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ADDERALL & ETHICS: OUR USE OF AMPHETAMINES

Frank DeVita

WOULD YOU LET YOURSELF OR YOUR CHILD TAKE AMPHETAMINES?

Amphetamines are prescribed to children and adults every year to treat attention deficit hyperactivity disorders and narcolepsy. Interestingly, attention disorders occupy an area of medical science that has fallen under much skepticism and criticism since the early 1970s. Specifically, speculation has been directed at the nature of attention disorders and their legitimacy as pathological conditions. For example, arguments made in the early 2000s question the validity of the diagnosis of attention disorders, especially with respect to prescription psychostimulants. In recent years, there has also been an alarming increase in amphetamine abuse in academic contexts - students have begun to abuse attention disorder medications to increase their focus for extended, unnatural periods of time. Both the prescription of these drugs to children and their abuse in academics is troublesome, and we should address the science and ethics behind these contemporary sources of controversy that relate to our modern medical and academic cultures.

Since the scientific discussion of attention disorder is still relatively controversial, I do not wish to inquire into the nature or causes of attention disorders, nor theorize heavily about mechanisms of drug action or biological effectiveness. Instead, I will address an apparent lack of understanding about the drugs involved in treating attention disorders, especially considering that many of these drugs are prescribed to developing children and are abused in both academic and recreational settings. We will need to say something about pathology to discuss these points, but the reader should know that I am not a scientific expert on the topic and do not wish to make any original arguments in these areas. However, I will present relevant literature. I wish to present the drugs often prescribed and abused for their effects on attention, the current understanding of their mechanisms, and the ethical and health concerns surrounding their use; that is, how they are relevant to the treatment of attention disorders and the use of 'study drugs' among students. First, let us delve into the current understanding of attention deficit disorders.

WHAT IS ADHD AND HOW IS IT TREATED?

Attention-Deficit Hyperactivity Disorder (ADHD) is one of the most common attention disorders diagnosed in children and young people. According to the Diagnostic and Statistics Manual of Mental Disorders (DSM) published by the American Psychiatric Association, its symptoms include persistent hyperactivity, inattentiveness, and impulsivity.^{1,2} The exact biological pathology of ADHD is not well defined, but studies argue that it essentially entails reduced activity of the neurotransmitter dopamine, a chemical involved in sensations of pleasure and reward, in the frontal lobes and basal ganglia of the brain.³ Additionally, genetic

studies have suggested an association between ADHD and abnormal human dopamine transporter (dat) genes, suggesting a heritable or mutative cause of dopamine dysregulation as the source of attention deficiencies.⁴ ADHD is often treated with the prescription of various types of amphetamines, and these drugs provide symptomatic relief for nearly 80% of patients to whom they are administered.^{1,5,6,7} Adderall is one of these widely prescribed ADHD medications, and is a mixture of two amphetamines: dextroamphetamine and amphetamine.⁸

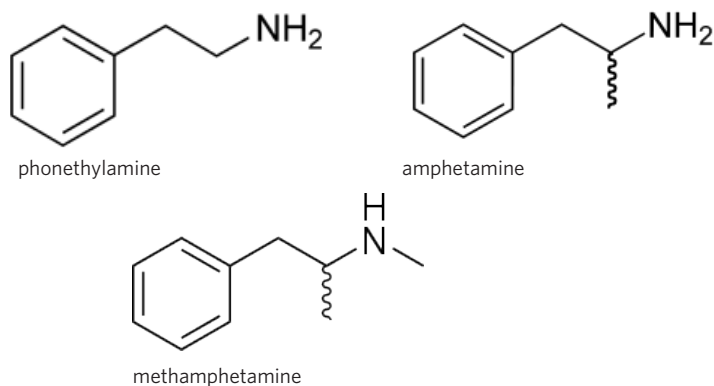
WHAT IS AN AMPHETAMINE AND WHAT DOES IT DO?

Since these amphetamines are widely prescribed to treat ADHD and are also a source of performance enhancement in academics, feelings of societal obligation should lead us to further inquire into their nature. It will be helpful to understand exactly what kinds of chemicals are making their way into human brains and to explore how and why they are both useful and destructive depending on the context of use. Namely, there are several important facts at the biological, chemical, and psychological levels that may go unnoticed to users in both medical and academic contexts, and I seek to inform the reader generally on amphetamines, their usage and their apparent effectiveness.

