

Would you or wouldn't you?: A report on the artifacts of performance enhancement on college campuses and the implications of their use.

David K. Lempert

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FORWARD

When I originally wrote this thesis, I was in the thick of undergraduate rigor. Having spent four years balancing the various perspectives and paradigms of science, philosophy, and sociology, I was nearly fed up with the incompatibility of the disciplines that cohesively formed my “interdisciplinary” education. Thus, my thesis was as much a response to the conventions of academia and rationale as it was an exploration of academic performance enhancement. On retrospect, I benefited from my immersion into the “cultural values of the nation” as Illinois professor Arthur Bestor¹ has described of the traditional disciplines, and am thankful for my broad—if occasionally overwhelming—exposure to these distinct techniques of reasoning. Having waited several months before even glancing at the work again, I approached my revisions with renewed perspective and a reevaluation of my audience. With my frustrations out of my system and a newfound direction, the following work makes an attempt to stay focused on the thesis topic itself rather than the critique.

Nonetheless, the critique itself remains a central tenant of this project. I had spent so much time researching and developing my stance on academic performance enhancement that frankly, by the time I began actually writing my project, I was bored with what I had come to perceive as the obvious and easily learned aspects of performance enhancement. Having sparse hard-science research experience, I was ill equipped to explore certain questions I found interesting, for example, a meta-analysis comparing the efficacy of using amphetamine to improve performance compared with getting adequate sleep. Since I first became interested in academic performance enhancement three years ago, the topic had exploded in popular and academic media, and the novelty of my original analogy to sports enhancement was long over-used. I scrapped the working title of “What’s wrong with aluminum bats?” and chose to focus on the framework by which we arrive at our jumbled ethics about enhancement, rather than the ontology of enhancement itself. In a sense, the thesis shifted from an attempt to form an ethical policy about enhancement to an argument about why it is rather futile to do so.

My writing for this project was heavily influenced by Feminist philosophy of science, evidenced by my radical pronoun choices (preferably ‘she’ instead

¹ Bestor, Arthur E. *Educational Wastelands* 1953 Urbana: University of Illinois Press; 13

of ‘he’ to mean ‘a person’), scrutiny of the existence of objectivity, and in my understanding of the inseparable relationship between researcher and research topic. My “narrative introduction” is a deliberate first-person device to familiarize the reader with the biases that shape my stance about academic performance enhancement.

I was also very influenced by an essay by Langdon Winner, titled “Do Artifacts Have Politics?”² In it, Winner attempts to argue that the nature of certain technologies is inherently political, and has “important consequences for the form and quality of human associations.” He examines this stance from two perspectives: 1) that certain technologies require or necessitate the creation of a specific set of social conditions, and 2) that certain kinds of technology are strongly compatible with particular types of social and political relationships. My use of the word “artifact” to describe the chemicals used for performance enhancement stems from my interpretation of this essay, and my evaluation of the properties of those artifacts is intended to fulfill the second clause.



Enhancement is really the heart of the Science, Technology, & Society (STS) major. STS demands address of the question, “How do the artifacts of science and technology interplay with society, and what are the ethical implications of that interaction?” How can responsible communities arrive at cohesive ethical stances to regulate these artifacts and understand that interaction? What are the properties of the artifacts themselves, and how can learning about the history of the development of those artifacts help us better understand our policies and ourselves? In short, it is the interdisciplinary study of the question, “When we try and invent new ways to improve the world, are those ways really making improvements, and how can we best evaluate that question?” Enhancement is the mechanism of those inventions and potential improvements, and the focus of this thesis is how the artifacts of enhancement interact with the academic community.

The topic of enhancement should be especially interesting for pre-med undergraduate students for both the intrinsic and extrinsic character of the available artifacts of enhancement. For students facing challenging course loads, the use of enhancement drugs is not just a possibility; it is a decision.

² Winner, Langdon. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. Chicago: University of Chicago Press, 1986; 19-39.

By this, I mean that enhancement drugs are so readily available on college campuses that most students are faced with the decision whether to take them, just as a person handed a cookie is faced with the decision whether to reach out and eat it, rather than seeking it out on their own. Unlike several other classes of illicit drugs currently being abused, academic performance enhancing drugs are so ubiquitous at some institutions that the decision whether or not to use them may be as much a fundamental part of the college experience as deciding whether to attend campus kegger parties.

The subject also holds extrinsic value because eventually as doctors, these students will need to reconcile their own values regarding enhancement versus treatment. As medical knowledge continues to improve, future doctors will be forced to address the dichotomy—or lack there of—between enhancement and therapy. Thus, the union of personal experience and foreseeable professional decision-making makes the study of enhancement current and relevant for students preparing for a career in medicine.

You will notice that the citation style appears to be erratic. Citation formats are used to make finding original works easiest. Since each discipline has its own internal cataloguing system, each discipline also has its own citation system. However, since the advent of the internet, and Google Scholar specifically, the convention of citation consistency appears less important for accomplishing the imperative of citation transparency. Thus, I like to think of this citation style as “Google Modern Language (GML)” because the citations are formatted such that when typed verbatim into Google, they return the original source I referenced. I hope this clarifies the voice and tone of this thesis, and gives a perspective from which to understand and evaluate the work.

I hope that this work contributes a balanced perspective about enhancement to the contentious and polarizing dialogue between doctors, policy makers, scientists, parents, educators, and students. It should establish that there is no legitimate therapy/enhancement dichotomy, and motivate further discussion about the meanings of health, risk, fairness, and how our policies should reflect these nebulous values of western culture.

-Dave Lempert, April 8, 2009

1 NARRATIVE INTRODUCTION

Along with Roller Blades, sagging, and insulated thermoses, Attention Deficit Disorder (ADD) and Ritalin were prominent relics of my primary education in the mid 1990s that all the kids took for granted and all our parents agonized over during spousal pillow talks and awkward Parent Club meetings. It seemed that everyone around me had strong opinions about both the disorder and its treatment. Among my peers, “take your Ritalin!” was an expression taken to mean, “stop goofing off,” our teachers translated “it’s because of my ADD” into “I am lazy,” and not one to miss out on the Zeitgeist, a close friend of mine began taking Ritalin himself, much to the disapproval of my parents. Clearly he wasn’t the only kid who was overly hyper-active; between 1990 and 1997, the prescription rate for Ritalin exploded 700 percent.

By the time I completed high school, I had mostly forgotten about ADD and Ritalin; the former was so omnipresent in our teenage lexicon that I hardly internalized its etymology, and the latter I assumed was only rarely ingested by troubled kids. However, I could not ignore the psychological disorder and its chemical antecedent³ once I started my first year at college, during which I began hearing stories of students who took Ritalin and Adderall to stay up all night writing papers and studying for tests. One friend from UC Berkeley quipped to me, “Getting Bs is like getting As without Adderall.” Another graduate from Dartmouth College admitted, “I don’t know anyone at Dartmouth who didn’t take Adderall.” A student at the University of Pennsylvania described his perception of the ubiquity of Adderall abuse, saying,

God it's everywhere at a school like this. Kids and parents alike care so much about how well they do in school and that they stay focused. Kids get prescriptions no problem, then people who don't have [prescriptions] want it so there is that demand. So the kids who do have [prescriptions] and questionable ADD to begin with start filling that [prescription] more often because they sell all the pills. A dude in my house...takes 60 mg of Adderall a day, which would probably kill a 10 year old via heart attack.

³ Chapter 4.2 discusses how amphetamine psychotropic drugs were discovered long before anyone ever mentioned Attention Deficit Disorder.

After hearing so many of these stories, I began to wonder, “Is everyone doing this?”

There is certainly evidence that students are increasingly likely to seek out illicit use of drugs intended for the treatment of ADD. Since 1992, the number of students who admit to abusing prescription medication tripled. A University of Michigan study found that on some campuses, up to 25 % of students admitted to using Ritalin or Adderall without a prescription. Another Michigan study reported that between 4 and 7 percent of all university students had tried drugs intended to treat ADHD at least once to study for exams. More than 50% of students with prescriptions for Adderall, Ritalin, or Dexedrine had been approached by peers to purchase the drugs for non-medical use.

A few years ago during the aftermath of a Tour de France scandal, I once again began thinking about the topic of students taking drugs intended for the treatment of ADD to enhance academic performance. Floyd Landis had just been stripped of his medal for “doping,” and the BALCO scandal in professional baseball continued to draw headline news. I started to see a parallel: if the integrity of professional sports was being threatened by sports enhancers (steroids), what is it saying about elite academic institutions if their students are being enhanced by study drugs?

To answer this question, it seemed necessary to first assess whether taking these drugs was actually enhancing the study abilities of these students. Yet the more I read about the topic, the more I began to think about the culture of enhancement itself in college and America. In a world of Starbucks, Rogaine, and tutors, we are inundated with opportunities to enhance our natural conditions and behaviors above a level we deem unfit.

At what point, then, does performance enhancement become unfair? It is rarely viewed as cheating for a wealthy biker to invest thousands of dollars in a lighter, more efficient bike than her competition, yet if she chooses to take supplements that allow her to train harder, she is chastised and thrown out of the race.

Athletics operates under arbitrary parameters that dictate the guidelines of competition. In the end, baseball players are banned from using aluminum bats because it takes away from the anachronistic pleasure that spectators get from watching the sport. Yet on the surface, academics doesn't seem as confined to arbitrary measures that limit efficiency and success. If a researcher chooses to take Adderall without a prescription so that she can work towards a cure for diabetes, who is to say that her actions are morally reprehensible,

even if it means she beat her other peers out of a grant opportunity?

On the other hand, perhaps we should limit our social-Darwinistic justifications for the utility of enhancement. College admission is becoming increasingly competitive due to an influx of qualified students. Once in college, many bright students have to deal with arbitrary grade curves to combat grade inflation. If Adderall is advertised as helping students perform well, it hardly seems like an enhancement to pursue a remedy that allows students to stay afloat. As college study drug use and competition rates continue to climb, few statistical measures indicate that our country is getting any happier, healthier, or wealthier. What, then, is all this competition accomplishing, and who is it benefiting?

In 2000, France adopted a 35-hour standard work week law to encourage a higher quality-of-life for its workers. Those who surpass that number must be paid overtime wages. But in America, time is money—or grades—and some students are given work loads that cannot possibly be completed without staying up all night three or four times a week.



This thesis explores academic performance enhancement externally on two levels. On the first level, the role of enhancement in society is considered, and the ways this role influences decisions to seek performance enhancement. On the second level, it examines the drugs themselves, and the context of their development.

Yet under the surface discussion of academic performance enhancement, this thesis is about the conventional logic that people use in their day-to-day lives, and the methods that these people use, as members of discrete academic disciplines, to rationalize their conventions. As a double major in Science, Technology, and Society (STS) and Public Health (STS being the major under which this thesis was written), I felt frequently torn between the conflicting rational paradigms of the various subjects I studied. STS is a broad field group, and has given me insight into the interplay between the three cultures of its namesake from philosophical, sociological, historical, ethical, psychological, and biological perspectives. It should be no surprise, then, that I was initially very overwhelmed by the daunting task of compressing these distinct approaches to studying STS into a single, concise and directed project.

More often than not, I have felt inadequate at fully immersing myself in any particular class of a specific discipline, usually due to the contradictory

ways that the other disciplines I study influence the ways that I look at the concepts discussed in class. However, scientific policy is not decided based on the unique rational paradigm of any one discipline. Moreover, the individuals in power who ultimately affect science policy are not accountable to the rational scrutiny of any discipline. Thus, in crafting science policy, it is important to be both skeptical and plastic with respect to any rational methodology.

In this regard, by learning about and critiquing the frameworks of rationale for several disciplines during my STS education, I have become sensitive to the fickle character of the rationale that is endemic to any particular intellectual discipline. It seems that frequently, two ontologically similar entities receive inconsistent treatment under the same rational paradigm⁴. In other words, things that should be treated equally under the law, as we have defined the law, are not being regarded as such. The discussion of academic performance enhancement offers an especially revealing medium through which to study this phenomenon of ontological inequality. For example, if the rational paradigm for banning testosterone doping in cycling is such that “enhancement is banned because it threatens the integrity of fair competition in sport,” I fail to see how expensive high-altitude training, personal trainers, and high-end equipment should be acceptable. “Enhancement,” as the action upon which the fairness of sport is evaluated, seems nearly impossible to determine in the context of such arbitrary and equivocal value-encoding.

There is an argument to be made that inefficient rules are simply irrational, and thus not worthy of my targeted scorn. I reject this argument on the grounds that if an irrational person has the power to impose irrational rules on other people, the fact that the rule is irrational, as an end in itself, is not necessarily relevant to meaningful political discourse. Consequentially, I reject narrow positions on rationality. Rationality should be viewed as a contextual dialogue subject to the assumptions and convictions, both *a priori* and *a posteriori*, of individuals. When we form strong convictions, we develop ad hoc rational paradigms to justify our actions. Strong convictions are defined not by their logical integrity, but by the extent to which individuals and groups believe these convictions.

If policies will be made without adherence to universal rational doctrine, then I choose to forgo the strict rational approach of any specific disci-

⁴The first of several classic “undergraduate thesis” propositions I have thrown in here for posterity’s sake on future inspection of this report

pline for discussing enhancement. Hence, this thesis attempts to tell honest stories, and invites readers apply these stories to their own arbitrary rational doctrines. Eventually, the convergence of these arbitrary doctrines will form policies that govern our academic institutions, communities, states, and countries. Yet with respect to the extent that individuality plays a role in the formation of these doctrines, I am more interested in evaluated the way that individuals develop these doctrines than the ways that societies ought to appraise and prioritize the beliefs of individuals.

2 NORMALCY, PSYCHOPATHOLOGY, AND THE DIAGNOSTIC CREEP OF ADD/ADHD

In this chapter I posit that the concepts of normalcy and pathology, as they are understood in both medical and social contexts, affect the drug-seeking behavior of individuals. The diagnostic creep of ADD/ADHD diagnoses is examined, and I argue that the cultural value-appropriation of “ADD” has generated ideal conditions for students to seek enhancement from drugs intended for the treatment of ADD/ADHD.

2.1 Colloquial Definition of Enhancement and its Connotations

The Colloquial definition of enhancement is rather useful, and from it follows many logical questions about how to evaluate enhancement in an institution, community, or society. Most major dictionary definitions offer a similar explanation along the lines of “To improve or add to the strength, worth, beauty, or other desirable quality of something” (Encarta World English dictionary). A deficient thing, such as a poor paint job on a car, can be enhanced to a more desirable level, and an already acceptable thing, such as a custom paint job, can be enhanced past a level of adequacy to a superior state. But today the term “enhancement” has come to be understood usually with regard to the latter example. Enhancement involves surpassing adequacy and is aided by some auxiliary force. The accessibility and effectiveness of that force invoke an intimate relationship between enhancement and fairness.

For the time being it is important to think of enhancement as some improvement over a commonly accepted baseline. By this definition, the concept of enhancement requires a certain theory of normalcy. Car paint, athletic performance, and intelligence cannot be made “better” than average if there is not a normal standard against which to evaluate these qualities. But defining normalcy is nearly as difficult as it is dangerous. The establishment of a definition of normalcy has the potential to exclude groups of highly functioning, worthwhile people who do not meet the criteria of “normal.” However, the establishment of fundamental standards is also critical

for the evaluation of any system.

Lennart Nordenfelt has summarized two definitions of normalcy, and considered their consequences. In the first, “normal” is a statistical average based on mathematical calculation. In the second, “normal” is a subjective perception of “ideal” performance⁵ (216). While the statistical view attempts to avoid certain value judgments that may arise from being labeled “abnormal,” the distinction between these statistical and subjective classifications is often unclear. Worse, it is difficult to avoid an implicit doctrine of superiority when classifying certain individuals as more normal than others.

It seems that we are better equipped to justify the value of establishing a normal standard than draft a framework for establishing that value. In the following section I will consider the different ways that normal is viewed medically, and some of the consequences of these definitions.

2.2 Medical Normalcy, Life Expectancy, and Human Dignity

Understanding normalcy is a rather critical primary requirement for medical applications. A doctor cannot diagnose a cancerous growth on the liver without understanding what a normal liver looks like. Beyond diagnosis, medicine relies on an understanding of normal health to make service more efficient. The old medical school adage, “if you see hoof prints in the forest, don’t look for a zebra, when it’s probably a horse” refers to the diagnostic principle of looking for the most common and thus most likely or “normal” answers to questions before devoting time and resources to testing esoteric diagnostic hypotheses. There is also an understanding of normal pathology in addition to normal health, which can make the out of context implementation of the word “normal” sometimes confusing. Edmond Murphy lists seven overlapping uses of the word “normal” in medical literature (Gilbert 216):

1. To refer to a statically normal distribution (“American men are normally between 5 and 7 feet tall”).
2. Used synonymously with “usual” or “general” to refer to the most commonly encountered characteristic (“humans normally have two eyes”).

⁵ Gilbert, Scott F., Tyler, Anna L., & Zackin, Emily J. *Bioethics and the New Embryology*: Springboards for Debate Sinauer Associates, MA, 2005; 214-220.

3. To refer to the most standard genotype of a phenotype found in nature, and used as a reference point against which other individuals of the same species are evaluated.
4. To mean “harmless” when referring to a physiological function (“The blood test results were normal”).
5. As a synonym for “conventional” (“normally people don’t want to break a bone”).
6. Used aesthetically to mean “the most perfect of its class.” In this sense, normal is the standard against all else is judged.
7. “Normal” is distinguished from diseased.

Murphy’s list exposes some important characteristics of normalcy in medicine. “Normal” and “healthy” are often used interchangeably. This is not an entirely reasonable association. Some habits that meet a normal standard distribution (such as cigarette smoking in Cambodia, where 86% of rural men smoke⁶) are not entirely healthy representations of ideal health. Also, setting the standard of the highest possible degree of health as “normal” might lead certain individuals to pursue unreachable health goals.

However, the most profound impact from the healthy/normal association is the way it implicitly allows augmentation to become “normal” as long as augmentation improves health. The best example of this effect is observed when considering normal life expectancy. In America, life expectancy has been gradually increasing⁷. Between 1900 and 2000, women’s life expectancy at birth grew from 46.3 years to 79.9 years. Improvements in sanitation technology, nutrition science, and molecular biology have been cited for this dramatic age expansion. Surely “normal” life expectancy today is achieved through engaging in various major and minor interventions and augmentations to improve health. If research continues in its current direction, people could very possibly live well past their tenth decade with adequate access to contemporary medical resources.

The impacts of an elongated “normal” or “healthy” lifespan are difficult to anticipate. On the political level, the graying of the population (the

⁶ WHO http://www.wpro.who.int/media_centre/fact_sheets/fs_20020528.htm

⁷ Fukuyama, Francis. *Our Posthuman Future: Consequences of the Biotechnological Revolution* New York 2002; 57

median age in the US has risen from 19 in 1850 to 34 in the 1990s⁸) will burden the Social Security budget and restrict access to medicine from senior citizens. By turning mechanisms of dying into pathologies, dying of “natural causes” becomes extinct. The understanding of enhancement will impact our decisions about end-of-life policy as the distinction between treatment and enhancement blurs.

