M. 2008. When the boss turns pusher: a proposal for employee protections in the age of cosmetic neurology. *Journal of Medical Ethics* 34: 616-8.
[5] Arria, A.M., Wish, E.D. 2006. Nonmedical use of prescription stimulants among students. *Pediatric Annals* 35: 565-71.
[6] American Psychiatric Association. 1968. *Diagnostic and Statistical Manual of Mental Disorders*. 2nd ed. Washington DC: American Psychiatric Association.
[7] American Psychiatric Association. 1980. *Diagnostic and Statistical Manual of Mental Disorders*. 3rd ed. Washington DC: American Psychiatric Association.
[8] American Psychiatric Association. 1987. *Diagnostic and Statistical Manual of Mental Disorders*. 3rd Revised ed. Washington DC: American Psychiatric Association.
[9] American Psychiatric Association. 2000. *Diagnostic and Statistical Manual of Mental Disorders*. 4th Text Revision ed. Washington DC: American Psychiatric Association.
[10] Atkinson, T. 2002. Lifestyle drug market booming. *Nature Medicine* 8: 909.
[11] Babcock, Q., Byrne, T. 2000. Student perceptions of methylphenidate abuse at a public liberal arts college. *Journal of American College Health* 49: 143-5.
[12] Ban, T.A. 2001. Pharmacotherapy of mental illness--a historical analysis. *Progress in Neuropsychopharmacology & Biological Psychiatry* 25: 709-27.
[13] Barch, D.M., Carter, C.S. 2005. Amphetamine improves cognitive function in medicated individuals with schizophrenia and in healthy volunteers. *Schizophrenia Research* 77: 43-58.
[14] Barondes, S.H. 2003. *Better than Prozac: Creating the next generation of psychiatric drugs*. Oxford: Oxford University Press.
[15] Barrett, S.P., Darredeau, C., Bordy, L.E., et al. 2005. Characteristics of methylphenidate misuse in a university student sample. *Canadian Journal of Psychiatry* 50: 457-61.
[16] Bayer, K. 2004. Students taking danger drug to help with exams, in *The Express*.
[17] Beddington, J., Cooper, C.L., Field, J., et al. 2008. The mental wealth of nations. *Nature* 455: 1057-60.
[18] Bergstrom, L.S., Lynoe, N. 2008. Enhancing concentration, mood and memory in healthy individuals: an empirical study of attitudes among

general practitioners and the general population. *Scandinavian Journal of Public Health* 36: 532-7.

[19] Blakemore, C. 2007. From the *"Public Understanding of Science" to Scientists' Understanding of the Public*, in Defining Right and Wrong in Brain Science, W. Glannon, Editor. New York: Dana Press.

[20] Bostrom, N. 2008. Drugs can be used to treat more than disease. *Nature* 451: 520.

[21] Bray, C.L., Cahill, K.S., Oshier, J.T., et al. 2004. Methylphenidate does not improve cognitive function in healthy sleep-deprived young adults. *Journal of Investigative Medicine* 52: 192-201.

[22] British Medical Association. 2007. *Boosting your brainpower: Ethical aspects of cognitive enhancement*. British Medical Association: London, UK. p. 42.

[23] Bubela, T. 2006. Science communication in transition: genomics hype, public engagement, education and commercialization pressures. *Clinical Genetics* 70: 445-50.

[24] Bubela, T.M., Caulfield, T.A. 2004. Do the print media "hype" genetic research? A comparison of newspaper stories and peer-reviewed research papers. *Canadian Medical Association Journal* 170: 1399-407.

[25] Bush, S.S. 2006. Neurocognitive enhancement: ethical considerations for an emerging subspecialty. *Applied Neuropsychology* 13: 125-36.

[26] Butcher, J. 2003. Cognitive enhancement raises ethical concerns. Academics urge pre-emptive debate on neurotechnologies. *Lancet* 362: 132-3.

[27] Health Canada. 2005. *Health Canada suspends the market authorization of ADDERALL XR® , a drug prescribed for Attention Deficit Hyperactivity Disorder (ADHD) in children*. Advisory: Ottawa.

[28] Canadian Centre on Substance Abuse.2007. *Prescription Drug Abuse FAQs*. Canadian Centre on Substance Abuse. p. 10.

[29] Canadian Pharmacists Association. 2008. *Ritalin*. 39th ed. Compendium of Pharmaceuticals and Specialties Vol.

[30] Caplan, A., Elliott, C. 2004. Is it ethical to use enhancement technologies to make us better than well? *PLoS Med* 1: e52.

[31] Caplan, A., McHugh, P. 2007. *Shall We Enhance? A Debate*, in Defining Right and Wrong in Brain Science: Essential Readings in Neuroethics, W. Glannon, Editor. Washington DC: The Dana Press.

[32] Caplan, A.L. 2003. Is better best? A noted ethicist argues in favor of brain enhancement. *Scientific American* 289: 104-5.

[33] Caulfield, T. 2004. The commercialisation of medical and scientific reporting. *PLoS Medicine* 1: e38.