Eventually, the concept of “lifespan” could become outdated, as normal humans could no longer be seen as having a life span. If this outcome is to be considered a true possibility, serious questions regarding human dignity need to be addressed. Is the vulnerability of human life (that is, the fact that all humans die) a defining characteristic of humanity? And if so, what does it say about human dignity and humanness itself to redefine the human lifespan so dramatically?

Of course, these lofty predictions about the consequences of theories of normalcy might be overly presumptuous. However, there are certainly risks to leaving the doors open for an ambiguous definition of a normal human lifespan. It seems likely that before people can live a healthy life for a significantly longer period of time, the dying process will elongate and become more painful and expensive. To this extent, establishing guidelines about what a normal human is capable of is beneficial to the practice of medicine and the flourishing of human dignity.

Because of the interventional nature of the elongated normal lifespan, it would be incorrect to equate “normal” with “natural.” If normal is reached by overstepping natural mechanisms, it would be inadequate to establish any theory of human dignity or identity through the implementation of any set of natural qualities or laws. If a theory of human dignity were drafted using any sort of naturalistic laws⁹, there would be no distinction between “treatment” and “enhancement,” as all unnatural interventions would enhance past the natural standard.

The topic of the relationship between human dignity and enhancement will be further discussed in Chapter 4. For the purposes of this chapter, it should be acknowledged that the seemingly inert principle of normalcy carries complicated and far-reaching implications. Defining normalcy serves a certain applied utility, but the application of that definition is not restrained

⁸ Statistic taken from Fukuyama page 61

⁹ Natural laws being “law whose content derives naturally from human nature or physical nature, and therefore has universal validity.” Sills, David L. (ed.) “Natural Law” International Encyclopedia of the Social Sciences (New York: 1968)

to any adiabatic system. The very language used for applied theories of normalcy allows far-reaching consequences to take effect.

2.3 Critiques of Normalcy and Quality of Life Prediction

Some critics argue that there is no need for a concept of normalcy. What is wrong with being abnormal? Helen Keller explained,

My life has been happy because I have had wonderful friends and plenty of interesting work to do. I seldom think about my limitations, and they never make me sad. Perhaps there is just a touch of yearning at times, but it is vague, like a breeze among flowers. The wind passes, and the flowers are content (Gilbert 215).

The study of the happiness of persons with disabilities exposes the complicated nature of defining disability as abnormal. Licia Carlson writes,

The emergence of disability studies has raised many questions regarding the status, legitimacy, and effects of the medical model of disability. According to this model, disability is understood as the presence of certain physical or cognitive impairments, located in the individual, that are considered objectively “abnormal” and “undesirable”¹⁰.

Plenty of people who are labeled “disabled” report a high quality of life (QOL). One researcher has noted, “There is no consensus on the definition of quality of life as it is affected by health (health related quality of life)”¹¹. One study found that of 153 persons interviewed with disabilities, 54.3% with moderate to serious disabilities reported having an excellent or good QOL¹².

¹⁰ Carlson, Licia. “Rethinking Normalcy, Normalization, and Cognitive Disability.” *Science and Other Cultures: Issues in Philosophy of Science and Technology* Ed. Figueroa, Robert & Harding, Sandra. Taylor & Francis Books, Inc. London, 2003: 154

¹¹ Carr, Allison J, Gibson, Barry, & Robinson, Peter G “Measuring quality of life: Is quality of life determined by expectations or experience?” *BMJ* 19 May 2001; 322: 1240-1243

¹² Albrecht, Gary L. & Devleger, Patrick J “The disability paradox: high quality of life against all odds.” *Social Science & Medicine*. April 1999; 48(8): 977-988.

There is often a discrepancy between the general public's predictions of what their own QOL would be if they were forced to live with a disability, and the actual experiences reported by patients. Much has been written about "affective forecasting," an individual's ability to rationally predict her future emotional state, or "affect." With regard to disabilities, healthy people asked to predict the QOL they would enjoy if faced with living with certain disabilities often estimate a lower QOL than what patients currently living with those disabilities report. For example, one study found that the general public estimates the QOL of dialysis patients at a value of 0.39 on a scale where 0 represents death and 1 represents perfect health, while current dialysis patients reported their QOL at 0.56¹³. In some cases, there is not even a discrepancy between the reported QOL of people who would generally be expected to be happy and those expected to be unhappy. One study found no substantial difference between the self-reported happiness of recently paralyzed paraplegic and quadriplegic car accident victims and that of recent lottery winners¹⁴.

These reports that conflict with popular assumptions regarding QOL underscore the inadequacy of the affective forecasting of many individuals. A University of Michigan study outlined three categories of factors that potentially contribute to the discrepancy between the QOL estimates of patients and the general public: 1) a failure to get patients and the public to compare the same health states ("comparing apples to oranges"), 2) a failure to get them to use the same 'measuring stick' (one person's '10' is another person's '11'), and 3) real difference of opinion about the severity of various illnesses or disabilities (comparing apples to apples using the same measuring stick)¹⁵. While the first two factors expose the subjective nature of affective forecasting, the third reason exposes a fundamental inability of some people to imagine the big picture of living a fulfilling life under very different circumstances.

What factors do individuals use when they estimate a high QOL? David Goode observes that high QOL for individuals is generally perceived as being

¹³ Sackett, DL, Torrance, GW. The utility of different health states as perceived by the general public. *J Chronic Dis* 1978; 31: 697-704.

¹⁴ Brickman, P, Coates, D, Janoff-Bulman R. Lottery winners and accident victims: Is happiness relative? *J Pers Soc Psychol* 1978; 36: 917-927.

¹⁵ Ubel, Peter A, Loewenstein, George, & Jepson, Christopher. Whose quality of life? A commentary exploring discrepancies between health state evaluations of patients and the general public. *Quality of Life Research* 2003; 12: 599-607.

in good health and experiencing subjective well-being and life satisfaction¹⁶. Another study notes that “Negative attitudes, perceptions and ambivalent behavior toward persons with disabilities appear to be accompanied by judgments of the general public that persons with disabilities do not have as high a quality of life as the able bodied.”¹⁷ This assumption that fuels negative attitudes towards persons living with disabilities contributes to other forms of social segregation between people who see themselves as enjoying a “normal” QOL and those who have an abnormal QOL. Other people, such as those who do not meet assumed standards for normal body weight, normal income, or normal family structure, are subject to social segregation due to low QOL assumptions by the general public.

One’s ability to adequately articulate an affective forecast seems rather dubious. For example, some research suggests that many individuals do not have the verbal capacity to speculate about or explain the nature of their personal higher-order cognitive decision-making. Another University of Michigan paper¹⁸ proposed that when people attempt to report about the processes mediating the effects of a stimulus on a response, they do not do so as a result of any true introspection. Routine responses to questions like “Why do you like him?” or “What is your favorite fruit?” that purport to explain the results of the cognitive processes that govern our “choices, evaluations, judgments, and behavior” are not based on true evaluation of cognitive processes, but rather “a priori, implicit causal theories, or judgments about the extent to which a particular stimulus is a plausible cause of a given response¹⁹.”

The paper goes on to note that accurate reports are most likely to occur, if accidentally, when influential stimuli are explicit, plausible causes of the responses they produce, and least likely to occur when the stimuli are neither explicit or plausible causes. In the case of predicting QOL, many factors that influence QOL are not explicit. For example, people attempting to predict their QOL if they became paraplegic might base their forecast on the foreseeable inability to do enjoyable activities that are hindered by paraple-

¹⁶ Goode, D. The national quality of life for persons with disabilities project: A quality of life agenda for the United States. Goode, D. (Ed.), *Quality of Life For Persons With Disabilities*. 1994 Cambridge, Brookline Press; 139–161.

¹⁷ Albrecht & Devligger pp. 979.

¹⁸ Nisbett, Richard E & Wilson, Timothy D (1977) Telling more than we can know: Verbal reports on mental processes. *Psychology Review* 84(3): 231-258.

¹⁹ Nisbett & Wilson 231.

gia, like playing sports and dancing, without taking into account stimuli that positively affect QOL that are not hindered by paraplegia, such as watching movies or engaging in conversation (Ubel, Loewenstein, & Jepson 601).

Expanding from the proposition of this paper, it follows that if people cannot be trusted to offer a posteriori explanations for their cognitive responses, they certainly should not be held accountable to discern between their opinions about normalcy and abnormalcy. Thus, we cannot discern between normalcy and abnormalcy because we simply do not have the mental capacity to do so.

This is a noteworthy critique, but its implications are greater and further reaching than the boundaries of the normal/abnormal distinction. While it raises a certain solipsistic-skepticism—that we cannot even know what we are thinking ourselves—the data regarding affective forecasting discrepancies in the context of disability-related QOL predictions should not be discounted. Even if people cannot understand why they think or act a certain way, their emotional state is no less real, and significantly impacts their QOL. Nonetheless, if QOL is not significantly affected by “abnormalcy” very frequently, the discrepancy between perceived QOL and actual QOL living with various ailments will continue to raise questions about the necessity of maintaining a distinction between normal and abnormal.

2.4 Benefits of Normal/Abnormal Distinction

If people can live abnormally and maintain a high quality of life, who benefits from a distinction between normal and abnormal? The distinction is most useful to those who report suffering from a lower quality of life as a result of their ascribed abnormalcy. If it is assumed that all people have a nearly equal potential for happiness and contentment regardless of physical disposition, the allocation of significant or expensive resources for the treatment of those physical ailments becomes difficult to rationalize. As health care costs continue to escalate, we cannot deny that cost-benefit analyses often affect treatment decisions for doctors and hospitals. Consider the following thought example offered by Peter Ubel:

... Imagine a treatment that delays, for 10 years, a patient’s need for a colostomy, [which] costs \$10,000, and has no side effects. As stated above, people who have not experienced colostomies estimate that having a colostomy would yield a health-related quality

of life (HRQoL) of 0.80. This treatment, then, would increase that person's HRQoL from 0.8 to 1, yielding 0.2 quality adjusted life years (QALYs), for a total of 2 QALYs over 10 years, at a cost of \$5000 per QALY. Now suppose, instead, that HRQoL estimates were taken from people who have colostomies. In that case, the intervention would increase HRQoL from 0.92 to 1, for a 10-year gain of 0.8 QALYs, and an overall cost effectiveness of \$12,500 per QALY, less than half the cost effectiveness based on general public HRQoL estimates. As this extremely simplified example suggests, the choice of whose HRQoL estimates to use could significantly impact cost effectiveness estimates (Ubel, Loewenstein, & Jepson 600).

Ubel's example reveals the risks of assuming a mean is an effective way to characterize the affect of a population. The HRQoL scores of patients who did and did not receive colostomies that Ubel cites were gathered using only one of the three distinct methods employed by the researchers to gather results for the study²⁰. The HRQoL scores Ubel cites have a standard deviation of .10 (out of 1.00) for the patients with colostomy and 0.12 for the patients without colostomy. The other two methods yielded significantly higher standard deviations, with the highest at 0.32. Although this degree of precision may be acceptable to the scientific community, the general American public is far from ready to discount the importance of valuing statistical outliers.

A good example of individuals who benefit from the normal/abnormal distinction is found in the group of blind people who don't want to be blind. Many blind people report a high quality of life, and resent the characterization of their condition as an abnormality or disability. Yet there are still others who would like to experience vision, and seek out treatment. An obligation of western medicine is often to protect the minority from the majority, or even the plurality. Doctors often opt for case-by-case consideration rather than relying on statistical figures to aid decision-making. Even if the mean indicates a low difference in HRQoL between a healthy and un-healthy group, in the tradition of medical beneficence, the lowest outlier deserves a full treatment effort. Discerning between normalcy and abnormalcy allows for the acknowledgement that some people do have an abnormally low qual-

²⁰ Boyd, Norman F, Sutherland, HJeather J, Heasman, Karen Z., Tritchler, David L, Cummings, Bernard J. (199) Whose utilities for decision analysis? *Medical Decision Making* 10(1);58-67

ity of life as a result of their ailments, and deserve resources allocated to improve their conditions.

Furthermore, all research does not agree that disabled persons are equally likely to report high levels of happiness as non-disabled persons. A recent study found that although both disabled and non-disabled persons report a positive mood, disabled people report a significantly lower degree of happiness²¹. Given this type of data, it should not be assumed that disabled people de facto experience an equally high quality of life as non-disabled people.

Other facets of happiness research contribute to the argument that QOL and happiness reporting should not be taken into account when developing public policies for allocating resources.

2.5 Normalcy and Psychopathology

The use of a baseline theory of normalcy is most criticized for its application in psychopathology, the study of mental illness. Many patients, psychiatrists, and health care advocates are very critical of the practice of defining “normal” behavior. Labeling a person’s psychological behavior as “abnormal” implies that the person can or should receive treatment under the diagnostic guidelines of the American Psychological Association. Georges Canguilhem is particularly critical of the subjective nature of establishing a difference between “normal” and “pathology.” In his book, *The Normal and the Pathological*, he writes, “There is no objective pathology. Structures or behaviors can be objectively described but they cannot be called pathological on the strength of some purely objective criterion²².”

Canguilhem rejects objective pathology because he rejects any natural distinction between normal and abnormal. Earlier in this chapter we established that the terms normal and natural were not synonymous. Canguilhem expands on this observation by noting that many naturally occurring behaviors and anomalies are considered abnormal or pathological. Thus, the concept of normal is not defined by a natural distinction, but rather by a dynamic process involving the individual’s relationship to the environment.

²¹ Marinic, Marko & Brkljacic, Tihana (July 2008) Love over gold-The correlation of happiness level with some life satisfaction factors between persons with and without physical disability. *J Dev Phys Disabil.* 20: 527-540.

²² Carlson 155

Thus, the task of establishing normal and abnormal psychological behavior is the arbitrary domain of the therapists and doctors who diagnose and treat psychological conditions.

The effects of the normal/abnormal distinction on the diagnosis and treatment of various forms of depression has been examined considerably. Because of the high rate of depression diagnosis, some critics worry about the greater implications of labeling so many people with a naturally occurring behavioral trait “abnormal” and giving them powerful, personality-affecting drugs.

In 1949, John Cade discovered the drug lithium, and began administering it to manic-depressive patients (Fukuyama 42). In contrast to the dominant talk-therapy treatment of the day endorsed by Freud, Cade’s lithium was so effective that in time, it nearly entirely replaced talk-therapy with drug-therapy. Soon thereafter, other drug-therapies began to emerge to treat various kinds of depression, including Prozac, Zoloft, and Paxil. Today, 28 million Americans, or 10% of the population, have taken Prozac or another related antidepressant drug (Fukuyama 43).

It seems arguable that the normal standard for happiness has been set unreasonably high if one in ten Americans require psychoactive medication to make herself ‘normal’. Some psychologists argue that contemporary psychopathology should be practiced according to a ‘social constructionism’ model, characterized by an exercise of studying psychiatric diagnoses “as representations of a variegated and ultimately unknowable human condition. Mental illness, according to this approach, is a by-product of the activity of mental health professionals”²³. Under this view, the study of psychopathology should involve the ways that psychopathology itself is socially constructed, including depression.

As we have seen, establishing a normal level of happiness is rather difficult. As a result, identifying depression has become a notable challenge for the field of psychology. Despite the amount of attention that ambiguity in defining depression receives, there is very little discussion of the psychopathology of happiness. Can too much happiness become pathological as well, or a symptom of other problems?

The neurotoxicity of high doses of MDMA is well documented²⁴, yet users

²³ Pilgrim, David, Bentall, Richard. The Medicalisation of misery: A critical realist analysis of the concept of depression. *Journal of Mental Health* Jun 1999. 8(3). Page 262 summarizing the position presented by Parker, et al. (1995). *Deconstructing Psychopathology*. London: Sage.

²⁴ <http://thedeia.org/neurotoxicity.html>

report extreme sensations of happiness and satisfaction on the drug. If a notably efficient mechanism for achieving physiological happiness is also threatening to health and cognition, clearly the value of happiness is not an independent variable but contingent upon the method through which it is achieved.

2.6 Normalcy and ADD/ADHD

The identification and subsequent diagnostic creep of Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) has also been the subject of much scrutiny. These syndromes, frequently interchanged with only subtly different diagnostic criteria under the DSM-IV²⁵, are characterized by “inattention, hyperactive motor behavior, and distractibility”²⁶. While some see ADD and ADHD as legitimate disabilities, others think they are turning the natural tendencies of adolescents into pathologies.

For a long time, many clinicians believed the association between ADHD and poor academic performance was the result of behavioral issues rather than actual learning disabilities^{27,28}. Because of this, many have felt that by “medicalizing” what is perceived as deviant behavior, the medical institution is taking on the role of an “agent of social control”²⁹. Other criticism stresses that the diagnosis of ADD/ADHD shifts the blame away from society for the cause of social problems. By blaming deviant social behavior on a pathological condition, the burden of treatment is shifted from governing institutions to medical institutions.

The alarming increase in ADD/ADHD diagnosis and prescription rates of stimulants used for its treatment in the 1990s has caused the greatest

²⁵ Refer to Appendix 3 for the current diagnostic criteria of ADD and ADHD

²⁶ Searight, Russell H. & McLaren, Lesley A. Attention-Deficit Hyperactivity Disorder: The Medicalization of Misbehavior. *Journal of Clinical Psychology in Medical Settings* 1998; 5(4); 467

²⁷ Baird, Jessica, Stevenson, Joan, and Williams, Don. The Evolution of ADHD: A Disorder of Communication? *The Quarterly Review of Biology*, March 2000; 75(1): 17

²⁸ McGee, R, Share D.L. Attention deficit disorder-hyperactivity; and academic failure: which comes first and what should be treated? *Journal of the American Academy of Child and Adolescent Psychiatry* May 1988; 27(3): 318.

²⁹ Conrad, Peter. The discovery of hyperkinesis: Notes on the medicalization of deviant behavior *Social Problems* Oct 1975; 23(1); 12

criticism for the syndrome. As with depression, many wonder what kind of message it sends to society to classify such a high number of children as diseased. Diagnosis rates began to escalate, and today ADHD is conservatively estimated to occur in 3.0 to 7.5 percent of school children, and more permissive criteria estimate up to 17 percent (source 1 page 4). In some school systems, up to 20 percent of boys receive medication for the treatment of ADHD.

Between 1992 and 1995, annual production quotas for Ritalin, the primary treatment for ADD and ADHD, tripled, and then doubled again between 1995 and 2002³⁰. Production quotas for Adderall, another leading ADD/ADHD treatment, more than tripled between 1997 and 2001. Due to this rapid diagnostic creep of ADD/ADHD, it has been noted that if ADD and ADHD are regarded as legitimate pathologies, the rapid increase in demand for treatment would indicate “an epidemic of truly staggering proportions” (Fukuyama 47).

There are certain physiological and neuroanatomical characteristics found in some patients diagnosed with ADHD. Some MRI studies have indicated that the anterior superior and inferior regions of the frontal lobes and the basal ganglia are about 10% smaller in groups of children diagnosed with ADHD than control groups, and genetic studies have observed polymorphisms in the D4 dopamine receptor gene and dopamine transporter gene in ADHD patients³¹. However, these diagnostic tools require expensive procedures, and are still developing their acuity. ADD/ADHD have historically been and continue to be diagnosed primarily using qualitative evaluations including written tests and psychological interviews. Since we cannot measure whether the diagnostic creep of ADD/ADHD occurred as the result of a shift in the population’s physiological makeup, we can speculate other subjective or sociological factors that may account for the rapid increase in the prevalence of the disorder.

Several factors have contributed to this diagnostic creep of ADD/ADHD. When the American Psychiatric Association released an updated version of

³⁰ “Staff Background Paper: Human Flourishing, Performance Enhancement, and Ritalin.” The President’s Council on Bioethics Dec 2002 <<http://bioethics.gov/background/humanflourish.html>> page 4

³¹ Swanson, James, Castellanos, F X, Murias, Michael, LaHoste, Gerald, Kennedy, James. Cognitive neuroscience of attention deficit hyperactivity disorder and hyperkinetic disorder. *Current Opinion in Neurobiology* April 1998; 8(2): 263-271

its Diagnostic Statistical Manual of Mental Disorders in 1987 (DSM-III-R), the criteria for assessing ADD were modified from the diagnosis of hyperactive physical movement and impulsivity to also including the problem of inattention³². These changes in diagnostic criteria broadened the group of people who might qualify for diagnosis. The updated DSM-IV published in 1994 further increased the likelihood of a diagnosis for a condition related to attention deficit or hyperactivity for which amphetamines may be prescribed for treatment. One comprehensive evaluation of the prevalence of attention deficit hyperactivity disorder found that the changing diagnostic criteria from DSM-III-R to DSM-IV increased the ADHD diagnoses from 56% to 63%³³. On the changing diagnostic criteria, Lawrence Diller explains,

The line between children with “normal” variations of temperament, lively or spontaneous children who are sensitive to stimuli, and those who have a “disorder” has become increasingly blurred. The sine qua non for the diagnosis of hyperactivity in the mid-1970s was a demonstration of motoric overactivity and/or distractibility in nearly all settings including the doctor’s office. . . Now children who sit quietly and perform well in social situations or in one-on-one psycho-metric testing can still be candidates for the diagnosis and treatment of ADHD if their parents or teachers report poor performance in completing tasks at school or at home (Diller 15).

The 1990s were also a time of escalating social pressures for success. Emerging out of the Cold War, expectations for childhood aptitude increased without much support for these new demands. Primary schools suffered from the aftermath of failed Cold War science curriculums such as the Physical Science Study Committee (PSSC) and the Biological Sciences Curriculum Study (BSCS), which left educators uncertain of the appropriate challenges to place on students and the appropriate expectations for success in taught subject matters, as some of these programs had highly rigorous curricula designed to educate a small elite group of student future-scientists to serve

³² Diller, Lawrence H. The run on Ritalin. Hastings Center Report Mar/Apr 1996; 26(2): 14

³³ Wolraich, Mark L., Baumgaertel, Anna. The Prevalence of Attention Deficit Hyperactivity Disorder Based on the New DSM-IV Criteria. Peabody Journal of Education 1996; 71(4): 180

the United States in the footsteps of the scientists who developed atomic weapons and space ships. For example, the PSSC curriculum was designed to produce at most a 25% student success rate³⁴. Throughout the late 1980s and early 90s, children were expected to enter school younger to learn primary spelling, mathematical, and social skills, yet childhood poverty rates concurrently increased from 15 percent to 20 percent. Class sizes increased, and special education services became more exclusive (Diller 16). Similar pressures have emerged for high school students as well, as SAT scores and college selectivity rates have continued to skyrocket.

It is understandable, then, why students who fail to live up to these heightened standards might begin to receive the classification of “abnormal” or “diseased.” After an intense lobbying campaign by the nonprofit group Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD), ADHD was put on the federal disabilities list in 1991 (Fukuyama 50).

Still another factor is worth considering when examining the diagnostic creep of ADD/ADHD. As of 2000, Pediatricians, Family Practice, and Psychiatry physicians were the first, second, and third lowest paid medical professions, and earned median annual incomes of \$125,000, \$132,000, and \$135,000 respectively³⁵. It is a fascinating coincidence that these are the same doctors who would presumably diagnose most of the ADD/ADHD cases. For physicians in these groups operating private practices, it is financially in their best interest to acquire more patients, especially patients on Schedule II prescription medications like Adderall and Ritalin that require in-office doctors visits to re-fill prescriptions. We will not explore whether or not there is a causal relationship between the diagnostic creep and the physician salary, but it is relevant to acknowledge the external incentive of ADD/ADHD diagnosis, and the potential conscious or unconscious bias favoring the prescription of Schedule II stimulants.

³⁴ Rudolph, John L. *Scientists in the Classroom: The Cold War Reconstruction of American Science Education* 2002. Palgrave, New York. 136

³⁵ Kane, Carol K. and Loeblich, Horst. “Physician Income: The Decade in Review” *Physician Socioeconomic Statistics*, American Medical Association 2003; 6

2.7 The Role of Terminology and Vernacular in Drug-seeking behavior

The well-documented, high rates of depression and ADD diagnosis might have a correlative effect on the drug seeking habits of Americans. The ubiquity of the drugs prescribed for the treatment of depression and ADD/ADHD might send the following message to Americans: “You are diseased, and need help.” This affirmation has the potential to motivate Americans to self-diagnose their psychological states and justify the administration of treatments without endorsement or regulation by doctors.

The mechanism of this influence is rather discrete. “Depression,” among a handful of other medical words, has entered the American vernacular. As a linguistic entity, depression does not carry the same value-specificity that other words used in medical terminology embody. It would be awfully peculiar to hear a person say, “I feel like I have a benign lymphatic growth today,” since the presence of this type of entity is only observable through an expert diagnostic process. However, the phrase “I feel depressed” (or even “I feel like I have depression” for parallel sentence formation) is neither uncommon nor inappropriate. For many people, it seems there is little ontological difference between feeling symptomatically depressed and receiving a diagnosis of depression. It seems reasonable to assume that it wouldn’t be hard to justify at least occasionally seeking treatment for the former if it is accepted that the latter condition is both treatable and worthy of seeking treatment. A few theories will be presented on how the linguistic value of certain medical words like depression might directly affect drug-seeking behaviors.

Following from a post-structuralist critique, there should be an inverse relationship between the value specificity of the word depression and the likelihood for individuals to manifest their own meaning for how it applies to their sense of self. As the ambiguity grows, it becomes easier for individuals to develop unique interpretations. Indeed, depression has been described as “the common cold of psychopathology, at once familiar and mysterious”³⁶. Furthermore, as a pathological condition ceases to be “abnormal,” the conventional synonymy between pathology and abnormalcy causes the pathological condition to appear less so as it becomes normative. For example, common signs of severe illness such as unresponsiveness and vomiting are often dis-

³⁶ Seligman, M.E.P. (1975). *Helplessness: On depression, development and death*. San Francisco: Freeman.

regarded as signs of dangerous pathology at fraternity parties, since binge drinking is common enough that these symptoms are considered normal.

The transformation from pathological and abnormal to normative is neither safe nor smooth. Indeed, fraternity parties yield a higher incidence of death from binge drinking than other niche communities. A common cold itself is hardly an excuse for missing significant obligations because it is such a routine condition, even though related symptoms can often be significant distractions³⁷.

As the incidence of depression diagnosis continues to rise, it loses its pathological identity. This fulfills synergistic effects with regard to drug-seeking behaviors. First, as described above, the transformation of depression into a normative condition places a higher demand on patients suffering from depression to fulfill social obligations. Just as an employee suffering from a common cold might take an aspirin before going to work, persons suffering from depression might be more expected to seek treatment for depression such that they can continue to carry out normal activities. Second, as what was once a stigmatized and embarrassing condition becomes normal and acceptable, it becomes less uncomfortable to openly seek treatment.

The self-medicating aspect of this account might also be considered to help explain the relationship between deviance, depression, and illicit drug abuse. It has been well documented that patients suffering from depression are likely to also abuse drugs and alcohol³⁸. Perhaps the link between drug abuse and depression can be partially explained by an internalized self-medicating justification.

ADD and ADHD have also become vernacular entities. It is not uncommon to hear students say, "I'm feeling a bit ADD today," even if they have never read the DSM-IV definition or consulted a doctor about the symptoms. The vernacular self-diagnosis of ADD might influence a student's decision to seek and ingest drugs for the treatment of ADD/ADHD.

This linguistic account for drug seeking behavior serves as a possible alternative to the explanation that the impetus for individuals to seek drugs intended for the treatment of ADD/ADHD is the desire for enhancement. Even if their self-diagnosis is incorrect, it would be inadequate to only study drug-seeking behavior from an enhancement perspective—and propose poli-

³⁷ A notable exception to this conventional trend is the increasing pathologization of end-of-life disease. As biomedical technologies continue to improve, dying of "natural causes" has become caught in the gray area between pathological and normal.

³⁸http://www.nami.org/Template.cfm?Section=By_Illness&Template=/TaggedPage/TaggedPageDisplay.cfm&T

cies based on that study—if the drug seeking population did not see themselves as seeking enhancement, but seeking treatment for legitimate ailments. Francis Fukuyama writes that “those who believe that they are suffering from ADHD are often desperate to believe that their inability to concentrate or to perform well in some life function is not, as they have often been told, a matter of poor character or weak will but the result of a neurological condition. . . they would like to absolve themselves of personal responsibility for their actions” (Fukuyama 49).

There is not much causal evidence to support these claims about drug-seeking behavior. However, during the same time frame that ADD/ADHD diagnosis has risen, non-prescription use of drugs intended for the treatment of these conditions has also increased³⁹. The coincidence is at least significant enough to pursue possible explanations for the possible correlation.

There are other possible explanations for how ADD as a vernacular entity might contribute to drug seeking even if the post-structuralist and normative/pathological dichotomy explanations are rejected. The Sapir-Worf hypothesis posits that the language a society uses to communicate shapes the unique cultural behaviors of its populace⁴⁰. This hypothesis has led to a field of study in linguistics and anthropology called linguistic relativism. John Lucy conducted a linguistic case study to test the Sapir-Worf hypothesis by comparing speakers of English with speakers of Yucatec Maya, an indigenous Indian language of southeastern Mexico⁴¹.

Lucy explains that the study of the influences of language on thought can be classified into three types: the semiotic, the structural, and the functional⁴². The semiotic type looks at the ways that symbolic code languages transform thinking compared with languages containing metaphorical elements. The structural type examines how speaking one or more languages affects thinking about reality. The functional type looks at the ways that using languages in particular ways influence thinking⁴³.

³⁹ Olfson et al 2002, zito et al. 2003 from McCabe, Sean E., et al. Non-Medical Use of Prescription Stimulants Among US College Students: Prevalence and Correlates From a National Survey. *Addiction* 100 (2005): 96-106.

⁴⁰ Koerner, Konrad E. The Sapir-Whorf Hypothesis: A Preliminary History and a Bibliographical Essay. *Journal of Linguistic Anthropology* Dec 1992, 2(2) pp. 173-198

⁴¹ Lucy, John. *Grammatical Categories and Cognition: A Case Study of the Linguistic Relativity Hypothesis* (Studies in the Social and Cultural Foundations of Language) Cambridge University Press 1996. Page 3

⁴² Niemeler, Susanne, and Dirven, René (eds) *Evidence for Linguistic Relativity*

⁴³ For a decent summary of evidence to support the Sapir-Whorf hypothesis, see Kay,

The functional type is the most applicable approach for the study of the effect of ADD as a vernacular entity on drug-seeking. Lucy explains the functional type, saying,

Any investigation of the relation between language and thought must also cope with [differences in patterns of use] in natural languages. The question is whether patterns of use have an impact on thought either directly or by amplifying or channeling any effects due to linguistic structure. We can call this the hypothesis of discursive relativity, a relativity stemming from diversity in the functional (or goal-oriented) configuration of language means in the course of interaction⁴⁴.

The pattern of use of the word ADD might influence the way it is handled and treated by lay individuals. If it has become a generalized condition capable of self-diagnosis and treatment, it might be regarded as worthy of action without medical consultation, just as “headache” may be self-diagnosed and treated without medical consultation.

2.8 Conclusions

The concept of normalcy plays a strong role in the operational habits of our culture, both explicitly and implicitly. We have looked at how normative values might help explain other reasons why some people might seek using drugs for ADHD other than for the pursuit of enhancement. However, the culture of enhancement in this country is such that these theories should not be considered the exclusive explanations for drug seeking. Furthermore, inadequate personal health-assessment does not indicate the absence of enhancing behavior, only enhancing intentions. Thus, we must examine the meaning and motivation of enhancement in the next chapter.

Paul, Kempton, Willett. What Is the Sapir Whorf Hypothesis? *American Anthropologist*, New Series: Mar 1984 86(1); 65-79.

⁴⁴ Lucy, John. The scope of linguistic relativity: an analysis and review of empirical research. In Gumperz and Levinson (eds.) *Rethinking linguistic relativity*. New York: Cambridge University Press. 52

3 PERSPECTIVES ON ENHANCEMENT

The purpose of this chapter is to discuss different perspectives about the definition of enhancement, and to present an original theory of enhancement. I intend to dispel the myth that normative claims can be made about enhancement itself, expose some of the ethical issues that enhancement raises, and give some background about the history of cognitive enhancement.

3.1 The Origins of Enhancement

It is not difficult to find foundational allegories about humanity's struggle to find a balance between pushing the limits in the pursuit of greatness and retiring its efforts with a humble concession to the primacy of our natural condition. Surely the tale of Adam's original sin of failing to accept his paradise and succumbing to curiosity and desire for further knowledge should be considered. After all, it was the perverse pursuit of knowledge that characterized Eve and Adam, and thus humans, committing us to the shame of self-awareness. Perhaps they were the first to pursue a dangerous cognitive enhancement, and unfortunately suffer the consequences.

Few legends are as oft cited with regard to the pursuit of human greatness than the myth of Prometheus stealing fire from the gods to deliver to mortals. He, too, was severely punished for his hubris. Prometheus, both celebrated and condemned, has come to represent the zest and audacity of mankind's lust for powers beyond its innate capabilities. Indeed, the alternative title to Mary Shelley's *Frankenstein* is "The Modern Prometheus" as a critique of Dr. Frankenstein's desire to wield power over capabilities that mankind has no business controlling.

Even the Faust legend offers insight into the measures that some will take to enhance themselves, even when facing enormous risks and consequences. Goethe's Faust is dissatisfied with the limitations of his knowledge and experience and lusts to find a method by which to expand it. He is so confident that he will never achieve full satisfaction that he makes a bet with the devil that the devil cannot produce any circumstances under which Faust would be so content that he would want the moment to last forever. That humans are intrinsically displeased with their capabilities regardless of their breadth

is a powerful position taken by Goethe, which underscores the stance that humans have, and always will, seek enhancement.

Leon R. Kass, chairman of the President's Council on Bioethics, received brief recognition and notoriety for assigning Nathaniel Hawthorne's short story, "The Birth-Mark," to other council members to prepare for a discussion titled "Science and the Pursuit of Perfection"⁴⁵. Hawthorne's 19th century story directly addresses questions relevant to bioethics today about the relationship between scientific pursuit, concepts of perfection, and the consequences of dissatisfaction. It is a tragedy about a scientist, Alymer, who inadvertently kills his beautiful wife in an attempt to rid her face of a birthmark. Hawthorne concludes his story with an explicit message about finding happiness and satisfaction in the conditions of the present instead of living life for the betterment of tomorrow:

...Had Alymer reached a profounder wisdom, he need not thus have flung away the happiness, which would have woven his mortal life of the selfsame texture with the celestial. The momentary circumstance was too strong for him; he failed to look beyond the shadowy scope of time, and, living once for all in eternity, to find the perfect future in the present⁴⁶.

These stories present convergent themes about humanity and enhancement. They all seek to address issues related to the following question: Can humans make themselves better than they are, and if so, is there anything wrong with that attempt? Hawthorne's message is of particular interest when considering the ethical questions that enhancement raises. How does one discern between times when a perceived problem merits fixing, and times when it should be accepted or overlooked? After all, certain achievements once considered impossible to reach, such as the integrated circuit, have become commonplace and celebrated as a direct result of the arrogance of some individuals.

For much of western history, conventions encouraged humans to remain humble about the extent of their abilities. Perhaps one of the most important changes to this cultural perspective came about during the Protestant

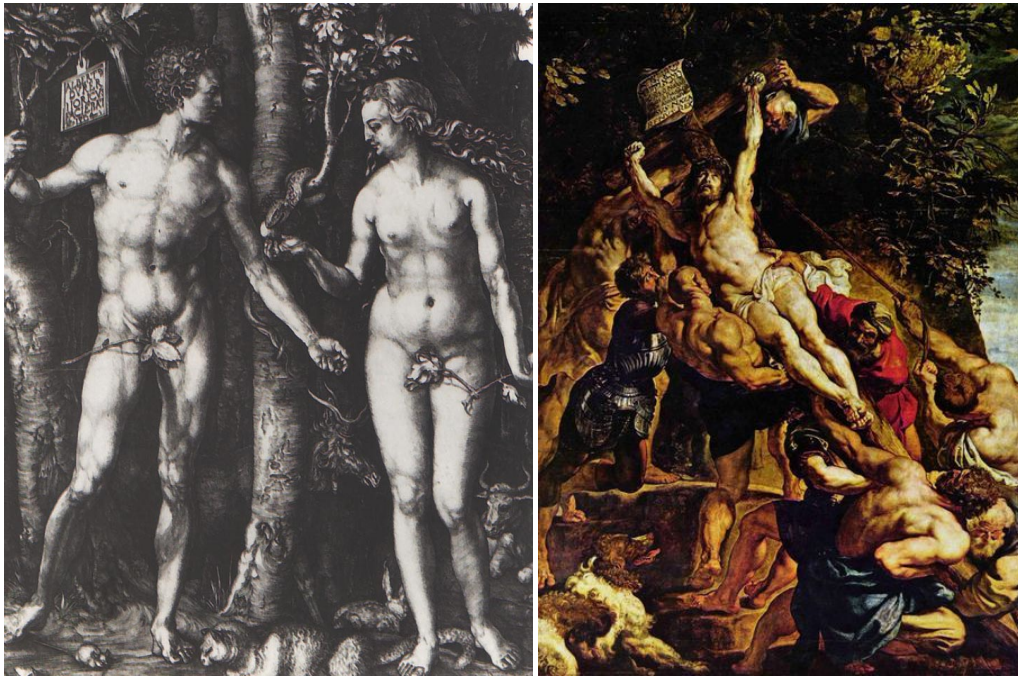
⁴⁵ The President's Council on Bioethics: January 2002 Meeting Agenda, <http://www.bioethics.gov/transcripts/jan02/index.html>

⁴⁶ Hawthorne, Nathaniel. "The Birthmark." 1843. Source: <http://www.online-literature.com/hawthorne/125/>

Reformation. As dissatisfaction with the Catholic Church grew during the beginnings of 16th century Europe, Martin Luther began to gain a following for his objection to Church practices. Among his influences, Luther's teachings of the Bible as one's only source for salvation contributed to a growing sense of individuality among reformed Christians. As people began to take control of their personal religious beliefs and relationships with God, the dogmatic message of human imperfection endorsed by the Catholic Church began to dissipate and make room for a sentiment of pride about humanity.