[34] Caulfield, T., Ogbogu, U. 2008. Biomedical Research and the Commercialization Agenda: A Review of main Considerations for Neuroscience. *Accountability in Research* 15: 303-20.

[35] Chatterjee, A. 2004. Cosmetic neurology: the controversy over enhancing movement, mentation, and mood. *Neurology* 63: 968-74.

[36] Chatterjee, A. 2006. The promise and predicament of cosmetic neurology. *Journal of Medical Ethics* 32: 110-3.
[37] Chen, Y., Kelton, C.M., Jing, Y., et al. 2008. Utilization, price, and spending trends for antidepressants in the US Medicaid Program. *Research in Social & Administrative Pharmacy* 4: 244-57.
[38] Cheng, A., Tithecott, G.A., Edwards, W.E., et al. 2007. The impact of the withdrawal of Adderall XR (long-acting mixed amphetamine salts) from the Canadian market on paediatric patients and their families. *Paediatrics & Child Health* 12: 373-8.
[39] Compton, W.M., Volkow, N.D. 2006. Abuse of prescription drugs and the risk of addiction. *Drug & Alcohol Dependence* 83 Suppl 1: S4-7.
[40] Conrad, P., Gabe, J. 1999. Introduction: Sociological perspectives on the new genetics: an overview. *Sociology of Health & Illness* 21: 505-16.
[41] Cooper, P. 2004. *Education in the age of Ritalin,* in The New Brain Sciences: Perils and Prospects, D. Rees and S. Rose, Editors. Cambridge University Press.
[42] Coveney, C.M., Nerlich, B. Martin, P. 2009. Modafinil in the media: Metaphors, medicalisation and the body. *Social Science & Medicine*.
[43] Daniels, N. 2000. Normal functioning and the treatment-enhancement distinction. *Cambridge Quarterly of Healthcare Ethics* 9: 309-22.
[44] Dees, R.H. 2004. Slippery slopes, wonder drugs, and cosmetic neurology: the neuroethics of enhancement. *Neurology* 63: 951-2.
[45] DeSantis, A.D., Webb, E.M., Noar, S.M. 2008. Illicit use of prescription ADHD medications on a college campus: a multimethodological approach. *Journal of American College Health* 57: 315-24.
[46] Diller, L.H. 1996. The run on Ritalin. Attention deficit disorder and stimulant treatment in the 1990s. *Hastings Center Report* 26: 12-8.
[47] Eaton, C. 2008. Low dose of alertness drug counters 'family fatigue'. *Nature* 451: 520-1.
[48] Elliott, R., Sahakian, B.J., Matthews, K., et al. 1997. Effects of methylphenidate on spatial working memory and planning in healthy young adults. *Psychopharmacology (Berl)* 131: 196-206.
[49] Farah, M.J. 2002. Emerging ethical issues in neuroscience. *Nature Neuroscience* 5: 1123-9.
[50] Farah, M.J., Haimm, C., Sankoorikal, G., et al. 2008. When we enhance cognition with Adderall, do we sacrifice creativity? A preliminary study. *Psychopharmacology (Berl)*.
[51] Farah, M.J., Illes, J., Cook-Deegan, R., et al. 2004. Neurocognitive enhancement: what can we do and what should we do? *Nature Reviews Neuroscience* 5: 421-5.
[52] Fischer, B., Rehm, J. 2007. Understanding the parameters of non-medical use of prescription drugs: moving beyond mere numbers. *Addiction* 102: 1931-2.

[53] Flower, R. 2004. Lifestyle drugs: Pharmacology and the social agenda. *Trends in Pharmacological Sciences* 25: 182-5.
[54] The Dana Foundation. 2003. *The Dana Guide to Brain Health*. Bloom, F., Flint Beal, M., and Kupfer, D, Editors. New York: The Dana Press.
[55] Gilbert, D., Walley, T., New, B. 2000. Lifestyle medicines. *British Medical Journal* 321: 1341-4.
[56] Glannon, W. 2007. *Bioethics and the Brain*. Oxford: Oxford University Press.
[57] Glannon, W. 2008. Psychopharmacological Enhancement. *Neureothics* 1: 45-54.
[58] Graff Low, K., Gendaszek, A.E. 2002. Illicit use of psychostimulants among college students: a preliminary study *Psychology, Health & Medicine* 7: 283-7.
[59] Greely, H., Sahakian, B., Harris, J., et al. 2008. Towards responsible use of cognitive-enhancing drugs by the healthy. *Nature* 456: 702-5.
[60] Grzybowski, S. 2004. The black market in prescription drugs. *Lancet* 364: s28-9.
[61] Hall, K.M., Irwin, M.M., Bowman, K.A., et al. 2005. Illicit use of prescribed stimulant medication among college students. *Journal of American College Health* 53: 167-74.
[62] Hall, W. 2004. Feeling 'better than well'. *EMBO Reports* 5: 1105-9.
[63] Hansen, D.L., Hansen, E.H. 2006. Caught in a balancing act: parents' dilemmas regarding their ADHD child's treatment with stimulant medication. *Qualitative Health Research* 16: 1267-85.
[64] Haydon, E., Rehm, J., Fischer, B., et al. 2005. Prescription drug abuse in Canada and the diversion of prescription drugs into the illicit drug market. *Canadian Journal of Public Health* 96: 459-61.
[65] Hercularno-Houzel, S. 2002. Do you know your brain? A survey on public neuroscience literacy at the closing of the decade of the brain. *The Neuroscientist* 8: 98-110.
[66] Hornig Priest, S. 1994. Structuring public debate on biotechnology. *Science Communication* 16: 166-79.
[67] Jones, R., Morris, K., Nutt, D. 2005. *Foresight Brain Science, Addiction and Drugs Project: Cognitive Enhancers*. Department of Trade and Industry: London.
[68] Juengst, E. 1998. *What Does Enhancement Mean?*, in Enhancing Human Traits: Ethical and Social Implications, E. Parens, Editor. Washington, DC: Georgetown University Press.
[69] Kessler, R.C., Adler, L., Barkley, R., et al. 2006. The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. *American Journal of Psychiatry* 163: 716-23.
[70] Kirsch, I., Deacon, B.J., Huedo-Medina, T.B., et al. 2008. Initial severity and antidepressant benefits: a meta-analysis of data submitted to the Food and Drug Administration. *PLoS Medicine* 5: e45.

[71] Kollins, S.H., MacDonald, E.K. Rush, C.R. 2001. Assessing the abuse potential of methylphenidate in nonhuman and human subjects: a review. *Pharmacology, Biochemistry & Behavior* 68: 611-27.
[72] Kramer, P. 1997. *Listening to Prozac*. London: Penguin Books.
[73] Langdon, C. 2000. Tired? Pop your pal's Ritalin; Students using Rx drug as study aid. *New York Post*.
[74] Lanni, C., Lenzken, S.C., Pascale, A., et al. 2008. Cognition enhancers between treating and doping the mind. *Pharmacological Research* 57: 196-213.
[75] Laurance, J. 2003 Abuse hits students looking for an exam kick. *The Independent*.
[76] Levine, M., Gow, R., Shea, S. 2005. Report of the "Adderall XR New Drug Committee".
[77] Lexchin, J. 2001. Lifestyle drugs: issues for debate. *Canadian Medical Association Journal* 164: 1449-51.
[78] Licata, S.C., Rowlett, J.K. 2008. Abuse and dependence liability of benzodiazepine-type drugs: GABA(A) receptor modulation and beyond. *Pharmacology, Biochemistry & Behavior* 90: 74-89.
[79] Maher, B. 2008. Poll results: look who's doping. *Nature* 452: 674-5.
[80] Mbongue, T.B., Sommet, A., Pathak, A., et al. 2005. "Medicamentation" of society, non-diseases and non-medications: a point of view from social pharmacology. *European Journal of Clinical Pharmacology* 61: 309-13.
[81] McCabe, S.E. 2008. Misperceptions of non-medical prescription drug use: a web survey of college students. *Addictive Behavior* 33: 713-24.
[82] McCabe, S.E., Knight, J.R., Teter, C.J., et al. 2005. Non-medical use of prescription stimulants among US college students: prevalence and correlates from a national survey. *Addiction* 100: 96-106.
[83] McCabe, S.E., Teter, C.J., Boyd, C.J. 2004. The use, misuse and diversion of prescription stimulants among middle and high school students. *Substance Use & Misuse* 39: 1095-116.
[84] McCabe, S.E., Teter, C.J., Boyd, C.J. 2006. Medical use, illicit use and diversion of prescription stimulant medication. *Journal of Psychoactive Drugs* 38: 43-56.
[85] McCarthy, M. 2007. Prescription drug abuse up sharply in the USA. *Lancet* 369: 1505-6.
[86] Mehlman, M.J. 2004. Cognition-enhancing drugs. *Milbank Quarterly* 82: 483-506.
[87] Mehta, M.A., Owen, A.M., Sahakian, B.J., et al. 2000. Methylphenidate enhances working memory by modulating discrete frontal and parietal lobe regions in the human brain. *Journal of Neurosci* 20: RC65.
[88] Merkel, R., Boer, G., Fegert, J., et al. 2007. *Intervening in the Brain: Changing Psyche and Society*. Ethics of Science and Technology Assessment: Springer Vol. 29.