The changing homocentric prerogative is evidenced in art produced during the foundation and aftermath of the Protestant Reformation. Dürer's "The Fall of Man" (Figure 1.a) shows a muscled, beautiful Adam with Eve at the moment they are seduced by the snake⁴⁷. The changing religious narrative presented by the Protestants threatened the Catholic Church, and steps were taken to counter the reformation efforts and market Catholicism to appeal to the new generation. The humanist influence is apparent, and Catholic alter pieces such as Rubens' "Elevation of the Cross" (Figure 1.b) depict the beautiful, glorified human form that the Protestant reformation helped develop.

⁴⁷Kleiner, Fred S. and Mamiya, Christin J, Gardner's Art through the Ages: The Western Perspective Vol. 2, ed 12. 2006; 551



(a) Albrecht Dürer, “The Fall of Man” (1504) (b) Peter Paul Rubens, “Elevation of the Cross” (1610)

Figure 1: Homocentricity in Reformationist art may be an early indicator of society’s burgeoning acceptance of human enhancement.

Luther’s emphasis on studying ancient source material to discover truth has been noted for inspiring a movement of translating and re-evaluating ancient Greek texts to better understand the sources of western thinking. New Latin translations of fundamental Greek medical writing, such as Galen’s prolific *Methodus medendi* [Method of Healing], spread the progressive Hellenistic medical philosophy that had been lost during the Middle Ages, including Galen’s posit that patients should be seen and treated as individuals⁴⁸. This proliferation of ancient writing served as a precursor to the Renaissance movement, which in turn, among other achievements, produced a greater knowledge of human anatomy that further contributed to an interest in human individuality and paved the way for the medical profession to create new procedures and therapies that enhance the human condition.

⁴⁸ Porter, Roy. *The Greatest Benefit to Mankind: A Medical History of Humanity* 1997 W.W. Norton, New York; 172

Rembrandt's "The anatomy lesson of Dr. Nicolaes Tulp" (Figure 2) depicts a dissection amphitheater and underscores the emerging fascination with the human form.



Rembrandt van Rijn, "The anatomy lesson of Dr. Nicolaes Tulp" (1632)

Figure 2: Although dissection is commonplace today, human dissection was a novelty in the seventeenth century.

3.2 Contemporary Theories of Enhancement

In Chapter 1 the colloquial definition of enhancement, “To improve or add to the strength, worth, beauty, or other desirable quality of something,” was introduced as relatively adequate. The simplicity of this definition is highly inclusive in what is classified as a “cognitive enhancement.” The emergence of new types of enhancement abilities should not indicate much need to re-define the definition of enhancement. Because there isn’t a consistent moral doctrine regarding things that are enhancements, anything that can be examined as a possible enhancement might as well be classified as an enhancement since the more important question is whether the artifact should be accepted into the examining community.

Despite the utility of this definition, there has been a considerable amount written defining human enhancement. Much of the recent discussion has aimed to draw a dichotomy between therapy and enhancement. The British Medical Association writes how this may be observed with regard to the elderly population:

There are a range of interventions which could be classified as either treatments or enhancements because they provide a desired benefit and are perceived as contributing to human flourishing. With an aging population, many people expect to be able to enjoy a healthy and active life style into their old age and, as a result, even relatively minor age related deficiencies that were, in the past seen as natural and inevitable are increasingly seen as both problematic and avoidable⁴⁹.

The difference between “therapies” and “enhancements” is ambiguous, and depends on the chosen definition of enhancement. For example, John Harris reflects on the way the perception of eyeglasses has changed:

Consider spectacles: before they became commonplace, those who had good eyesight enjoyed an advantage over those who did not. Later, those who could afford spectacles joined those with naturally good eyesight—increasing (or decreasing?) natural unfairness. Enhancing technologies that improve eyesight are now widely available; we do not conclude that they are unethical because they are not globally accessible... The same is and will continue to be true of cognitive enhancers. We must press for wider and more equitable access, turning our backs neither on technology nor on improving the human

⁴⁹ BMA, Boosting your brainpower: ethical aspects of cognitive enhancements. A discussion paper from the British Medical Association. November, 2007 page 5

condition⁵⁰.

Nick Bostrom and Rebecca Roache go on to outline six reasons why it is problematic to draw a distinction between therapy and enhancement⁵¹. A summary of their position has been provided after each quotation on the list:

1) “The therapy-enhancement dichotomy does not map onto any corresponding dichotomy between standard-contemporary-medicine and medicine-as-it-could-be-practiced-in-the-future.” Bostrom & Roache observe that as medicine changes, new types of therapy fall under its domain. They are wary of a dichotomy that does not allow for the same growth of enhancement.

2) “It is unclear how to classify interventions that reduce the probability of disease and death.” Following from the first reason, it is unclear whether vaccination should be seen as an immune system enhancement or a preventative therapeutic intervention.

3) “There is the question of how to define a normal healthy state.” Here the complicated nature of normativity discussed in Chapter 2 is cited.

4) “Capacities vary continuously not only within a population but also within the lifespan of a single individual.” It is unclear whether the pursuit of extending what is currently understood to be normal life expectancy should be seen as enhancement or therapy.

5) “We may wonder how ‘internal’ an intervention has to be in order to count as an enhancement (or a therapy).” It is observed that without some requirement that an intervention is some form of “internal” treatment, all technologies and tools should constitute enhancements in that they “give us capacities to achieve certain outcomes more easily or effectively than we could otherwise do.”

6) “Even if we could define a concept of enhancement that captured some sort of unified phenomenon in the world, there is the problem of justifying the claim that the moral status of enhancements is different from that of other kinds of interventions that modify or increase human capacities to the same effect.”

Bostrom & Roache observe that these problems are only issues for “bio-conservatives,” or people who think that therapy is acceptable while enhance-

⁵⁰ Harris, John and Quigley, Muireann, “Humans have always tried to improve their condition” source 20 Nature magazine

⁵¹ Bostrom, Nick and Roache, Rebecca Ethical Issues in Human Enhancement Forthcoming in *New Waves in Applied Ethics* ed. Jesper Ryberg. Palgrave Macmillan. Essay available at www.nickbostrom.com pp 1-2

ment is not. For “transhumanists” like Bostrom, individuals who believe that enhancement is OK, the list does not present any issues.

3.3 Cognitive Enhancement

Academic performance enhancement falls in the special category of cognitive enhancement. A considerable amount has been written about how to define cognitive enhancement. Douglas C. Engelbart defined the goal of augmenting human intellect in 1962, saying,

By ‘augmenting human intellect’ we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems. Increased capability in this respect is taken to mean a mixture of the following: more-rapid comprehension, better comprehension, the possibility of gaining a useful degree of comprehension in a situation that previously was too complex, speedier solutions, better solutions, and the possibility of finding solutions to problems that before seemed insoluble⁵².

Sandberg and Anders have more recently defined cognitive enhancement as “the amplification or extension of core capacities of the mind through improvement or augmentation of internal or external information processing systems” (Sandberg & Bostrom 201). When applied to cognitive enhancement, a colloquial definition might be, “To improve or add to the strength, worth, beauty, or other desirable quality of cognition,” which I maintain is an adequate and useful definition of cognitive enhancement. However, in Chapter 4 the definitions of cognition and intellect will be criticized, and how they pertain to the measurement, and hence enhancement, of these perceived intellectual faculties will be discussed.

The origins of cognitive enhancement may be traced back to antiquity, but the contemporary culture of cognitive enhancement probably emerged in England during World War II. After observing that wartime airplane pilots were incapable of registering all the information presented on their dials and

⁵² Taken from Sandberg, Anders and Bostrom, Nick. *Converging Cognitive Enhancements*. Ann. NY. Acad. Sci. 2006; 1093: 202.

instruments while flying, psychologists set out to study the way humans interact with the technology and suggest ways the instrument panels may be re-designed to improve performance⁵³. During this research, the psychologists began to develop theories about the mechanisms that humans utilize to process information. The Unit for Research in Applied Psychology was founded as an adjunct to the Cognitive and Brain Science Unit at Cambridge in 1944, itself a branch of the UK Medical Research Council⁵⁴. The unit's first director, Kenneth Craik, developed the first computational model of skill and applied it to the task of aiming guns. Following the sequence of research and thought produced at the Cognitive and Brain Science Unit, western scientists began to form a new field of "cognitive psychology," a term coined by Ulrich Neisser's 1967 book of the same name, that aimed to better understand how information is processed in the human brain.

Gaining popularity conveniently during the same era as cognitive psychology, the dissemination of computers during the 1950s aided scientists in the formation of new research techniques for testing cognitive science hypotheses. Allan Turing's 1936 description of a physical computation device capable of processing abstract calculations, known as a "Turing machine," set the stage for the mechanical network of new computers to serve as a popular metaphor for how the human brain functions to store and process skills, information, and memories. This increasingly reductionistic approach to studying human cognition paved the road for an implicit assumption: If the brain operates like a machine, and if we can identify a faulty cog in that machine, we may be able improve the performance of that machine, and thus enhance cognition.

The brain as a mechanical device allowed cognitive enhancement to gain momentum from several perspectives. In this project we are mostly focusing on the approach of using pharmaceutical medications to alter and improve cognition. However, there is an incredible amount of research devoted to other approaches to cognitive enhancement. The clambering excitement about DNA following the success of Watson & Crick's 1953 Nature article, "Molecular structure of nucleic acids: A structure for Deoxyribose Nucleic Acid," jumpstarted the scientific "gene race" to breakdown the fundamentals artifacts of human nature into the genes that make up our genetic material.

⁵³ Medin, Douglas L, Ross, Brian H., Markman, Arthur B. Cognitive Psychology 4th ed. 2005 John Wiley & Sons; 20

⁵⁴ MRC Cognition and Brain Sciences Unit History of the Unit 11 September 2008 <www.mrc-cbu.ac.uk/about/history> 2 February 2009

Some cognitive psychologists aimed to understand whether there is a gene that determines a person's intelligence. Some scientists, such as Dr. Robert Plomin, even claim to have discovered this type of gene⁵⁵.

The magnitude of recent discoveries in the field of cognitive enhancement is far greater than the scope of this project. From this brief history of the emergence of cognitive psychology, it is sufficient to take away that from a scientific perspective, there has been an increasing trend towards understanding human behavior from the perspective that the physical makeup of a person's brain dictates her cognitive abilities. However, the evaluation of the extent to which this is true remains hotly debated, and is the primary topic of the "nature versus nurture" debate⁵⁶.

Finally, it is key to appreciate the profound union of the desire to enhance cognition and the foreseeable ability to do so has been a very new development in the history of science during the end of the 20th century, and we are only beginning to see how this interest will affect individuals and societies. This thesis explores the narrow aspect of cognitive enhancement by students at academic institutions by the use of a handful of stimulant drugs.

3.4 Contextual Enhancement

Some might not be so enamored by the colloquial definition of enhancement that has been offered, yet see the limitations of the therapy/enhancement dichotomy theory. A solution might be to develop a theory of contextual enhancement. Contextual enhancement posits that enhancement can only be understood through the evaluation of the circumstances under which the enhancement or augmentation in question is taking place. Under this view, there is no inherent quality of modern artifacts such as drugs, technologies, and therapies that decisively classifies them as enhancements. Instead, the context of how they are applied and the expectations placed on their effects dictates the nature of their enhancing properties.

⁵⁵ Plomin, Robert, Petrill, Stephen, (1997) "Genetics and intelligence: What's new?" 1997 *Intelligence* 24(1); 53-77

⁵⁶ For a compelling read about the misconceptions that plague the nature versus nurture debate, read David Moore's *The Dependent Gene: The Fallacy of Nature vs. Nurture* (2001).

This definition is implicitly used in almost any setting where enhancement is regulated. For example, during the 2008 Summer Olympics, a North Korean pistol shooter was stripped of his silver and bronze medals after testing positive for the drug propranolol, a beta-blocker that blocks the action of adrenaline and lowers blood pressure and heart rate, often prescribed to treat hand tremors⁵⁷. In nearly any other sport competition, propranolol would not be an enhancing drug, and if anything a performance reducer due to its sedative effects. But the challenges of shooting competition make the effects of propranolol advantageous, and therefore enhancing.

Musicians have also been known to take small doses of beta-blockers before auditions to reduce performance anxiety and maintain lucid hand movements that high adrenaline levels might hinder⁵⁸. Nervousness before auditions has led to the development of the diagnostic term ‘music performance anxiety’ (MPA)⁵⁹. The medicalization of MPA seems to put the decision to take beta-blockers in the domain of therapy. However, the lens of contextual enhancement does not discern between therapy and enhancement, and thus the use of beta-blockers is an enhancement.

It may appear that a consequence of the contextual enhancement approach is that it may lead to a therapy/enhancement dichotomy if individuality is taken to be a context. For instance, if an enhancing drug has no contextual effect on a particular person, it is not an enhancement. However, if the enhancing drug has no effect on a person, it also has no therapeutic effect either. Therefore, it actually leads to an implicit therapy-enhancement association rather than a dichotomy. Again, if there can be two instances of enhancement such that using enhancement A is deemed morally acceptable while using enhancement B is deemed morally unacceptable, then there is no specific moral assignment to enhancement itself. Because of this, it is irrelevant to focus on distinguishing between enhancement and therapy. Instead, focus should be placed on understanding the artifacts of enhancement/therapy, and deciding whether there are reasonable grounds to either

⁵⁷ Strickland, Eliza. Olympic Pistol Shooter Used Anti-Trembling Drug to Steady His Hands. 18 Aug 2008 Discover Magazine 5 December 2008 < <http://blogs.discovermagazine.com/80beats/2008/08/18/olympic-pistol-shooter-used-anti-trembling-drug-to-steady-his-hands/> >

⁵⁸ <http://eye.columbiaspectator.com/index.php/site/article/classical-musics-dirty-little-secret/>

⁵⁹ Kenny, Dianna T. A Systematic Review of Treatments for Music performance Anxiety. *Anxiety, Stress & Coping*. Sep 2005. 18(3) p 183-208

ban or accept these items.

3.5 Conclusions

Enhancement and cognitive enhancement can be understood and studied in a variety of ways. However, after removing value assumptions about the ethics of a particular enhancement, the definition of enhancement and cognitive enhancement is rather straightforward. The therapy/enhancement dichotomy is only relevant if enhancement itself is always perceived to have negative connotations, a stance which has been presented as incorrect. However, enhancements can and often do produce moral, psychological, and physiological side effects. Before we can develop policies to govern the placement of risky enhancements in our communities, we must first understand and evaluate the artifacts of enhancement, that is, the substances, chemicals, technologies, and therapies that interact with humans to allow them to enhance certain desirable properties.

4 THE ARTIFACTS OF ENHANCEMENT

In this chapter I identify the drugs most commonly used as academic performance enhancers, and evaluate whether they are effective at improving cognition in individuals. I offer an account of the development of amphetamines, along with the troubling history of intelligence testing. For more information about the chemistry of these “artifacts of enhancement,” please refer to appendixes 1 and 2.

4.1 What are Study Drugs?

Study drugs, academic performance-enhancing drugs, and cognitive enhancing drugs are terms used interchangeably to describe a class of chemicals known as central nervous system (CNS) stimulants prescribed for the treatment of Attention Deficit disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD). Drugs intended for the treatment of narcolepsy, depression, and over-eating are also used as academic performance-enhancers. By 2005, medications for ADHD were the ninth-largest segment of the CNS drug market in terms of sales, with the United States spending \$2.4 billion and seeing a 40% annual growth⁶⁰.

CNS stimulants produce a wide range of side effects⁶¹. Even though each CNS stimulant affects the body and consciousness in a distinct way, they all increase heart rate and blood pressure to varying degrees. Systemic effects increase with dose, and high doses can cause irregular cardiac rhythms leading to cardiac arrest and psychosis. Other reported side effects include euphoria, formication (the sensation of insects crawling on the skin), delusions, hallucinations, obsessive-compulsive disorder, pupil dilation, bruxia (jaw clenching), depression, nausea, dehydration, insomnia, and seizures. Different CNS stimulants produce varying degrees of long-term health effects, but the greatest risk is damage to the cardiovascular system⁶².

⁶⁰ McGough James J, McCracken James T Adult attention deficit hyperactivity disorder: moving beyond DSM-IV.. *The American journal of psychiatry*. 2006; 163(10): 1673-5.

⁶¹ For more information about CNS stimulants, please refer to Appendix 1

⁶² Lehne, Richard A. *Pharmacology for Nursing Care*. 5th ed. 2004 Saunders, Missouri. pp 353-369

Because of the range of euphoria produced by CNS stimulants, they have a high potential for abuse and psychological dependence. Many cocaine users find the subjective effects of amphetamines to be nearly identical. In studies of lab animals, the subjects showed no preference for cocaine over Ritalin (Fukuyama 48).

A recent study showed that more than 7 million people in the US have abused ADHD stimulants, and as many as 750,000 teenagers show signs of addiction⁶³. For this reason, there has been a modest push to develop abuse-proof ADHD treatments. In 2002 Eli Lilly released the non-stimulant ADHD treatment Strattera. In 2006 Cortex Pharmaceuticals began clinical trials of CX717. Unfortunately, most doctors find that these non-stimulant alternatives are not as effective as the stimulants. Currently, Strattera commands only 15% of the market. “Despite massive advertising and educational campaigning by Eli Lilly, the word on the street amongst physicians is that Strattera is a second choice drug, at least in children,” says Lawrence Diller, a behavioral pediatrician in Walnut Creek, California⁶⁴.

4.2 The History of Study Drugs

One of the most well known CNS stimulants, amphetamine, is the active ingredient in the ADHD drug Adderall, and is generally seen as the primary organic chemical from which all other ADD/ADHD drugs have been developed⁶⁵. Some have cited amphetamine as the first antidepressant and pharmaceutical treatment for any mood disorder⁶⁶. Over the past 100 years, it has been marketed and prescribed for a variety of different physical and psychological ailments,

Amphetamine was first synthesized from ephedrine, a decongestant derived from the Chinese medication Ma-Huang, in 1887 by German chemist Lazar Edeleanu while experimenting with the recently discovered derivative.