[89] Meyer, J., Quenzer, L. 2005. *Psychopharmacology: Drugs, the Brain, and Behavior*. Sunderland, Massachusetts: Sinauer Associates, Inc.
[90] Mintzes, B. 2006. *What are the Public Health Implications? Direct-to-Consumer Advertising of Prescription Drugs in Canada*. Health Canada.
[91] Mintzes, B., Barer, M.L., Kravitz, R.L., et al. 2003. How does direct-to-consumer advertising (DTCA) affect prescribing? A survey in primary care environments with and without legal DTCA. *Canadian Medical Association Journal* 169: 405-12.
[92] Morency, K. 2006. More students abusing Ritalin as study aid: 'It really not hard to get hold of' Abuse rate among students at 5% to 10% and is rising, Concordia officials say, in *Montreal Gazette.* Montreal.
[93] Moynihan, R., Henry, D. 2006. The fight against disease mongering: generating knowledge for action. *PLoS Medicine* 3: e191.
[94] National Institute on Drug Abuse. 2005. *Prescription Drugs: Abuse and Addiction*. Research Report Series. National Institute on Drug Abuse. p. 12.
[95] Neuendorf, K.A. 2002. *The Content Analysis Guidebook*. Thousand Oaks, CA: Sage Publications.
[96] Novak, S.P., Kroutil, L.A., Williams, R.L., et al. 2007. The nonmedical use of prescription ADHD medications: results from a national Internet panel. *Substance Abuse, Treatment, Prevention & Policy* 2: 32.
[97] O'Regan, N. 2005. Want to be clever? Don't take 'smart drugs'. *Irish Independent*.
[98] Office of Applied Studies. 2007. *The NSDUH Report: patters and trends in nomedical prescription pain reliever Use: 2002 to 2005*. National Survey on Drug Use and Health.
[99] Panizzon, L. 1944. La preparazione di piridil-e piperdil-arilacetonitrili e di alcuni prodotti di trasformazione (Parte 1a). *Helvetica Chimica Acta* 27.
[100] Parens, E. 1998. *Is Better Always Good? The Enhancement Project*, in Enhancing Human Traits, E, Parens, Editor. Washington DC: Georgetown Press.
[101] Phillips, S. 2006. An espresso in the morning is just so last year, in *The Times Higher Education Supplement*.
[102] Pitman, R., Sanders, K.M., Zusman, R.M., et al. 2002. Pilot study of secondary prevention of posttraumatic stress disorder with propranolol. *Biological Psychiatry* 51: 189-92.
[103] Poulin, C. 2001. Medical and nonmedical stimulant use among adolescents: from sanctioned to unsanctioned use. *Canadian Medical Association Journal* 165: 1039-44.
[104] Poulin, C. 2007. From attention-deficit/hyperactivity disorder to medical stimulant use to the diversion of prescribed stimulants to non-medical stimulant use: connecting the dots. *Addiction* 102: 740-51.

[105] President's Council on Bioethics. 2003. *Beyond Therapy*. President's Council on Bioethics/Harper Collins: Washington, DC. p. 328.
[106] Priest, S.H. 2000. US public opinion divided over biotechnology? *Nature Biotechnology* 18: 939-42.
[107] Racine, É. 2002. Thérapie ou amélioration? Philosophie des neurosciences et éthique des neurotechnologies. *Ethica* 14: 70-100.
[108] Racine, E., Bar-Ilan, O., Illes, J. 2005. fMRI in the public eye. *Nature Reviews Neuroscience* 6: 159-64.
[109] Racine, E., Bar-Ilan, O., Illes, J. 2006. Brain Imaging: A Decade of Coverage in the Print Media. *Science Communication* 28: 122-42.
[110] Racine, E., DuRousseau, D. Illes, J. 2007. Ethical issues in performance enhancing technologies: From bench to headline. *Technology* 11: 37-54.
[111] Racine, E., Gareau, I., Doucet, H., et al. 2006. Hyped biomedical science or uncritical reporting? Press coverage of genomics (1992-2001) in Québec. *Social Science & Medicine* 62: 1278-90.
[112] Racine, E. Illes, J. 2006. Neuroethical responsibilities. *Canadian Journal of Neurological Sciences* 33: 269-77.
[113] Racine, E., van der Loos, H.Z. Illes, J. 2007. Internet marketing of neuroproducts: new practices and healthcare policy challenges. *Cambridge Quarterly of Healthcare Ethics* 16: 181-94.
[114] Racine, E., Waldman, S., Palmour, N., et al. 2007. "Currents of hope": neurostimulation techniques in U.S. and U.K. print media. *Cambridge Quarterly of Healthcare Ethics* 16: 312-6.
[115] Rajczi, A. 2008. One danger of biomedical enhancements. *Bioethics* 22: 328-36.
[116] Rose, S. 2008. Drugging unruly children is a method of social control. *Nature* 451: 521.
[117] Rose, S.P. 2002. 'Smart drugs': do they work? Are they ethical? Will they be legal? *Nature Reviews Neuroscience* 3: 975-9.
[118] Rose, S.P.R. 2003. How to (or not to) communicate science. *Biochemical Society Transactions* 31: 307-12.
[119] Ross, S. 2006. Students turn to smart drugs for exam help. *The Scotsman*.
[120] Sabin, J.E. Daniels, N. 1994. Determining "medical necessity" in mental health practice. *Hastings Center Report* 24: 5-13.
[121] Sabini, J., Monterosso, J. 2005. Judgments of the fairness of using performance enhancing drugs. *Ethics & Behavior* 15: 81-94.
[122] Safer, D.J., Zito, J.M., Fine, E.M. 1996. Increased methylphenidate usage for attention deficit disorder in the 1990s. *Pediatrics* 98: 1084-8.
[123] Sahakian, B., Morein-Zamir, S. 2007. Professor's little helper. *Nature* 450: 1157-9.
[124] Sandberg, A., Bostrom, N. 2006. Converging cognitive enhancements. *Annals of the New York Academy of Sciences* 1093: 201-27.
[125] Savulescu, J. 2006. Justice, fairness, and enhancement. *Annals of the New York Academy of Sciences* 1093: 321-38.

[126] Schepis, T.S., Marlowe, D.B. Forman, R.F. 2008. The availability and portrayal of stimulants over the Internet. *Journal of Adolescent Health* 42: 458-65.
[127] Schermer, M. 2007. Enhancements, Easy Shortcuts, and the Richness of Human Activities. *Bioethics* 22: 355-63.
[128] Schermer, M. 2008. On the argument that enhancement is "cheating". *Journal of Medical Ethics* 34: 85-8.
[129] Schmied, L., Steinberg, H., Sykes, E. 2006. Psychopharmacology's debt to experimental psychology. *History of Psychology* 9: 144-57.
[130] Schwartz, L.M., Woloshin, S. 2002. Marketing medicine to the public: a reader's guide. *Journal of the American Medical Association* 287: 774-5.
[131] Schwartz, L.M., Woloshin, S., Baczek, L. 2002. Media coverage of scientific meetings: too much, too soon? *Journal of the American Medical Association* 287: 2859-63.
[132] Seale, C. 2003. Health and media: an overview. *Sociology of Health & Illness* 25: 513-31.
[133] Seale, C., Boden, S., Williams, S., et al. 2007. Media constructions of sleep and sleep disorders: a study of UK national newspapers. *Social Science & Medicine* 65: 418-30.
[134] Seale, C., Kirk, D., Tobin, M., et al. 2005. Effect of media portrayals of removal of children's tissue on UK tumour bank. *British Medical Journal* 331: 401-3.
[135] Secko, D.M., Burgess, M., O'Doherty, K. 2008. Perspectives on engaging the public in the ethics of emerging biotechnologies: from salmon to biobanks to neuroethics. *Accountability in Research* 15: 283-302.
[136] Office of Diversion Control Drug and Chemical Evaluation. 1995. *Methylphenidate (A Background Paper)*. U.S. Department of Justice and Drug Enforcement Administration.
[137] Singh, I. 2005. Will the "real boy" please behave: dosing dilemmas for parents of boys with ADHD. *American Journal of Bioethics* 5: 34-47.
[138] Singh, I. 2008. Beyond polemics: science and ethics of ADHD. *Nature Reviews Neuroscience* 9: 957-64.
[139] Still, G. 1909. *Disorders and Diseases of Children*. London: Oxford Medical Publications.
[140] Teter, C.J., McCabe, S.E., Boyd, C.J., et al. 2003. Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. *Pharmacotherapy* 23: 609-17.
[141] Teter, C.J., McCabe, S.E., Cranford, J.A., et al. 2005. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *Journal of American College Health* 53: 253-62.
[142] Teter, C.J., McCabe, S.E., LaGrange, K., et al. 2006. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy* 26: 1501-10.

[143] Timpane, J. 2007. *Models for the Neuroethical Debate in the Community*, in Defining Right and Wrong in Brain Science. W. Glannon, Editor. New York: The Dana Press.
[144] Tone, A. 2005. Listening to the past: history, psychiatry, and anxiety. *Canadian Journal of Psychiatry* 50: 373-80.
[145] Turner, E.H., Matthews, A.M., Linardatos, E., et al. 2008. Selective publication of antidepressant trials and its influence on apparent efficacy. *New England Journal of Medicine* 358: 252-60.
[146] Vastag, B. 2004. Poised to challenge need for sleep, "wakefulness enhancer" rouses concerns. *Journal of the American Medical Association* 291: 167-70.
[147] Volkow, N.D., Ding, Y.S., Fowler, J.S., et al. 1995. Is methylphenidate like cocaine? Studies on their pharmacokinetics and distribution in the human brain. *Archives of General Psychiatry* 52: 456-63.
[148] Volkow, N.D., Swanson, J.M. 2003. Variables that affect the clinical use and abuse of methylphenidate in the treatment of ADHD. *American Journal of Psychiatry* 160: 1909-18.
[149] Volkow, N.D., Swanson, J.M. 2008. The action of enhancers can lead to addiction. *Nature* 451: 520.
[150] Volkow, N.D., Wang, G.J., Fowler, J.S., et al. 1999. Methylphenidate and cocaine have a similar in vivo potency to block dopamine transporters in the human brain. *Life Sciences* 65: PL7-12.
[151] Warren, O.J., Leff, D.R., Athanasiou, T., et al. 2008. The Neurocognitive Enhancement of Surgeons: An Ethical Perspective. *Journal of Surgical Research*.
[152] White, B.P., Becker-Blease, K.A., Grace-Bishop, K. 2006. Stimulant medication use, misuse, and abuse in an undergraduate and graduate student sample. *Journal of American College Health* 54: 261-8.
[153] Whitehouse, P.J., Juengst, E., Mehlman, M., et al. 1997. Enhancing cognition in the intellectually intact. *Hastings Center Report* 27: 14-22.
[154] Wilens, T.E., Adler, L.A., Adams, J., et al. 2008. Misuse and diversion of stimulants prescribed for ADHD: A systematic review of the literature. *Journal of the American Academy of Child and Adolescent Psychiatry* 47: 21-31.
[155] Wilens, T.E., Gignac, M., Swezey, A., et al. 2006. Characteristics of adolescents and young adults with ADHD who divert or misuse their prescribed medications. *Journal of the American Academy of Child and Adolescent Psychiatry* 45: 408-14.
[156] Williams, S.J., Seale, C., Boden, S., et al. 2008. Waking up to sleepiness: Modafinil, the media and the pharmaceuticalisation of everyday/night life. *Sociology of Health & Illness* 30: 839-55.
[157] Wisniewski, A.M., Purdy, C.H. Blondell, R.D. 2008. The epidemiologic association between opioid prescribing, non-medical use, and emergency department visits. *Journal of Addictive Diseases* 27: 1-11.