⁶³ Basu, Paroma. Addictive Drugs Still Best Option for Attention Deficit Disorder. *Nature Medicine* Jan. 2008;12 (2006): 375 <<http://www.nature.com/nm/journal/v12/n4/full/nm0406-374a.html>>.

⁶⁴ For more information about the risks associated with Amphetamines, please refer to Appendix 3

⁶⁵ For more information about the chemistry of study drugs, please refer to Appendix 2

⁶⁶ Rasmussen, Nicolas. *On Speed* New York University Press, New York. 2008; Page 3

No pharmacological use was found for amphetamine until American pharmacologist Gordon Alles revisited the substance in 1929 and tested it on himself in search for a replacement for the nauseating side effects of ephedrine. After injecting 50mg of the substance (five times what would later become the standard dose), Alles noticed that along with nasal decongestion, he experienced a heightened blood pressure and a “feeling of well-being,” and believed himself to be an especially witty dinner guest at his lab partner’s house later that evening (Rasmussen 6).

With the early 1930s came the Great Depression, and Alles became desperate to find some marketable application to his discovery and continued to perform experiments with the amphetamine molecule to see if its allergy-reducing effects could be retained while minimizing its stimulating side-effects. One such self-administered experiment involved a slightly modified version of the molecule, which would later be identified as a precursor to the street drug ecstasy. While the subjective effects of this chemical, MDA, are hardly distinguishable from ecstasy, MDMA, the structural difference of the molecule is the same difference between amphetamine and the notorious street drug methamphetamine: an extra methyl group (Rasmussen 19).

After producing and marketing an asthma drug derived from amphetamine, Alles began to consider possible medical applications for which the stimulating effects of amphetamine and its derivatives might serve a purpose. Noting the insomnia often experienced by users of the drug, in 1933 he began testing the drug on narcolepsy patients. It was a success, and Alles obtained a patent for his chemical. The pressing financial demand for drug companies to find exciting new medications to market led to many variations of the amphetamine chemical, most notably a more volatile form called Benzedrine Sulfite that could be inhaled to relieve nasal congestion. A prominent drug company of the day, Smith, Kline, & French employed Alles to develop new drugs, and with this funding Alles was able to further research the effects of amphetamine (Rasmussen 23).

According to Lawrence Diller, the first documented use of stimulants to treat children’s behavior problems occurred in 1937⁶⁷, although papers written in this decade suggest that Benzedrine Sulfite was first used on mentally disordered patients in 1936⁶⁸. Psychiatrist Charles Bradley tried the drug on

⁶⁷ Diller, L. H. The run on Ritalin. Attention deficit disorder and stimulant treatment in the 1990s. *The Hastings Center Report* Mar-Apr 1996; 26(2): 12-18

⁶⁸ Davidoff, Eugene. A clinical study of the effect of Benzedrine on self-absorbed patients, *Psychiat. Quar.* 10, 1936, 652-659.

30 young boys and girls with learning disabilities, and found that while about half of them scored higher on tests, the rest of the unruly children became more unmanageable after ingesting the drug⁶⁹. Later researchers noted that the action of amphetamine was “variable, uncertain, unpredictable, and at times paradoxical”⁷⁰. Nonetheless, the researchers conceded that amphetamine had been “successfully utilized in medicine in the treatment of narcolepsy, postencephalitic Parkinsonism, certain depressive mental states and similar conditions.”

Amphetamine (still marketed in the form of Benzedrine Sulfite) continued to gain popularity, especially for its anti-depressive effects. For example, one 1940 full-page ad for the drug in the *New England Journal of Medicine* read as follows:

The Patient With Mild Depression: The patient with mild depression usually presents a clinical picture characterized by the following symptoms:

1) Apathy, discouragement and undue pessimism; 2) subjective difficulty in thinking, in concentrating and in initiating and accomplishing usual tasks; 3) subjective sensations of weakness and exhaustion; 4) hypochondria (undue preoccupation with vague somatic complaints such as palpitation or gastro-intestinal disorders which may have no organic basis)⁷¹

Alas, it was also gaining notoriety for its addictive properties. During the early 1940s, research about Benzedrine addiction was becoming widespread⁷². Non-addictive anti-depressant alternatives also began appearing on the market in the 1960s, and Benzedrine began to lose its popularity as a psychotherapy medication as further reports of abuse, health problems, and psychosis began to emerge and converge. By 1962, the FDA became wary of the widespread abuse, and restricted Benzedrine inhalers to prescription use.

⁶⁹ C. Bradley, *The Behavior of Children Receiving Benzedrine*. *American Journal of Psychiatry* 94 (1937): 577-85.

⁷⁰ Reifstein, Edward C and Davidoff, Eugene. *The Psychological Effects of Benzedrine Sulfate*. *The American Journal of Psychology*, 53(1) Jan 1939 56-64

⁷¹ Rasmussen, Nicolas. *Making the First anti-depressant: Amphetamine in American Medicine, 1929-1950* *Journal of the History of Medicine and Allied Sciences* 61.3 (2006) page 315

⁷² Friedenberg, Sidney. *Addiction to Amphetamine Sulfate*. *J. Am. Med. Assoc.*, 1940, 114, 956-57

Eventually, amphetamine became a schedule II drug under the Controlled Substances Act in 1971⁷³.

During the 1960s, amphetamine was also distributed as a little known diet drug Obetrol. It was not hugely successful, and rights to the formulation were sold to Richwood pharmaceuticals in 1994. The FDA re-approved the drug as an ADD and ADHD treatment in 1996 under its new brand name Adderall. Since it was approved for this purpose, its use has been rapidly on the rise, growing from 1.3 million prescriptions in 1996 to nearly 6 million in 1999 for the treatment of ADHD⁷⁴.

Other non-amphetamine CNS stimulants are also used for the treatment of ADD and ADHD and are consequently used as academic performance enhancers. Methylphenidate has been distributed under the brand name Ritalin since the 1960s for the treatment of ADD⁷⁵. Though chemically dissimilar from amphetamine, its pharmacological action is nearly the same. Currently, methylphenidate is the most prescribed treatment for ADHD. Since 1990, its prescription rate has gradually increased, but seems to have leveled off at around 11 million prescriptions a year (pbs 1). According to the United Nations, the United States produces and consumes 85% of the world's methylphenidate. Per capita, New Hampshire has the highest rate of methylphenidate prescriptions, and California has the lowest.

Other frequently used study drugs include Dexmethylphenidate, sold commercially as Focalin, approved for distribution in 2005⁷⁶. Nearly identical to Ritalin, Focalin removes one of the methylphenidate stereo-isomers believed to cause certain unpleasant side effects. Modafinil, distributed commercially in the United States as Provigil for the treatment of narcolepsy, has also been used as an academic performance enhancer. Although the mechanism of action of Provigil is dissimilar from amphetamines and methylphenidate, it is still a CNS stimulant. Patients have reported staying awake on Provigil for three days without any immediately noticeable undesirable effects.

⁷³ Elia, Josephine, et al. Lisdexamfetamine Dimesylate. *Nature Reviews Drug Discovery* 6 (2007): 343-344.

⁷⁴ <<http://www.pbs.org/wgbh/pages/frontline/shows/medicating/drugs/stats.html>>

⁷⁵ L. L. Greenhill, Pharmacologic Treatment of Attention Deficit Disorder. *Psychiatric Clinics of North America* 15 (1992): 1-27.

⁷⁶ McGough, James J, Pataki, Caroly S, Suddath, Robert, "Dexmethylphenidate extended-release capsules for attention deficit hyperactivity disorder" *Expert Review of Neurotherapeutics* Jul 2005, Vol. 5 No. 4; 437-441

4.3 Who Takes Study Drugs?

The mood-lifting effects and good reputation of ADD/ADHD drugs make them appealing for college students subject to high stress. A study conducted by Monitoring the Future (MTF), an “ongoing study of the behaviors, attitudes, and values of American secondary school students, college students, and young adults”⁷⁷ found that in 2002, college students reported rates of non-medical use of Ritalin twice as high (5.7% versus 2.5%) as peers of the same age who were not in college⁷⁸. These results are inconsistent with other trends of illicit drug use that usually report lower rates of college student abuse. Data for 2007 released by the same group maintains the higher rate of use for college students, but shows lower numbers reporting Ritalin use (3.7% to 2.3%)⁷⁹. However, the sharper drop in use for college students compared with non-college students might be caused by an increase in the use of alternative drugs intended for the treatment of ADD/ADHD that the MTF study did not investigate. For example, one 2006 study observed that more than 75% of college students who admitted to using prescription stimulants chose Adderall over Ritalin⁸⁰.

A 2005 study of more than 10,000 college students found that of participants, 6.9% admitted to using ADD/ADHD drugs for non-prescription use, with some schools showing up to 25% of students taking the drugs without prescription⁸¹. The rates were highest among students at colleges with more competitive admission standards. Interestingly, students with a “B” grade point average or lower were more than twice as likely to take study drugs.

The 2005 study noted that students of higher socio-economic status are more likely to take study drugs. This finding converges with another study, which found that students from families with higher incomes reported higher

⁷⁷ <http://www.monitoringthefuture.org>

⁷⁸ Johnston, LD., O’Mailley, PM, & Bachman, JG. Monitoring the Future National Survey Results on Drug Use, 1975-2002: II. College Students and Adults Ages 19-40. NIH publication no. 03-5376. Washington, DC: US Dept. of Health and Human Services

⁷⁹ Monitoring the Future: National Survey Results on Drug Use 1975-2007. Vol II College Students & Adults Ages 19-45. page 237

⁸⁰ Teter, Christian J., McCabe, Sean E., LaGrange, Kristy, Cranford, James, Boyd, Carol. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy* Oct 2006; 26(10): 1501-10

⁸¹ McCabe, Sean E., et al. Non-Medical Use of Prescription Stimulants Among US College Students: Prevalence and Correlates From a National Survey. *Addiction* 100 (2005): 96-106.

rates of non-medical Ritalin use⁸². The use of prescription stimulants is higher in the United States than any other country (McCabe et al. 97).

4.4 Misconceptions about Study Drugs and the History of Intelligence Testing

Currently, it is not entirely understood how any of these drugs affect attention, memory, and performance in healthy people or patients diagnosed with ADD or ADHD⁸³. To study the effectiveness of these drugs, it is first important to understand what these drugs are aiming to accomplish. To say that they increase overall “cognition” or “intelligence” would require very narrow definitions of these terms. The history of the measurement of intelligence exposes the inadequate measures by which intelligence is defined and measured. Putting an empirical value on cognitive performance is a tricky and dangerous field subject to research bias and capable of harming individuals and groups of people.

Stephen J. Gould’s *The Mismeasure of Man* (a title he chose deliberately for its inherent irony) serves to methodically critique and abolish one particular aspect to ranking of human groups: “the argument that intelligence can be meaningfully abstracted as a single number capable of ranking all people on a linear scale of intrinsic and unalterable mental worth”⁸⁴. His book chronicles the history of fallacious intelligence measurement, specifically biological determinism, or the belief that “shared behavioral norms, and the social and economic differences between human groups—primarily races, classes, and sexes—arise from inherited, inborn distinctions and that society, in this sense, is an accurate reflection of biology” (Gould 52).

Over the past 200 years, researchers have repeatedly attempted to find empirical distinctions between the intelligence of various groups of people defined by their socio-economic status and race. From the measurement of skull sizes and brain weights to standardized intelligence testing, research has consistently and repeatedly failed to design tests that adequately develop methods for predicting human intelligence.

⁸² Teter, CJ., McCabe, SE., Boyd, CJ, & Guthrie, SK Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. *Pharmacotherapy* 2003, 23: 609-617

⁸³ Please refer to Appendix 5 for a concise summary on human memory and learning.

⁸⁴ Gould, Stephen J. *The Mismeasure of Man* page 20

Gould believes that the attempt to find a biologically deterministic explanation for human intelligence is based on two fallacies: 1) reification, or the belief that intelligence is a thing (similar to the John Stuart Mill concept described as, “To believe that whatever received a name must be an entity or being, having an independent existence of its own”⁸⁵), and 2) that it can be ranked. He argues that because we can intuitively recognize the importance of mentality and cognition in our lives, we thus seek to characterize it, and create the concept of “intelligence” to explain “this wondrously complex and multifaceted set of human capabilities” (Gould 56). “This shorthand symbol is then reified and intelligence achieves its dubious status as a unitary thing.”

It follows, then, that once intelligence becomes an entity, the factors that make up that entity are quantifiable and measurable, to the same extent that science assumes that all “things” are measurable. This is partly based on the ubiquitous reductionism of science. In this case, the attempt is to measure intelligence on a scale from low to high. This is most easily accomplished by assigning a specific number to each person’s intelligence. Just as a person might be objectively ranked in their class according to GPA, intelligence testing aims to give a single numerical value of intelligence to each person.

The reductionist assumption that many scientists hold is inherently a priori. That all things, even things that have not been observed yet, can be explained by composite components is a bold claim, but it has also driven numerous scientific achievements.

Gould’s message about the flaws of intelligence testing is well received, but he oversteps his bounds when he begins to critique the entire scientific method itself in a manner akin to philosopher of science Paul Feyerabend. During a talk given to the Philosophy Society at Sussex University in 1974, Paul Feyerabend rather notoriously stated that he wanted to defend society and its inhabitants from all ideologies, science included. He explained,

All ideologies must be seen in perspective. One must not take them too seriously. One must read them like fairytales which have lots of interesting things to say but which also contain wicked lies, or like ethical prescriptions which may be useful rules of thumb but which are deadly when followed to the letter (Feyerabend 35).

He goes on to explain that while science was and instrument of libera-

⁸⁵ Mill, John Stuart. *Analysis of the phenomena of the human mind* (1829), page 5

tion and enlightenment, there is nothing inherent in science or in any other ideology that makes it essentially liberating.

Gould's point is similar when he argues, "I criticize the myth that science itself is an objective enterprise, done properly only when scientists can shuck the constraints of their culture and view the world as it really is" (Gould 53). It is rather easy to discover the flaws of any research and raise doubt. It has been a conservative tactic for generations, from cigarette companies creating doubt about nicotine test results, to current doubts raised about the scientific evidence of global warming. The heart of Gould's criticism is his observation (although he hardly deserves credit for making this observation, as it echoes the work of Thomas Kuhn and Max Weber) that science is a social phenomenon. He posits that science is "a gutsy, human enterprise, not the work of robots programmed to collect pure information." He goes on to explain,

Science, since people must do it, is a socially embedded activity. . . Much of its change through time does not record a closer approach to absolute truth, but the alteration of cultural contexts that influence it so strongly. . . Facts are not pure and unsullied bits of information; culture also influences what we see and how we see it. Theories, moreover, are not inexorable inductions from facts. The most creative theories are often imaginative visions imposed upon facts; the source of imagination is also strongly cultural. Gould (53-54)

Despite his critique, Gould still stands by science. He says bluntly, "I believe that a factual reality exists and that science, though often in an obtuse and erratic manner, can learn about it" (Gould 54). At his worst, Gould is verbose and arrogant, simultaneously acknowledging the merits of science while observing its flaws. Gould does not mention his own biases, specifically his perspective that is popular among today's liberal circles that we cannot quantify differences between groups.

Measuring differences between social groups is a reasonable goal and hypothesis. After all, other groups observed in nature have definable traits, and the attempt to measure traits is a cornerstone of scientific research. If we are to accept the scientific method and its practitioners as adequate agents for solving problems and answering questions in our lives, we cannot be selectively critical of their research techniques. Intelligence testing

may be flawed, but to imply that this is always because of inherently racist convictions, as Gould does, goes a step too far.

This commentary about Gould and Feyerabend's critique of the scientific method has been included to show some of the well-distributed critiques of science, and how these critiques can be misapplied to overlook the merits of science when it is done correctly. The history of the development and subsequent misapplication of Alfred Binet's Intelligence Quotient test illustrates a circumstance when the best intentions of practicing the scientific method with appropriate scrutiny and reporting only falsifiable results became exploited and harmed the perception of the scientific method.

4.5 The Intelligence Quotient Test

Intelligence testing has a long history beginning with the science of Craniometry, or the study of "the relationship between the intelligence of subjects and the volume of their head" (Gould 176). It wasn't until the beginning of the 20th century that intelligence testing as it is known today was developed.

Gould reported that in 1898, Alfred Binet, the father of the Intelligence Quotient (IQ) test, was convinced that Craniometry was the best way to measure intelligence, saying, "The relationship between the intelligence of subjects and the volume of their head... is very real. We conclude that the preceding proposition must be considered as incontestable" (Gould 176). However, as he began pursuing his own research, Binet began to doubt the validity of Craniometry. Even more damning, he began to question the ability of any researcher to perform "objective" research. After performing a study of his own bias, Binet concluded, "suggestibility... works less on an act of which we have full consciousness, than on a half-conscious act and this is precisely its danger" (Gould 177). In the case of Craniometry, he believed that previous research, including his own, had been inhibited by experimental bias, often against the poor. Discouraged, Binet wrote in 1900, "The idea of measuring intelligence by measuring heads seemed ridiculous... I was on the point of abandoning this work, and I didn't want to publish a single line of it" (Gould 178).

Binet's observation of the impossibility of experimental objectivity was in some respects ahead of his time. It wasn't until well over a half-century later that philosophers of science began to criticize the "objective" fallacy of scientific research. Thomas Kuhn's famous *The Structure of Scientific*

Revolutions outlined the mechanism of scientific change, highlighting the existence of “paradigms” of scientific thought that people fall into until better theories come forward. More recently, feminist philosophers of science have been even more critical of scientific objectivity. Richard Olson writes on feminist philosophy of science,

With respect to issues of bias, I take a position often called “feminist point of view epistemology.” That is, I doubt seriously whether any scholar can be completely objective and unbiased no matter how hard they try. I thus welcome those scholars who openly admit their point of view, for that invites the reader to be particularly careful in evaluating their arguments and evidentiary claims⁸⁶.

Indeed, Binet declared his own bias, writing, “I want to state very explicitly, what I have observed about myself. The details that follow are those that the majority of authors do not publish; one does not want to let them be known” (Gould 178).

Binet’s big break came in 1904 when he was commissioned by the minister of public education to develop a series of techniques to identify children who did not succeed in a normal classroom setting and required special education. Unlike previous tests to identify this caliber of student that relied on physical measurement, Binet had his subjects perform a broad array of short tasks. Instead of focusing on learned skills, he chose to test different abilities and assign each child a single score. The test was a success, and Binet eventually published three versions of the test before his death in 1911.

The 1908 version assigned an age level to each task, defined as the youngest age at which a child of normal intelligence should be able to complete the task successfully (Gould 179). The age associated with the most difficult tasks he could perform was her mental age, and her intellectual level was calculated by subtracting this mental age from her true age. German psychologist W. Stern argued that mental age should be divided, not subtracted from chronological age, and thus the Intelligence Quotient (IQ) score was formed.

It is unfortunate that, like many other developments in the history of science and technology, Binet’s test has eventually been used for purposes it was never intended. Binet believed that intelligence is a value too complex

⁸⁶ Richard Olson, from sakai website

to be defined by a single number. As far as he was concerned, his test should only be used as a practical tool to help identify students who deserved additional help in school. Thomas Jefferson once said, “whatever be their degree of talents, it is no measure of their rights” of persons with a low intelligence (Gould 63). With regard to Thomas Jefferson, Binet’s test was intended to increase the equity of education, saying, “we are of the opinion that the most valuable use of our scale will not be its application to the normal pupils, but rather to those of inferior grades of intelligence” (Gould 182). Binet insisted that the scores of his test be used as a practical assessment device, and should not be used to develop any concept of a person’s intellect.

Binet’s intelligence test was quickly exploited, and re-formatted, and is still used today as a method to define a person’s overall intelligence. Standardized testing has become a divisive measure in school systems across the country, operating under a reverse paradigm from Binet and Thomas Jefferson’s goals: school systems with higher scores are rewarded with more money. Thus, the schools with inadequate resources to adequately prepare students for standardized tests are stigmatized, and the students suffer.

More recently, there has been another push to dissolve the concept of intelligence in academia. Howard Gardner’s widely cited 1983 publication, *Frames of Mind: The Theory of Multiple Intelligences*, set out to define the multiple faculties of human intelligence. While standardized tests might only report the success of a certain facet of a person’s intellect, Gardner argues that people can manifest their intelligence in many different ways. Although the book is often criticized for its lack of empirical evidence, its lessons have been applied to many education systems across the country, and many teachers target the various types of intelligence in their lessons.

Recent corroborating research confirms the inadequacy of intelligence testing. Social science research indicates that a person’s ability to achieve success is often dictated by their perception of their role in society. For example, a woman who thinks that women as a group are believed to do worse than men in math will tend to perform worse on math tests as a result⁸⁷. In fact, other experiments have indicated that during math testing, skilled mathematicians “choke” under pressure performing problems that, under other circumstances, they solve easily⁸⁸.

⁸⁷ Haslam, Alexander S., Salvatore, Jessica, Kessler, Thomas, and Reicher, Stephen D. *The Social Psychology of Success*. *Scientific American Mind* Apr/May 2008; 19(2): 24-31.

⁸⁸ Beilock, Sian L, Kulp, Catherine A, Holt, Lauren E, Carr, Thomas H. More on the fragility of performance: choking under pressure in mathematical problem solving. *Journal*

4.6 Intelligence Testing and Technological Development

By many definitions of technology, Binet's intelligence test should be seen as a technological development. One of the earliest widely distributed definitions of technology was written by V. Gordon Childe in 1929, saying, "Technology should mean those activities, directed to the satisfaction of human needs, which produce alterations in the material world [along with] the results of those activities"⁸⁹. It is a stretch to say that the allocation of resources to students identified as needing help is an alteration in the material world, but the rest of the definition fits. More recently, Rudi Volti defined technology as "a system based on the application of knowledge, manifested in physical objects and organizational forms, for the attainment of specific goals"⁹⁰. By this definition, Binet's test is unequivocally a technology.

As noted earlier, many developments in the history of science and technology have been the result of unintended applications of technology, often to the benefit of humanity. No one could have predicted the full extent the application of the transistor would have in our society when it premiered in 1934, and perhaps the most famous example of unintended benefits emerging from an accident is noted in Alexander Fleming's accidental discovery of penicillin in 1928 after noticing mold growing in a Petri dish. Richard Olson says of technology:

Though a technology may be aimed at a specific goal, its greatest importance may be in the connection with unintended consequences. Thus, for example, in the modern world the adhesive, which made post-it notes possible, was initially developed for completely different purposes. In the ancient world, astronomical techniques that were initially intended to predict the outcome of terrestrial events for divinatory purposes served much more effectively for the creation of calendars. (Olson 8)

However, it is important to be wary of the misapplication of a technology. For instance, a gun has the ability to kill, but it should not be used to kill the innocent. In the case of misapplying science, Darwin's theory of evolution was never intended to be applied to improve the human race. Nonetheless, many prominent leaders supported the eugenics movement, including

of *Experimental Psychology: General*. Dec 2004;133(4): 584-600.

⁸⁹ Childe, Man makes himself

⁹⁰ Volti, Rudi Technology and social change (volti 6).

Theodore Roosevelt, Winston Churchill, and Margaret Sanger, oblivious to the bigotry that such a theory could incite. Although some of Binet's followers might have had reasonable intentions to increase the utility of his test, the very nature of testing intelligence makes their efforts moot, just as the very nature of a gun makes it a dangerous item to handle without explicit regulations.

4.7 Mechanisms of Learning, Memory, and Attention

The history of intelligence testing implies that even if drugs intended for the treatment of ADD and ADHD could increase the cohesive value of "intelligence" in a person, there is no reliable way to assess that increase. We can test specific facets that might contribute to the overall concept of intelligence, or at least, a derivative of intelligence. These include learning, memory, retention, and reaction time. We can also test the change in these functions in persons with ADD and ADHD drugs in their brains.

It needn't be said that learning and memory are complicated functions of the brain. To define the terms explicitly, consider this quote from a neuroscience perspective.

Learning is the acquisition of new information or knowledge. Memory is the retention of learned information. We learn and remember many things, and it is important to appreciate that these various things may not be processed and stored by the same neural hardware. No single brain structure or cellular mechanism accounts for all learning. Moreover, the way in which information of a particular type is stored may change over time⁹¹.

It is difficult to observe learning. For instance, a person might look like they are reading a newspaper, but be unable to understand the words (as was the famous case of Harriet Tubman evading slave authorities on a train by pretending to read a newspaper and guessing the correct orientation of the pages). Learning can be placed into two broad categories. Associative learning occurs when two stimuli are associated with each other, such as the practice of training dogs by rewarding them with food every time they perform a trick. Nonassociative learning is a learning process that involves repetitive exposure to a stimuli (Silverthorn 317).

⁹¹ Bear, Michael. Neuroscience: Exploring the Brain. 2nd ed. 740

ADD and ADHD are routinely referred to as “learning disabilities.” However, because the mechanism of learning is itself difficult to measure, we must instead measure learning by studying the effects of learning, such as measuring memory. In the case of studying the effectiveness of pharmaceuticals on learning, one might consider applying the principle of superposition to a drug’s effect on a person’s learning system. For example, if a patient without a drug can remember x amount of raw data after studying it for 5 minutes, and after being given the drug, can remember $x+3$ amounts of raw data, one might infer that the drug is effective. However, memory is clearly not a linear system. If it were, drug doses would be directly proportional to memory retention.

Memories are stored throughout the cerebral cortex in memory trace pathways. Some components of memories are stored in the sensory cortices where they are processed. For example, pictures are stored in the visual cortex, and sounds in the auditory cortex (Silverthorn 318). Recently, a team of Israeli and American researchers actually recorded individual brain cells in the act of summoning a spontaneous memory⁹². Their experiment, published in September of 2008 in the journal *Science*, reveals specifically where an experience is stored and how the brain is able to recreate it. The findings confirm that for the brain, remembering a short-term memory is a lot like doing the event that provoked the memory.

Multiple brain circuits work in parallel to recall information. This is why a person who has never seen a volleyball may still identify the object as a ball. The hippocampal region of the limbic system is an important structure for learning and memory. Patients who had part of their hippocampus surgically destroyed to relieve epileptic symptoms have been observed to have trouble remembering new information. When given a list of words to repeat, they can remember the words as long as their attention stayed focused on the task. If they were distracted, they forgot the words and had to learn the list again. Long-term memories from before the operation were not affected. (Silverthorn 318).

Memory has multiple levels of storage. When a stimulus comes into the CNS, it first goes into the short-term memory. This area has limited storage capacity, usually holding about seven to twelve pieces of information at a time. Unless some type of effort is put into turning these memories

⁹² Carey, Benedict. Brain Cells Observed Summoning a Memory. *New York Times* 4 September 2008

into a more permanent form, short-term memories will disappear. Working memory is a special type of short-term memory devoted to keeping track of bits of information long enough to use them in a task that occurs after the information has been acquired. Working is linked to long-term memory storage, so that newly acquired information can be integrated with stored information and utilized (Silverthorn 320).

Short-term memories become long-term memories after going through a process called consolidation. This process involves changes in the synaptic connections of the circuits involved in learning. In some cases, new synapses are formed. In others, the effectiveness of synaptic transmission is altered either through long-term potentiation or long term depression of the neurons.

Long-term memory is divided into two types of memory: 1) Declarative memory is the memory for facts and events. Declarative memory is what is usually meant by the word memory in everyday use, and is often called explicit memory. 2) Nondeclarative memory is procedural memory, such as memory for skills, habits, and behaviors. We learn to play piano, throw a football using nondeclarative memory. This is also frequently called implicit or reflexive memory (Neuroscience 742). Declarative memory and nondeclarative memory are not always easy to discern. For instance, when we first learn a new skill, such as throwing a football, it begins as a declarative action. As it becomes routine, it becomes nondeclarative (Silverthorn 319).

Memory is an individual thing, we all process information differently, related to our experiences and perception of the world. No two people will process a given piece of information the same way. But this does not mean that those two people are not equally adept at information processing itself, which keys into another inherent flaw with intelligence testing based on specific tasks.

In the whirlwind of public discourse about ADHD and the drugs used to treat it, it is easy to lose sight of what the chemicals are actually intended to treat: an attention deficit. Attention is generally broken down into five distinct functions: focusing, perceptual enhancement, binding, sustaining behavior, and action selection⁹³. Each function of attention describes a different way that information is being processed in the brain.

Focusing is the act of limiting the number of items being processed, for example, studying in a quiet room as opposed to studying in a coffee

⁹³ Medin, Ross, & Markman. *Cognitive Psychology* 107

shop. Perceptual enhancement is the act of sustaining concentration under various perceptual circumstances. For example, if a student generally sits at the front of the room to take notes and comes in one day to find that the only available seat is in the back, perceptual enhancement is the process of the student adapting to the circumstances in order to learn as much as she would at the front of the room. Binding is the process of bringing together observations that are processed in various parts of the brain to form a cohesive theory about something. For example, when we look at a table, we observe its color, texture, and material properties independent of one another; yet immediately bind that information together to form the understanding that it is a table. Sustaining behavior, as its name implies, is the process of focusing on a specific task for a given amount of time. Finally, action selection occurs when we select one information processing action over another. For example, when we walk into a candy store, we would be overwhelmed if we looked at each piece of candy and memorized its color, shape, and context. However, usually, we sift through the information available and pick certain pieces of available information to process.

In general, we should understand that attention in the nervous system is resource limited. The challenge of patting your head and rubbing your tummy simultaneously is an example of the difficulties we experience when we try to spread our attention resources to accomplishing discrete tasks. Patients with ADHD tend to attempt to spread their resources especially thin. For example, one well-known study had control and ADHD children study a series of pictures of familiar objects to memorize. In the testing room, there were several brightly colored posters. While the control group was better at remembering the objects in the pictures, the ADHD group was actually better at remembering the colored posters⁹⁴.

In Chapter 2 it was established that ADHD has been associated with abnormal processing in the frontal lobes and dopamine systems of the brain. Ritalin (methylphenidate) has been shown to increase activity in these areas and improve performance on attention tests in patients with ADHD⁹⁵. The next section will explore the enhancing effects of Ritalin and other stimulant ADHD medications.

⁹⁴ Ceci, SJ, & Tishman, J. Hyperactivity and incidental memory: Evidence for attentional diffusion. *Child Development* 1984, 55: 2192-2203

⁹⁵ Mehta, Mitul A, Owne, Adrian, Sahakin, Barbara J. Methylphenidate enhances working memory by modulating discrete frontal and parietal lobe regions in the human brain. 2000 *The Journal of Neuroscience*. 20:RCO65: 1-6

4.8 Clinical Evidence for Performance Enhancement

The complexity and immense number of variables that affect a person's memory make it incredibly difficult to assess the effectiveness of ADD and ADHD drugs without the possibility of a significant degree of experimental error. Nonetheless, there have been many controlled studies over the past thirty years that have demonstrated that these drugs can effectively reduce the symptoms of ADHD⁹⁶. According to child psychiatrist Lawrence Diller, methylphenidate "helps anyone, child or adult, ADHD or not, perform better."

In a counterbalanced, double-blind, placebo-controlled study of the effects of methylphenidate on 28 healthy young men, methylphenidate was found to have significant effects on their performance on tests of spatial working memory and planning, but not on the attention and verbal fluency tests⁹⁷. The subjects were tested two times; the first time, half received a placebo and the other half received the drug, and the second time the subjects who received the placebo received the drug and vice versa. The second drug-receiving subjects received twice the dose as the first subjects to test the dose-dependant aspects of methylphenidate. The tests used were widely accepted tests for measuring verbal fluency, spatial short-term memory, spatial working memory, planning, and attention.

Subjects taking the drug during the first test session showed enhanced performance on the spatial tests compared to those who took the placebo. However, subjects who received the drug during the second round of tests showed impaired performance accuracy while their response latencies were decreased. These findings might indicate that methylphenidate influences performance in two conflicting ways: it enhances executive aspects of spatial function on novel tasks, yet impairs previously established performance abilities.

Other studies have also shown improvements in spatial working memory tests given to healthy subjects administered a dose of methylphenidate. A 2000 study investigated changes in regional cerebral blood flow in healthy

⁹⁶ "Staff Background Paper: Human Flourishing, Performance Enhancement, and Ritalin." The President's Council on Bioethics. Dec. 2002. <<http://bioethics.gov/background/humanflourish.html>>.

⁹⁷ Elliot R, Sachakian BJ, Matthews K, Bannerjea A, Rimmer J, Robbins TW. Effects of methylphenidate on spatial working memory and planning in healthy young adults. *Psychopharmacology* 1997; 131; 196-206.

subjects given methylphenidate while performing a spatial working memory task⁹⁸. It confirmed that there were methylphenidate-induced improvements in regional cerebral blood flow to the dorsolateral prefrontal cortex and the posterior parietal cortex. Patients with damage to these areas have been found to perform poorly on spatial working memory tests, and it has been hypothesized that these areas aid in one's ability to perform these tasks. The study also observed that subjects with lower baseline working memory capacity received a greater degree of beneficial effects from the methylphenidate than subjects with a higher baseline capacity. This observation is one of the first and few indications that methylphenidate might be most effective in unhealthy patients, such as patients diagnosed with ADD or ADHD.

Other studies have also observed reduced benefits of ADHD drugs in subjects who perform higher on baseline IQ tests. One study found that modafinil only significantly improves performance on a test of sustained attention in subjects with a lower measured IQ, and not in the higher IQ group⁹⁹. It is important to note, however, that this finding is contingent on the acceptance of the IQ test as an appropriate measure of natural mental ability, an assumption which, as discussed earlier, is not necessarily universally accepted. More support for these findings would influence the argument that stimulant ADD and ADHD treatments are less likely to be considered enhancements and more likely to be therapies, since they are less effective in healthy people who would use it purely for cognitive enhancement.

Other stimulants used for the treatment of ADD and ADHD have also shown positive cognitive effects in healthy subjects. A study comparing the effects of modafinil and the dextro isomer in amphetamine (d-amphetamine) in healthy adults confirmed their effectiveness at improving scores on various cognitive tasks¹⁰⁰. Modafinil is of particular interest to college students because it is marketed for reducing fatigue and inducing a sensation of well-restedness, a luxury many college students do not enjoy. In a study of sleep-deprived healthy volunteers, modafinil was shown to be a reliable coun-

⁹⁸ Mehta, M A., et al. Methylphenidate Enhances Working Memory by Modulating Discrete Frontal and Parietal Lobe Regions in the Human Brain. *J Neurosci* 20 (2000).

⁹⁹ Randall, Delia C., Shneerson, John M., File, Sandra E. Cognitive effects of modafinil in student volunteers may depend on IQ. *Pharmacology Biochemistry and Behavior Pharmacology Biochemistry and Behavior* Sept 2005; 82(1): 133-139

¹⁰⁰ Makris, Angela P., Rush, Craig R., Fredrich, Robert C., Taylor, Alisia C., Kelly, Thomas H. Behavioral and Subjective Effects of d-Amphetamine and Modafinil in Healthy Adults. *Experimental and Clinical Psychopharmacology* Apr 2007 15(2): 123-133.

termeasure to the effects of sleep deprivation stress on cognitive performance on a perceptual judgment task and complex mental addition task¹⁰¹. The positive effects of modafinil are likely due to its tendency to slow response time, but produce better accuracy on performance tests. This suggests that it causes users to carefully evaluate problems before initiating their response, thus improving overall performance on the tasks being measured¹⁰².

All the studies on the effects of ADD and ADHD drugs have not reported cognitive improvements. A study of males over the age of 55 did not find any significant effects of the drug on working memory or sustained attention¹⁰³. Another study on modafinil in healthy, well-rested volunteers found that it affected mood, but not cognitive function¹⁰⁴.

Despite clinical research, the decision to take a drug might be a form of contractualism to perform better. Users might take the drug as a type of contract with themselves to study harder (“if I had some Adderall, I’d work on this paper for five hours!”), allowing the anticipated effects to spur a placebo effect. The drugs have such a high reputation that the anecdotal success stories often trump objective data. For example, a Harvard student gloats the success of Ritalin, saying,

In all honesty, I haven’t written a paper without Ritalin since my junior year in high school. I even wrote my Harvard essay on it. It keeps you up when you’re tired, and makes you much more aware of what you’re doing. Although there are certain risks involved, I think it’s worth it¹⁰⁵.

Michael Shermer, editor of *Skeptic Magazine*, writes about the influence of

¹⁰¹ Baranski JV, Pigeau RA Self-monitoring cognitive performance during sleep deprivation: effects of modafinil, d-amphetamine and placebo. *Journal of Sleep Research* 1997; 6: 84-91

¹⁰² Turner DC, Robbins TW, Clark L, Aron AR, Dowson J, Sahakian BJ. Cognitive enhancing effects of modafinil in healthy volunteers. *Psychopharmacology* 2003; 165: 260-269

¹⁰³ Turner DC, Robbins TW, Clark L, Aron AR, Dowson J, Sahakian B. Relative lack of cognitive effects of methylphenidate in elderly male volunteers. *Psychopharmacology* 2003; 168: 455-464

¹⁰⁴ Randall DC, Shneerson JM, Plaha KK, File SE. Modafinil affects mood, but not cognitive function, in healthy young volunteers. *Human Psychopharmacology: Clinical and Experimental* 2003; 18: 163-173

¹⁰⁵ (brown psychopharmacology update 2005)

anecdotes on the decision to seek holistic treatments and folk medicine¹⁰⁶. He believes that it is more natural to consider anecdotal evidence than scientific evidence, saying,

The reason for this cognitive disconnect is that we have evolved brains that pay attention to anecdotes because false positives (believing there is a connection between A and B when there is not) are usually harmless, whereas false negatives (believing there is no connection between A and B when there is) may take you out of the gene pool. Our brains are belief engines that employ association learning to seek to find patterns... So it is that any medical huckster promising that A will cure B has only to advertise a handful of successful anecdotes in the form of testimonials (Shermer 42).