[158] Woloshin, S. Schwartz, L.M. 2006. Giving legs to restless legs: a case study of how the media helps make people sick. *PLoS Medicine* 3: e170.
[159] Wolpe, P.R. 2002. Treatment, enhancement, and the ethics of neurotherapeutics. *Brain & Cognition* 50: 387-95.
[160] Wolraich, M.L., Wibbelsman, C.J., Brown, T.E., et al. 2005. Attention-deficit/hyperactivity disorder among adolescents: a review of the diagnosis, treatment, and clinical implications. *Pediatrics* 115: 1734-46.
[161] Yesavage, J.A., Mumenthaler, M.S., Taylor, J.L., et al. 2002. Donepezil and flight simulator performance: effects on retention of complex skills. *Neurology* 59: 123-5.
[162] Young, S.N. 2003. Lifestyle drugs, mood, behaviour and cognition. *Journal of Psychiatry & Neuroscience* 28: 87-9.
[163] Zernike, K. 2005. The difference between steroids and Ritalin is... *The New York Times*.
[164] Zuckerman, D. 2003. Hype in health reporting: "checkbook science" buys distortion of medical news. *International Journal of Health Services* 33: 383-9.

Appendix 1: Discourse Articles

Press articles

Adams, Lucy. How Ritalin became poor man's cocaine; Warnings over increasing adult abuse of children's drug. *The Herald.* March 23, 2005.

Bayer, Kurt. Students taking danger drug to help with exams. *The Express*. May 24, 2004.

Diaz, Johnny. Ritalin grows as 'cramming drug' at U.S. colleges; Medicine can have serious side effects. *The Seattle Times*. November 4, 2001.

Garreau, Joel. 'Smart pills' are on the rise. But is taking them wise?. *The Washington Post*. June 11, 2006.

Hupp, Stacy. Students abusing ADHD drugs: Prescription pills easy to get, youths, health workers say. *The Indianapolis Star*. May 8, 2006.

Khan, Mahvish. Study drugs draw concern. *The Miami Herald*. July 6, 2003.

Langdon, Christine. Tired? Pop your pal's Ritalin; Students using Rx drug as study aid. *New York Post.* May 28, 2000.

Laurance, Jeremy. Abuse hits students looking for an exam kick. *The Independent*. August 26, 2003

Lawrence, Jessica. 'Kiddie speed' for exam boost. *Sunday Mail (Queensland, Australia).* March 28, 2004.

Lite, Jordan. Who needs a dealer…when you have a doctor? New Yorkers are just saying yes to prescription abuse. *Daily News (New York)*. March 30, 2006.

Morency, Kristin. More students abusing Ritalin as study aid: 'It really not hard to get hold of¸Abuse rate among students at 5% to 10% and is rising, Concordia officials say. *Montreal Gazette*. January 8, 2006.

No author. Drug aid for exam students. *Associated Newspapers*. May 23, 2004.

No author. Royal Uni 'snorters'. *The Mirror*. May 24, 2004.

No author. Royal varsity's danger pills. *The Express.* May 24, 2006.

No author. Smart drugs for all in 20 years. *The Australian: The Sunday Times.* June 5, 2006.

O'Regan, Nadine. Want to be clever? Don't take 'smart drugs'. *Irish Independent*. November 24, 2005.

Phillips, Stephen. An espresso at three in the morning is just so last year. *The Times Higher Education Supplement*. No. 1733. p.18. 2006

Reinink, Amy. Colleges eye ways to curb Ritalin abuse. *Denver Post*. December 13, 2001.

Ross, Shan. Students turn to smart drugs for exam help. *The Scotsman*. June 2, 2006.