The power of anecdotes exposes that while the clinical research about academic performance enhancement drugs is important to consider, it is probably is not a strong factor in the drug-seeking decisions of students.

4.9 Alternatives to Study Drugs

There has been considerable interest in the effect good nutritional habits might have on brain function and intelligence. As mentioned earlier, testing this phenomenon accurately is difficult, as lower-income families tend to keep less healthy diets, and intelligence tests tend to favor wealthier families. If income is not controlled for, a misleading correlation could easily arise between diet and performance on intelligence tests.

Some research has focused on the effect omega 3 essential fatty acid supplements, such as fish oil, might have on intelligence. 20% of the brain's structure is made of the omega 3 polyunsaturated fatty acid docosahexanoic acid (DHA)¹⁰⁷. There has been a good deal of research on the link between both maternal seafood intake and infant omega 3 supplementation and cognitive development in children. A meta-analysis of the results of 8

¹⁰⁶ Shermer, Michael. Wheatgrass Juice and Folk Medicine: Why subjective anecdotes often trump objective data. *Scientific American* August 2008; 299(2): 42

¹⁰⁷ British Medical Association. Boosting Your Brainpower: Ethical Aspects of Cognitive Enhancements. British Medical Association. 2007. Page 8 <[http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFCognitiveEnhancement2007/\\$FILE/Boosting_brainpo](http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFCognitiveEnhancement2007/$FILE/Boosting_brainpo)

randomized clinical trials estimated that mothers who increase their DHA intake by 1 gram per day increased their child's later IQ by 0.8 to 1.8 points. Other research has shown that children with developmental disorders given omega 3 supplements for three months had significant improvements in reading, spelling, and behavior over the group taking a placebo¹⁰⁸. There have been reports that the positive effects of omega 3 supplementation have been so convincing that the British government has considered giving fish oil supplements to students¹⁰⁹.

Napping may also improve memory. A recent study found that sleep-deprived subjects improved word recollection with only a six-minute nap, and longer naps continued to improve results¹¹⁰. For sleep-deprived students, the old adage "get a good night's sleep before a test," seems to be a rather effective trick to improve performance without needing to ingest anything out of the ordinary.

Caffeine is among the most ingested psychoactive substances in the world. More than half of Americans drink at least two cups of coffee per day¹¹¹. Caffeine is a class of compound called xanthines, known to relax and open breathing passages and improve breathing. Xanthines block the action of the neurotransmitter adenosine, whose receptors cause sedation when adenosine binds to them. As neurons become more active, they produce more adenosine and thus the brain naturally self-regulates by producing feelings of fatigue when it has had to work hard. By reducing the ability of adenosine to do its job, the brain receives fewer signals to promote fatigue, and the user has a greater sensation of wakefulness (Kuhn 63).

Caffeine is considered to have few clinical applications (Lehne 356). One study found that long-term consumption of low doses of caffeine slowed hippocampus-dependent learning and impaired long-term memory. Even consumption for as short as four weeks significantly reduced hippocampal neurogenesis¹¹². Nonetheless, due to its immediately stimulating effects, it

¹⁰⁸ Richardson AJ, Montgomery P. The Oxford-Durham study: A randomized controlled trial of dietary supplementation with fatty acids in children with developmental coordination disorder. *Pediatrics* 2005; 115: 1360-1366

¹⁰⁹ Smithers R. Fish oil for pupils may improve behaviour. *The guardian*. 12 June 2006.

¹¹⁰ Whitfield, John. Naps for Better Recall. *Scientific American*, May 2008.298(5); 32

¹¹¹ Kuhn, Cynthia Buzzed: The straight facts about the most used and abused drugs from alcohol to ecstasy ed 2. W.W. Norton & company Ltd. New York. 2003; 62

¹¹² Han Me, Park KH, Baek SY, Kim BS, Kim JB, Kim hj, Oh SO. Inhibitory effects of caffeine on hippocampal neurogenesis and function. *Biochem biophys res commun*. 2007

is still the most frequently used academic performance enhancement.

4.10 Conclusions

The drugs used for academic performance enhancement are serious chemicals with a broad range of side effects. The development of the most commonly used and abused drugs for enhancement shows that they are far from targeted specifically for the unique symptoms of ADD/ADHD. They affect the body and cognition in complicated ways that should not be oversimplified or under-examined.

5 ENHANCEMENT AND HEALTH

It is our duty, my young friends, to resist old age; to compensate for its defects by a watchful care; to fight against it as we would fight against disease; to adopt a regimen of health; to practice moderate exercise; and to take just enough food and drink to restore our strength and not to overburden it - Cicero (106-43 BCE)

This chapter considers the culture of health and longevity in present society, and discusses the role that academic performance enhancement plays in that environment. The definition of health is considered, and research about the health risks of amphetamines is reviewed.

5.1 Are You Unhealthy?

If the Cicero's epigraph is any indication, it appears that the desire to live longer is engrained in western culture. That desire is, and always has been, the implicit goal of medicine. Yet as our medical abilities began to catch up with this objective in the 20th century, the looming trend towards the pursuit of immortality has led to the re-evaluation of this primary function of medicine and the definition of health that underscores both our actions and our assumptions about how medicine ought to be practiced.

As discussed in Chapter 2, over the last 100 years life expectancy in the west has swelled from 46 to 80 years of age, and over the next forty years is even expected to increase from 65 to 75 years of age in underdeveloped countries, increasing the world population by over 2 billion¹¹³. Over population is in fact a daunting problem that will demand address in the near future, and we can no longer afford to take a *laissez faire* attitude with regard to the pursuit of life elongation.

If asked, many people will deny that they would like to live forever¹¹⁴. However, most will complain of the symptoms of aging. For example, I

¹¹³ United Nations Dpt. Economic & Social Affairs. World Population to 2300. United Nations. New York: United Nations, 2004. 18-24.

¹¹⁴ "Do you want to live forever?" around-the-world survey. 20 April 2009 <www.rd.com/your-america-inspiring-people-and-stories/do-you-want-to-live-forever-around-the-world-with-one-question/article127287.html>

recently watched a video of overweight middle-aged comedian Louis C.K. During his routine, Louis lamented his “worn out” knee, and his doctor's disinterest in treating it. He joked that if he were younger, the doctor would have recommended therapy or surgery, but at his current age he was being asked to accept that his knee is simply “worn out” and beyond treatment. The crowd was very receptive to this series of jokes, for Louis touched on a very poignant topic that most people can relate to: coping with injury, appraising our personal health, and establishing our expectations for the role that medicine can play in alleviating the physical symptoms of natural aging.

What does it mean to be healthy? A knee wearing out is a foreseeable symptom of normal aging, as are many other unpleasant health events, and it can be challenging to balance expectations for reasonable health interventions with a concession that inevitably, our bodies just do not work as well as they did when we were young. Clearly Louis takes the stance that the consequences of normal aging are not healthy. We may not want to live forever, but as it is right now, it is rather inconceivable that we would simply live out our lives with the pleasures of youth and then abruptly and painlessly terminate at some pre-determined, appropriate age.

This is to say that for the most part, to be healthy is to be youthful. Yet we have also developed other definitions and beliefs about health that occasionally contradict with this definition, and as the challenges associated with our ability to live very long get realized in the west, other theories of health have also taken influential precedence. The experience of feeling healthy sometimes has absolutely nothing to do with its effect on lifespan. Risky liposuction, cosmetic over-exposure to the sun, and consumption of fattening food for immediate satisfaction are only a few examples of measures that people take to feel as if they are healthy, at least momentarily, yet are likely to inhibit life expectancy.

The nebulous definition of health is important to consider when establishing the opposite value: what is unhealthy? On your deathbed at 110 years old as you suffer from arthritis, dementia, and prostate cancer, you are certainly not healthy, despite your old age. This generation is especially sensitive to questions about end-of life quality due to the hotly debated case of persistent vegetative state euthanasia and the story of Terri Schiavo's feeding tube removal in 2005. Some of us have come to resent this image of aging in a society where our life expectancy outlasts our preferred quality of life. Thus, many people decide that it is appropriate to engage in activities that

are fleetingly satisfying, even if they are likely to restrict life expectancy. For example, young people who begin smoking cigarettes are often aware of the risks, yet continue the habit. Given this newfound openness to knowingly engaging in risky activities, it is difficult to firmly establish what is an unhealthy behavior besides actions that are neither fun nor conducive to life elongation.

This is not to say that everyone only engages in activities they define as healthy and avoids those that they define as unhealthy. There is still such a thing as making bad decisions. However, this era of changing paradigms about health definitions is important to consider before we establish the health risks of the artifacts of enhancement.

5.2 Perspectives on the Skeptical Renaissance in Science and Medicine

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Perhaps a strong reason why people make strange health decisions is an emerging skepticism about the merits of medicine and scientific information. This growing sentiment may be interpreted as a modern day “renaissance” of pre-Enlightenment skepticism about science before Francis Bacon set the stage for inductive empiricism to edge its way into widespread acceptance. As the scientific method was beginning to format its conventions towards the end of the 16th century, philosophers including Francisco Sanchez and Michel de Montaigne contributed to the established skepticism about the degree of certainty that empiricism could produce, since mankind’s senses and cognitive reasoning are unreliable. The cynicism mounted, most famously typified by Rene Descartes “Discourse on Method” in which he concluded that the only thing that we can know with certainty is that we exist (cogito, ergo sum, “I think, therefore, I am”). His conclusion has become much more influential than the ontological arguments he attempted to make to reconcile this deduction.

¹¹⁵ I wrote this section, in fact, this entire chapter, after I had already turned in my thesis and received an ‘A’ grade. Having graduated in December, I wanted to give my professors a final version of my thesis at my graduation ceremony in May. However, since I had already been evaluated for my work (and since I was in a hurry), I chose to write this section purely out of inference and without much cited evidence, so please treat it more like a biased opinion piece than a well-supported thesis argument.

These natural philosophers struggled because they were pursuing certainty in the literal sense of the word. Today, the assertion that we can be unequivocally certain about anything seems outrageous, yet for a time, this is how science was presented. It seems that after the influence of scientists in the conclusion of WWII, the authority of science went relatively unquestioned for several decades as we became enamored in its strategies for winning the cold war. One student has described his primary education, admitting, “During my primary education, I was taught that science, because it is objective, is able to solve the problems of the world.” Indeed, I’ve seen many friends make poor decisions using the justification that “science will fix it” eventually. Up to a point, many of us regarded science and rationality highly not because we deduced their beneficence, but because we followed the indoctrination of our primary education.

It is peculiar that science is taught not as a methodology for investigating the natural world, but as a specific set of facts and theories to memorize. Aside from misrepresenting science, this dogmatic, anti-scientific approach promotes bad scientific practices since ideally, scientists themselves should aim to be skeptical of everything, including their own research. After all, Einstein would never have discovered general relativity had he not been skeptical of the application of Newtonian physics to very massive objects. Raising questions about prevailing conventions is, as Thomas Kuhn would say, the structure of scientific revolutions.

Nevertheless, it seems that once again some philosophers, such as feminist philosopher of science Lynn Hankinson Nelson, as well as the public are struggling with the implicit contradictions of the scientific method itself. Feminist philosophy of science recalls the skepticism of the Middle Ages, raising questions about the existence of true scientific objectivity. Yet without knowledge of the canon of the philosophy of science, innate critical thinking may lead to the clear observation that theories are based on sets of premises, and those premises are fundamentally inductive, just like non-scientific theories. Consequently, the skeptical renaissance seems return to the classical question, “Why is science the best way to answer questions and to solve problems?”

Today, scientists resolve the infamous “problem of induction” that was first elucidated by David Hume using various techniques. Arguably the most influential has been a movement out of Vienna known as “Logical Positivism,” figure headed by Karl Popper. Popper required that all scientific theories are falsifiable, meaning there are tests that could hypothetically disprove the

theory at hand. However, non-scientists are occasionally prone to adopt a form of Descartes' "Demon Hypothesis" (In which he posits that we cannot be certain that anything is true because it is possible that a demon implanted that information in our minds to sabotage us) when considering the certainty that science can produce¹¹⁶.

From the perspective of a modern skeptic, what is the point, of taking to heart anything science tells us, if we don't believe it to be a valid authority? We've all heard Mark Twain's adage, "There are lies, damn lies, and statistics." A student who rejects the validity of scientific research about the interaction between alcohol and acetaminophen might be less likely to avoid mixing the two chemicals. To this extent, the skeptical renaissance promotes a culture of indifference with regard to the suggestions that scientific research offers us, including suggestions about health.

5.3 Demand for Holistic Healthcare

The skeptical renaissance may also be interpreted as a rejection of orthodox medicine, sometimes referred to as allopathic medicine, in favor

¹¹⁶ I believe that science is useful, and is the best available way to solve certain types of problems. Anyone who has ever casually taken antibiotics should acknowledge the fundamental merits of scientific thought, even if they internalize the metaphysical anomalies raised by science. The moral evaluation of those antibiotics, however, is not something that falls within the domain of scientific thought. Saint Augustine was highly influential throughout the Middle Ages for his justification for natural philosophy as a "handmaiden," capable of solving functional problems but ill equipped at addressing the issues that only Christian faith could answer.

Augustine's approach isn't such a bad way to think about science, regardless of ones theistic tendencies. We ought to evaluate science and the artifacts it produces not based on their metaphysical objectivity or ability to answer ontological questions, but for their utility. In the process, we might discover great truths, and even greater questions that demand further study. But in the end, our evaluation of science ought to be humanistic. The scientific method itself is objective, rational, and unaffiliated with any morals, even those that protect humans. It should be regarded as a tool to help answer certain questions, much like a knife itself is dangerous and meaningless, yet it can be an important tool when used under certain circumstances. There is no reason we need to apply the scientific method to our decisions about how to apply the scientific method, and this process is subject to human bias and error independent of the success of the applied methodology itself.

of a more holistic approach to healing. By most accounts, the western healthcare system is damaged and in desperate need of repair. Patients may lump all of their complaints about the treatment they receive on the system itself, whether not that format is actually the culprit. Disillusioned with long waits and poor treatment, many patients call for an overhaul of the entire medical system. Some patients hope to see the healthcare system take other things into account when treating illness, include their life circumstances and mental state. When available western medicine does not provide these requirements, some patients turn to alternative medical approaches to pursue health.

An interesting facet of the alternative medicine movement is that it is still a fundamentally interventionalist movement. By this, I mean that it takes the stance that health is best achieved by engaging in some form of intervention, whether it is yoga, Ayurvedic tea, or acupuncture treatments. To that extent, the alternative medicine movement is very much not a renaissance of widespread classical ideas (besides anachronistic beliefs), but exactly as its name implies, an alternative to customary medical practices. For patients with unresolved allegiance to a particular medical orthodoxy, the influence of alternative medicine might further contribute to indifference with regard to allopathic approach to treatment in favor of alternative health theories.

5.4 White Noise

Finally, the most profound characteristic of the current health culture is the “white noise” of perceivable health risk. We are inundated with messages about how dangerous the world is, from skin cancer risks to pollution to diabetes. Short of living in a bubble, we cannot possibly live our lives preparing to responsibly combat every risk to the state of our health. As a result, some of us tune out the white noise into the background ambiance of our lives. Like the boy who cried wolf, the overabundance of health risk messages makes it difficult for normal people to decide which messages to take to heart and which to overlook. Most recently, the public’s mockery of the Swine Flu pandemonium is an example of an overlooking the efficacy of our public health department in curbing what could have potentially been a disastrous epidemic.

This leaves many people left to decide for themselves how evaluate

available evidence and make health decisions themselves. Unfortunately, as this project has made explicit, people's beliefs are subject to inherent bias. One famous study exposed the extent of this phenomenon. Two groups of people with different initial beliefs about the health risks of marijuana were presented with the same research about marijuana. After evaluating the evidence, each group took even more extreme positions about the health risks of the drug. The research subjects tended to see flaws in the studies whose results did not fit their initial views, and did not see any problems with the studies that supported their views. The study concluded that a biased search for information can lead to a distorted view of the evidence that appears to confirm one's preexisting view¹¹⁷.

In the case of personal health decisions, people may be biased to tune out health messages they do not want to hear. Students may read research about academic performance enhancement and be overly skeptical of experimental flaws if the research indicates a stance on academic performance enhancement that conflicts with a preexisting belief.

The white noise also inundates us with contradictory messages about health risks. For example, cigarette advertisements are not allowed on TV because they are seen as foreseeably influencing young people to make dangerous health decisions. However, shows like *Jackass* and Travis Pastrana's *Nitro Circus* celebrate activities that are incredibly dangerous and put practitioners at a high risk of traumatic injury. These shows could very well influence young people to make poor health decisions that are equally as dangerous as smoking cigarettes.

5.5 Health Identity and Risk

This is all to say that it is not easy for members of our generation to adequately assess health risk. When added to the number of people who will make poor decisions anyway regardless of available health information, it is very possible that this is an incredibly dangerous time for population health. The things that made us live longer in the 20th century, such as improved sanitation and antibacterial medications, are being offset by unhealthy behaviors that lead to diabetes, strokes, and heart attacks. We have yet to

¹¹⁷ Ross, L., Lepper, MR, & Hubbard, M. Perverserance in self-perception and social perception: Biased attributional processes in the debriefing paradigm. *Journal of Personality and Social Psychology* 1975; 32: 880-892

see how the health of our population will be affected by new technologies including ipods, laptops, and cell phones. We can assume that at the very least, there will be a rise in hearing loss, since loud noises are the dominant reason for hearing loss in old age¹¹⁸. Ray Kurzweil gained notoriety in 2004 for his book, *Fantastic Voyage* and its contention that soon humans (himself included if he can live for the next 50 years taking 3 hours of intravenous vitamin supplements a day provided by a personal hired vitamin assistant) should be able to live forever. In stark contrast and as a matter of record, I predict that the next generation of Americans will be the first generation to demonstrate lower life expectancy.

It may be difficult for individuals to even develop a concept of their own health identity. Imagine an island of 400 lb humans. Every year, the island people hold a race around the perimeter of the island. This year, one village has been training their fittest athlete to compete in the games, for she weighs 300 lbs. Relative to everyone on the island, she displays the healthiest cardiovascular system ever witnessed. Unfortunately, when she travels to a neighboring island to compete in their annual race, she finds that she is considerably less fit than their average contestants, who only weigh 200 lbs.

To an extent, we all build a relativistic health identity based on our peers and surroundings. In the West, this identity has become associated with an increasing life span. Among niche communities, some behaviors may be seen as very healthy or very unhealthy depending on the constituents of that community. For example, among chain smokers, a person who smokes five cigarettes a day may seem relatively healthy, yet among non-smokers that person would be considered very unhealthy (assuming that in both communities, excessive smoking is considered unhealthy). This culture of relativism makes it very difficult to appraise the degree of risk that any action incurs.

Yet at the end of the day, many people are really just in denial. Plenty of students regard Adderall use as illicit and dangerous; yet choose to use it anyway. It is easy to say, "it's worth the risk" when making a decision if you do not have to suffer the consequences immediately. However, there are not many people suffering from emphysema who maintain the same sentiment about smoking as they did when they were young. Although this has always been the case about risk prediction, it is especially easy for those who engage in cost/benefit health decision-making in this generation to justify bad

¹¹⁸ Noise Induced Hearing Loss < <http://www.nidcd.nih.gov/health/hearing/noise.asp>>

decisions with skeptical rationality.

5.6 Enhancement Health Risks

In 2006, the Drug Safety and Risk Management Advisory Committee of the Food and Drug Administration (FDA) voted to recommend a “black box” warning label on stimulant drugs used to treat ADHD explaining the potential cardiovascular risks¹¹⁹. This recommendation was based on several reports that the prescription stimulants exerted similar cardiovascular risks as other illicit amines¹²⁰ such as methamphetamine (speed). One study¹²¹ found that adults who took amphetamine displayed an increased systolic blood pressure (the blood pressure measured when the heart is in contraction) by 5 mm Hg. Another study on methylphenidate indicated that normal adults had an increased blood pressure and heart rate than those who took a placebo¹²².

Other reports are not as suspicious of the likely health risks of taking amphetamines. For example, one study¹²³ found that although there is relatively sparse long-term data about amphetamine use, the data that are available suggest that the long-term risk to appropriately diagnosed patients is “relatively modest.”

Most doctors and medical researchers agree that amphetamines put patients at risk for addiction. Until recently, drug addiction was characterized as a developed drug tolerance that involved a physical dependence on a substance, and the degree of an addiction’s severity was measured by assessing the withdrawal symptoms it produced. To many people, this definition is still circulated. However, the contemporary perspective takes a disease-

¹¹⁹ Nissen, Steven E. ADHD Drugs and Cardiovascular Risk. *N Engl J Med* 2006; 354(21): 2296

¹²⁰ See Appendix 1 for a chemical description of chemicals in this family.

¹²¹ Wilens TE, Hammerness PG, Biederman J, et al. Blood pressure changes associated with medication treatment of adults with attention-deficit/hyperactivity disorder. *J Clin Psychiatry* 2005; 66: 253-259.

¹²² Clark, CR, Geffen, GM, Geffen, LB. Role of monamine pathways in attention and effort: Effects of clonidine and methylphenidate in normal adult humans. *Psychopharmacology* August 1986; 90(1): 35-39

¹²³ Kociancic, Todd, Reed, Michale, Findling, Robert. Evaluation of risks associated with short- and long-term psychostimulant therapy for treatment of ADHD in children. *Expert Opinion on Drug Safety* March 2004; 3(2); 93-100

model approach to understanding addiction. The disease-model definition can be summarized as follows:

Addiction is a primary, progressive, chronic disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. The disease is often progressive and fatal. It is characterized by impaired control over use of the substance, preoccupation with the substance, use of the substance despite adverse consequence, and disorientations in thinking¹²⁴.

This model has been used to help understand and treat many addictive behaviors, including amphetamine addiction.

Addiction and dependence come from the enhanced transmission in the mesocorticolimbic dopamine system during drug use. This system normally functions to reinforce adaptive behaviors that may be necessary to happiness or survival. However, by short-circuiting this system, these drugs instead reinforce drug-seeking behavior. Clinical studies have shown that rats will work just as hard to electrically stimulate the mesocorticolimbic projection as to receive an injection of cocaine¹²⁵.

5.7 Personal Experience

To gain some first-person perspective about academic performance enhancement, I visited three primary care physicians to request a prescription for stimulant ADHD medication. Only one did not prescribe it to me on the first visit.

5.8 Conclusions

Despite the relatively sparse available information about the health risks of stimulants, this is a case of, “do we really need research to tell us this is probably bad?” There is something to be said for the intuitive, associative spirit. Heart disease is still the number one killer of American citizens; anything

¹²⁴ Morse, RM, Flavin, DK (Aug 1992) The definition of alcoholism. The Joint Committee of the National Council on Alcoholism and Drug Dependence and the American Society of Addiction Medicine to Study the Definition and Criteria for the Diagnosis of Alcoholism. JAMA. 268(8): 1012-1014

¹²⁵ Bear, Michael. Neuroscience: Exploring the Brain. 2nd ed. 519-520

that raises your blood pressure or pulse for an extended period of time puts you at a higher risk for cardiovascular disease. 60,000 people suffer from aortic aneurysms a year; anything that suddenly raises your blood pressure puts you at a higher risk for a ruptured aneurysm. Health decision-making is a double-edged sword: the absence of conclusive evidence tends to make people discount the risks of a substance, yet the availability of the research doesn't necessarily curb use. There is a pressing need for an overhaul of research about prescription stimulant risk, and a national conversation about health identity to prepare for the years to come.

6 IMPLICATIONS AND SUGGESTIONS

For academic success, there is hardly a substitute for a good work ethic. Even the most brilliant students will fall behind their peers if they refuse to engage in the time-consuming tasks of problem sets, reading assignments, and essay writing. If we chose to use a compute metaphor for human cognition, pretend that the minds of two students are each made out of Pentium II processors. One student uses her processor to do homework; the other uses it to watch porn. The point is that giving the porn watching computer a faster processor or more memory will not change it's motivation to do homework.

Thus far I have presented a case that the drugs frequently used as academic performance enhancers are best equipped to augment the habits that contribute to a good work ethic. By themselves, they do not necessarily produce enhancing properties without their interaction with the user, just as a real Pentium II computer needs to interact with a certain type of computer user to produce calculation. What remains unclear is whether there is anything particularly wrong with choosing to enhance academic performance, specifically through using the most popular study drugs.

A common misconception about athletic performance enhancers is that the nature of the drugs themselves can make people better athletes. In actuality, many of the drugs allow people to become better athletes by improving recovery time so that athletes can train harder more frequently. The same may be said of academic performance enhancers. A person who stays up all night writing a paper while using Adderall still wrote the paper, and that hard work shouldn't be discounted.

The problem with this practice arises if expectations become such that it seems to be impossible to be academically successful without engaging in such a stressful workload. If professors measure the challenges they give to college students based on the success rates of students who are taking enhancements, the competitive atmosphere of college will indefinitely escalate. It is reasonable to say that an "appropriate" workload should not necessitate students to take drugs.

It is rather easy to get sucked into the "Darwin trap," and this is the primary reason why academic institutions should take a more aggressive policy with regard to academic performance enhancement. In Chapter 4 I alluded to the miss-application of Darwin's theory to a bigoted social movement. Al-

though terms like “eugenics” and “social Darwinism” have become outdated and condemned, it is very easy to get lured into the appeal of applying natural selection and survival of the fittest to academia. We should remember that “evolution” as a scientific theory is not a value judgment. Indeed, the merits and successes of natural selection are exclusively defined by the ways that certain traits contribute to procreative success; to “evolve” as a species does not mean that humans are getting “better” by all the standards by which we value human dignity.

Leon Kass reminds us, “Our views of the meaning of our humanity have been so transformed by the scientific technological approach to the world and to life that we are in danger of forgetting what we have to lose, humanly speaking¹²⁶.” In the pursuit of progress, we should not discount or overlook the importance of maintaining and adhering to the theories of human dignity that underscore most value systems.

This is not to say that academic performance enhancement necessarily threatens any theory of human dignity. Yet the British Medical Association reminds us, “any technology that involves risks and benefits that go beyond the individual raises ethical questions” (BMA 3). Along with the headline debates concerning procreative rights, cloning, and end-of-life decision making, there is a pressing need for institutions to begin outlining policies about these practices.

I have stated that for the most part, I reject narrow theories of rationality. But the absence of any normative or deontological moral position on enhancement does not mean that institutions cannot construct their own guidelines in accordance with the strong convictions they hold. Any adiabatic niche of human interaction is subject to its own ethical system to govern the unique behaviors of members of that community. For the most part, academia discerns between right and wrong by evaluating activities seen as cheating. Like professional baseball, this decision is mostly based around a concept of fair competition, that is, students deserve to fairly compete against each other. However, academic institutions should live up to a greater responsibility. Just as primary schools and professional offices operate under guidelines intended to ensure that they provide conducive environments for inhabitants to build healthy habits, colleges should build policies to protect the health habits of students.

¹²⁶ Kass, Leon R. *Life, Liberty, and the Defense of Dignity—The Challenge for Bioethics*. 2002. San Francisco: Encounter Books: 8.

Elite academic institutions need to realize that the nature of the demands they place on humans is potentially unhealthy. If, through turning a blind eye, academic institutions negligently support students to develop habits that would be considered unhealthy under any other circumstances, they should critically assess programs that may curb those bad habits. This may include creating stricter rules about academic performance enhancement as further research provides insight about the true health risks of taking these drugs.

APPENDIX 1: HOW CNS STIMULANTS WORK

The brain communicates with the body through a complicated, interconnected network of electrically active cells called neurons. There are several different sub-systems within this network that control different parameters of cognition, motor control, and sensation. The autonomic nervous system is the system that sub-consciously governs and maintains homeostasis in the body, allowing us to sleep, eat, digest, breath, and perform other necessary functions at appropriate times during the day¹²⁷. The motor control of the autonomic nervous system is divided into two parts, the sympathetic and parasympathetic systems. The sympathetic nervous system becomes active during times of stress or when quick responses are imperative (such as the fight or flight response). Alternatively, the parasympathetic nervous system governs the body when quick responses are unnecessary. Both systems are necessary for survival, and have distinct, recognizable characteristics when they are active.

CNS stimulants are sympathomimetic, meaning they cause effects that mimic activation of the sympathetic nervous system. These effects include increased heart rate and blood pressure, dilation of the pupils, perspiration, and decreased digestion. Many users of CNS stimulants report physical effects that are similar to those experienced during sympathetic nervous system activation, including sweaty palms and constipation. Some stimulants, such as MDMA (the street drug ecstasy), are known for their dramatic sympathetic effects, such as extremely dilated pupils.

The effects of CNS stimulants can be better understood with a basic understanding of the diffuse modulatory systems of the brain. These are systems that affect the brain's functions much like the EQ on a stereo can affect the qualitative experience of listening to a song. When we amplify the bass, middle, or treble frequency of a song, the lyrics do not change, but the way those lyrics are received and interpreted by the listener might be dramatically altered¹²⁸. In the diffuse modulatory systems, certain transmitter chemicals act like these frequency knobs on the stereo. When we affect the rate and amount that these chemicals are released and re-absorbed, many subjective changes occur that affect personality, mood, and consciousness.

¹²⁷ Silverthorn, de Unglaub. *Human Physiology: An Integrated Approach* 4th ed. 377

¹²⁸ Bear, Michael. *Neuroscience: Exploring the Brain*. 2nd ed. 512

Each neuron in the diffuse modulatory systems has an axon that may contact more than 100,000 postsynaptic neurons spread across the brain. This broad interconnection allows subtle changes to these neurons to greatly affect neurological functioning. When neurons in the diffuse modulatory systems make synapses, the transmitter chemicals are released into the extracellular fluid around neural cells, allowing them to diffuse to many neurons rather than being confined to acting solely in the synaptic cleft, hence the name diffuse modulatory systems.

Each diffuse modulatory system contains different concentrations of transmitter chemicals, called neurotransmitters. Many CNS stimulants mimic the shape of the specific transmitter molecules that affect these systems. When they are introduced into the brain, they can trick the brain into handling its own chemicals in various ways that cause the subjective effects of the stimulants.

Norepinephrine (NE) is a class of neurotransmitter in the noradrenergic diffuse modulatory system. When used in the locus coeruleus, just one of NE neurons can make more than 250,000 synapses. Locus coeruleus cells are involved in the regulation of attention, arousal, and sleep-wake cycles (Bear 514). Generally speaking, the locus coeruleus functions to increase brain responsiveness and maximize the efficiency of information processing. NE is involved in this process by making neurons of the cerebral cortex more responsive to sensory stimuli.

Serotonin is another class of neurotransmitter. Serotonin-containing neurons are mostly found within the nine raphe nuclei. Raphe nuclei cells fire most rapidly when a subject is awake and well rested. They are believed to affect moods and some emotions, as well as sleep-wake cycles. Thus, changes in serotonin levels may affect moods, emotions, and wakefulness. The neurotransmitter dopamine (DA) facilitates the initiation of motor responses by environmental stimuli (Bear 515).

NE and DA are chemical compounds called catecholamines, derived from the amino acid tyrosine. Often known as hormones, catecholamines are released naturally in the body. The actions of catecholamines released into the synaptic cleft are normally terminated by specific uptake mechanisms that re-absorb the chemicals, preventing them from building up.

Amphetamines are the family of CNS stimulants most commonly found in drugs marketed for the treatment of ADD and ADHD, including Ritalin,

Focalin, Adderall, and Dexadrine¹²⁹. They belong to a group of organic molecules called amines¹³⁰. Catecholamines are also amine molecules, and the structural similarity between amphetamines and NE and DA contribute to their success at affecting the function of these chemicals. Along with many other psychoactive substances, the presence of amino functional groups allow amphetamines to bind to brain receptor sites responsible for neurotransmitter action (Vollhardt 960). These groups contain a nitrogen atom connected by a two-carbon chain to a benzene nucleus. In general, amphetamines both promote the release of NE and DA and inhibit their reuptake. Experimental depletion of brain catecholamines has countered the stimulant effects of cocaine and amphetamine. Thus, it is believed that the stimulant effects of these drugs comes from the stimulation of the neurotransmitter release they induce¹³¹.

Generally positive effects of amphetamines include an increase in wakefulness, reduction of fatigue, mood elation, euphoria and increased respiration. Other possible effects include appetite suppression, insomnia, and adverse cardiovascular effects.

¹²⁹ Lehne, Richard A. Pharmacology for nursing care. fifth edition. page 353.

¹³⁰ Vollhardt and Schore Organic Chemistry: Structure and Function 5th edition. 956

¹³¹ (Bear 517-518 for following paragraphs).

APPENDIX 2: CHEMICAL STRUCTURE OF STUDY DRUGS

Amphetamine is an equimolar mixture of the enantiomers dextroamphetamine and levamphetamine (Vollhardt 957). Because amphetamines contain an asymmetric carbon atom, they can exist as mirror images of each other, called stereo-isometry. Dextroamphetamine and levamphetamine contain the same atomic components, but because of their structural differences, have different properties. Dextroamphetamine is more selective of the neurons it affects than levamphetamine, and produces fewer side effects. However, levamphetamine has a quicker onset and longer half-life of 13 hours compared with dextroamphetamine's 11 hours, and has been observed to yield a better clinical response in some children. There have been reports of depressive symptoms in amphetamine users. However, after controlling for poly-drug use and lifetime depressive symptoms, the link between amphetamine and depression disappears¹³².

Adderall is composed of two dextroamphetamine salts and two levamphetamine salts¹³³. The four salts are each orally metabolized at different rates, and result in less dramatic onset and termination of stimulant effects. It is available in a variety of doses from low strength to very high, and extended-release and instant-release formats.

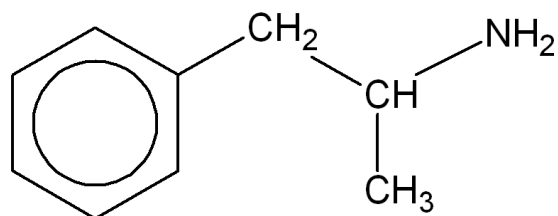
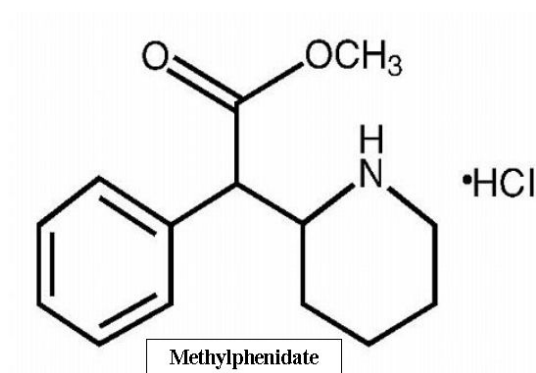
There are subtle chemical differences that define the differences between legal amphetamines and illicit street drugs. Methamphetamine, also known as the notorious street drug speed that was once given to Nazi soldiers, is dextroamphetamine with an extra methyl group. MDMA, otherwise known as ecstasy, is also an amphetamine.

Other chemicals marketed for the treatment of ADD/ADHD produce similar effects on neurotransmitters. Like amphetamine, methylphenidate (Ritalin) promotes norepinephrine and dopamine release, and inhibits their reuptake. It is also a racemic mixture of dextro and levo isomers. Dexmethylphenidate, sold commercially as Focalin and approved for distribution in 2005, consists of the more effective dextro isomer of methylphenidate and removes the levo isomer. Because of this, the dose is one half the dose of methylphenidate,

¹³² Riehm, Kara S., Iguchi, Martin Y., Anglin, M. Douglas, Depressive symptoms among amphetamine and cocaine users before and after substance abuse treatment. *Psychology of Addictive Behaviors*, Vol 16(4), Dec 2002. pp. 333-337.

¹³³ Lehne, Richard A. *Pharmacology for Nursing Care*. 5th ed. 2004 Saunders, Missouri. pp 354.

and the negative side effects are possibly reduced¹³⁴.



Amphetamine

¹³⁴ McGough, James J, Pataki, Caroly S, Suddath, Robert, "Dexmethylphenidate extended-release capsules for attention deficit hyperactivity disorder" Expert Review of Neurotherapeutics Jul 2005, Vol. 5 No. 4; 437

APPENDIX 3: DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (DSM-IV)

A. Either (1) or (2):

1. Six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

- a. Often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
- b. Often has difficulty sustaining attention in tasks or play activities
- c. Often does not seem to listen when spoken to directly
- d. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
- e. Often has difficulty organizing tasks and activities
- f. Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- g. Often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books or tools)
- h. Is often easily distracted by extraneous stimuli
- i. Is often forgetful in daily activities

2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive or inconsistent with developmental level:

Hyperactivity

- a. Often fidgets with hands or feet or squirms in seat
- b. Often leaves seat in classroom or in other situations in which remaining seated is expected
- c. Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
- d. Often has difficulty playing or engaging in leisure activities quietly
- e. Is often "on the go" or acts as if "driven by a motor"

- f. Often talks excessively Impulsivity
- g. Often blurts out answers before questions have been completed
- h. Often has difficulty awaiting turn
- i. Often interrupts or intrudes on others (e.g. butts into conversations or games.)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g. at school [or work] or at home.

D. There must be clear evidence of clinically significant impairment in social, academic or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g. Mood Disorder, Anxiety Disorder, or a Personality Disorder).