Twohey, Megan. Pills become a dangerous study aid. *The Milwaukee Journal Sentinel.* March 26, 2006.

Zernike, Katie. The difference between steroids and Ritalin is…. *The New York Times*. March 20, 2005.

Zeilbauer, Paul. New Campus High: Illicit Prescription Drugs. *The New York Times*. March 24, 2000.

Bioethics Articles

Bush, S.S. "Neurocognitive Enhancement". *Applied Neuropsychology*. 2006. 13(2): 125-36.
Butcher, J. "Cognitive enhancement raises ethical concerns". *The Lancet.* 2003. 362: 132-3.
Caplan, A. and Elliott, C. "is it ethical to use enhancement technologies to make us better than well?". *PLoS medicine*. 2004. 1(3):172-5.
Chatterjee, Anjan. "Cosmetic neurology: The controversy over enhancing movement, mentation, and mood". *Neurology.* 2004. 63:968-74
Farah, Martha, J. "Emerging ethical issues in neuroscience". *Nautre neuroscience*. 2002. 5 (11): 1123-1129.
Farah, M. *et al.* "Neurocognitive enhancement: what can we do and what should we do?". *Nature Reviews Neuroscience*. 2004. 5: 421-25.
Farah, Martha J. and Wolpe, Paul Root. "Monitoring and Manipulating Brain Function: New Neuroscience technologies and Their Ethical Implications" *Hastings Center Report*. 2004. 34 (3): 35-45.
Farah, Martha J. "Neuroethics: the practical and the philosophical". *Trends in Cognitive Science*. 2005. 9 (1): 34-40.
Hall, Wayne. "Feeling 'better than well'". *EMBO reports*. 2004. 5(12). 1105-1109.
Mehlman, Maxwell, J. "Cognition-enhancing Drugs". *The Milbank Quarterly.* 2004. 82 (3): 483-506.
Racine, E. and Illes, J. "Neuroethical Responsibilities". *The Canadian Journal of Neurological Sciences. 2006. 33: 269-277*
Rose, S.P.R. "'Smart Drugs': do they work? Are they ethical? Will they be legal?". *Nature Reviews Neuroscience*. 2002. 3: 975-979.
Whitehouse, P.J. *et al.* "Enhancing Cognition in the Intellectually Intact". *Hastings Center Report.* 1997. May-June: 14-22.
Wolpe, P.R. "Treatment, enhancement, and the ethics of neurotherapeutics". *Brain and Cognition.* 2002. 50: 387-395.

Public health articles

Babcock, Q. and Byrne, T. "Student Perceptions of Methylphenidate Abuse at a Public Liberal Arts College". *Journal of American College Health*. 2000. **49**: 143-45.

Barrett, S.P. *et al.* "Characteristics of Methylphenidate Misuse in a University Student Sample". *Canadian Journal of Psychiatry*. 2005. **50** (8): 457-461.

Graff Low, K. and Gendaszek, A.E. "Illicit use of psychostimulants among college students: a preliminary study". *Psychology, Health & Medicine.* **7** (3): 283-287.

Hall, K.M. *et al.* "Illicit Use of Prescribed Stimulant Medication Among College Students". *Journal of American College Health*. 2005. **53** (4): 167-174.

Prudhomme White, B. *et al.* "Stimulant Medication Use, Misuse, and Abuse in an Undergraduate and Graduate Student Sample". *Journal of American College Health*. 2006. Wednesday, August 15, 20074/6/2009**54** (5): 261-268.

Teter, C.J. *et al*. Prevalence and Motives for Illicit Use of Prescription Stimulants in an Undergraduate Student Sample". *Journal of American College Health*. 2005. **53** (6): 253-262.

Teter, C.J. *et al.* "Illicit Use of Specific Prescription Stimulants Among College Students: Prevalence, Motives, and Routes of Administration". *Pharmacotherapy*. 2006. **26** (10):1501-1510.

Appendix II: Coding guide

Section 1: Description of non-medical use of MPH

1.1. *Definitions and synonyms for non-medical use of MPH*

Formal definition of non-medical use of MPH: Explicit definition of "non-medical use" or "cognitive enhancement" (e.g., "This term includes the use of drugs and other interventions to modify brain processes with the aim of enhancing memory, mood and attention in people who are not impaired by illness or disorder" (Hall, 2004))

Lay descriptions of non-medical use of MPH: Implicit definition of the non-medical use of MPH (e.g., "Her pal is fueled with "smart pills" that increase her concentration, focus, wakefulness and short-term memory" (Garreau, 2006))

Distinction between treatment and enhancement: Descriptions of the treatment-enhancement distinction as being blurry or explicitly defining the two terms

1.2. *Uses of MPH*

Medical use: MPH used as treatment for ADHD

Cognitive and academic performance enhancement use: MPH used as a study aid

Recreational use: MPH used for motives unrelated to ADHD or enhancement (e.g., partying, used with alcohol)

1.3. *Aims of cognitive enhancement:* Statements explaining why an individual would enhancement their cognition (e.g., could include motive of increasing memory)

1.4. *Extent of non-medical use of MPH*

Accepted
Frequent
Neutral
Questionable
Rare

1.5. *Description of practices of non-medical use of MPH*

When is MPH used non-medically
Who is using MPH non-medically
Where is MPH used non-medically
How MPH is procured for non-medical use
- Black market
- Buying pills from other students
- Feigning symptoms of ADHD
- Online pharmacies
- Other (e.g., theft)

1.6. T*ypes of non-medical uses reported*

Methylphenidate
Other neuropharmaceuticals (e.g., modafinil)
Non neuropharmaceuticals (e.g., caffeine, natural products)
Other (e.g., transcranial magnetic stimulantion)

Section 2: Workings and effects of MPH

2.1. *How MPH works*: Statements on the causes of the physiological and psychological effects of methylphenidate or why it produces such effects (including its mechanism of action).

2.2. *Physiological effects of non-medical use of MPH*

Physiological negative effects of non-medical use of MPH (e.g., heart palpitations, increase in blood pressure, and loss of sleep and appetite)

Physiological positive effects of non-medical use of MPH (e.g., prolonged wakefulness, increase in energy level, or lack of negative effects of other stimulants i.e. the diuretic effect of coffee.)

2.3. *Psychological effects of non-medical use of MPH*

Psychological negative effects of non-medical use of MPH (e.g., depression with withdrawal, psychosis, aggression, anxiety, hallucinations and paranoia)

Psychological positive effects of non-medical use of MPH (e.g., increases in alertness, concentration, memory, and confidence)

2.4. *Unknown effects of non-medical use of MPH* (e.g., unclear whether MPH actually has an effect on concentration)

2.5. *Information on ADHD*

Nature of ADHD: Medical definition of ADHD (e.g., symptoms, causes)

Prevalence of ADHD (in children and adults)

Section 3: Ethical, social and legal issues associated with non-medical use of MPH*

3.1. *Abuse*: Statements on the misuse of MPH but different from the dependence upon the drug (e.g., "The administration says that methylpenidate carries a high potential for abuse" (Phillips, 2006))

3.2. *Authenticity, identity, and personhood*: Statements pertaining to the conservation or changing of an individual's identity following enhancement (e.g., "if we substantially improve our overall cognitive functioning, we may also alter aspects of our identity that are fundamental to who we are" (Butcher, 2003))

3.3. *Autonomy, individual rights, and informed consent*: Statements pertaining to an individual's freedom to choose to enhancement themselves (e.g., "people may feel that they must do so in order to succeed or just to stay where they are in competitive endeavors" (Mehlman, 2004))

3.4. *Cheating*: Statements on the issue of whether or not cognitive enhancement by means of methylphenidate provides an unfair advantage

3.5. *Commercialization*: Statements pertaining to the involvement of business in the non-medical use of MPH (e.g., "pharmaceutical companies stand to make substantial profits" (Chatterjee, 2004))

3.6. *Illegality*: Statements making mention of the illegality of non-medical use of MPH (e.g., "sicne the drugs is classified as a controlled substance, possessing or distributing it without a doctor's prescription is a felony" (Reinkink, 2001))

3.7. *Injustice, access, and equality*: Statements about matters of justice, distribution and rights (e.g., "We tacitly accept wide disparities in modifiers of cognition, as demonstrated by the acceptance of inequities in education, nutrition, and shelter"

(Chatterjee, 2004))
3.8. *Overprescription*: Statements on the prescription habits of physicians for methylphenidate (e.g., "the fact that students are giving away supplies means that they didn,t need them in the first place, or at least in the dosages prescribed" (Phillips, 2006))
3.9. *Regulation and governance*: Statements about how cognitive enhancers should be governed and who should be responsible for regulation of these substances. (e.g., "legislators and the public will need to decide whether current regulatory frameworks are adequate for the regulation of neurocognitive enhancement, or whether new laws must be written and new agencies commissioned" (Farah, 2004))
3.10. *Reliability of scientific research*: Statements about the current state of scientific research on the effects of MPH on healthy individuals
3.11. *Safety*: Statements about the possible negative side-effects of pharmacological enhancement (can include mention of lack of long-term data)

3.12. *Social meaning*: Statements highlighting the impact of cognitive enhancement with methylphenidate on social values and practices (e.g., "Moreover, there is evidence that age-associated cognitive deterioration begins around age 30. If so, then everyone beyond that age might be regarded as cognitively impaired" (Mehlman, 2004))
3.13. *Social integration and acceptability*: Statements about the emergence of cognitive enhancement in society (e.g., "The view that cognitive enhancement drugs are bad because they are not customary or traditional also is not persuasive. Caffeine has been used for centuries" (Mehlman 2004))

Section 4: Prevention of non-medical use of MPH and related challenges

4.1 *Solutions*: Description of the measures university administrations and law enforcement agencies are taking in order to prevent abuse from starting and spreading (e.g., awareness campaigns)
4.2 *Challenges*: Challenges that prevention efforts may be faced with (e.g., difficulty in controlling black markets)