An amphetamine is a chemical stimulant, meaning that it increases overall activity in the nervous system, putting it into overdrive, so to speak. Caffeine also belongs to this broad category of drugs. In the context of our discussion about attention, stimulants are referred to as psychostimulants, which act in the central nervous system (the brain) and can induce alertness, wakefulness, and euphoria in the user. Psychostimulants are relevant to the medical treatment of ADHD and related disorders specifically because they can improve focus and attention in the user, combating the symptoms of attention deficit quickly and effectively through simple medication regimens. Amphetamines are thought to increase dopamine (DA, important in 'reward'), norepinephrine (NE, important in 'fight-or-flight responses) and serotonin (5-HT) levels in the brain by increasing the chemicals' concentration between neuronal synapses.¹⁸ This is described to be largely accomplished through release of DA, NE and 5-HT through the channels that typically bring the chemicals into neurons.^{19,20} This 'reverse transport' is also aided secondarily by blockage of mechanisms that normally sequester the chemicals in synapses called "reuptake inhibition."^{19,20} This combination of reverse transport (the major mechanism) and reuptake inhibition (the minor mechanism) flushes synapses in the frontal lobe and basal ganglia with DA, NE and 5-HT, thus inducing the above-described stimulatory effects.⁹

Amphetamines are part of a studied group of chemicals called phenethylamines, which are known for their stimulatory effects and neurotransmitter modulation. These and many other similar drugs, e.g. methamphetamines, are FDA approved psychostimulants for ADHD

treatment and all seem to produce similar effects. That said, we should appreciate that the commonality in observed effects of these drugs is also reflected in their chemical structures:



IN THESE CHEMICAL REPRESENTATIONS, SOLID LINES REPRESENT CHEMICAL BONDS (TWO LINES SIGNIFY A DOUBLE BOND). N REPRESENTS NITROGEN, H REPRESENTS HYDROGEN, AND THE ABSENCE OF A LETTER INDICATES A CARBON ATOM. ZIGZAG LINES ARE VARIABLE, NONESSENTIAL CHEMICAL GROUPS.

Interestingly, trace amounts of phenethylamine are found naturally in chocolate. However, the reader may know the above-pictured amphetamine and methamphetamine more readily by their unofficial names—“crystal meth” and “speed,” respectively—illegal narcotic forms of synthetic amphetamine sold in black markets. These illegal drugs are abused for their induction of euphoria and now their prescription strength derivatives are abused for their effects on attention. The consequences of abusing these drugs are very serious in both contexts. Specifically, physical and psychological dependence may lead to addiction, psychosis, and severe withdrawal symptoms after long-term usage.^{10,11} These drugs are dangerous in the wrong contexts and doses, thus forming a preliminary point about the ethics of their abuse.

IS THERE A FUNCTIONAL RELATIONSHIP BETWEEN PRESCRIBED AND SYNTHETIC SUBSTANCES?

In cognitive enhancement cases, the types of amphetamines abused illicitly are typically prescription drugs issued initially for attention disorders, e.g. Adderall. However, chronic recreational drug abusers often turn to synthetic compounds. Considering this, the chemicals abused may differ slightly in structure, but it is not invalid to argue that their function and effects in the brain and on the mind may be similar regardless of their point of sale. Skeptics may argue that differences in these chemicals' structures make this suggestion invalid; however, let us consider another class of structural homologs (“homology” meaning sameness) that millions of people use daily in place of a natural compound in the human body with great results: synthetic insulin. Insulin is a natural protein produced by the body, constructed from chains of smaller amino acids. Its analogues, which are administered in diabetes treatment, differ in composition from the natural compound by one or more amino acids just as prescription methamphetamines and amphetamines may differ from their prescribed, FDA approved

derivatives by only a few constituents. Since insulin and its synthetic analogues can produce functionally similar effects inside the human body, is it not valid to reason that amphetamines essentially analogous to those in the hypodermic needles of drug abusers are making their way into the bodies of children and students in the form of prescription drugs? Considering recent efforts to diagnose attention disorder at earlier ages and the prevalence of amphetamine abuse in academics, we should consider this a possible state of affairs and inquire further into the ethical issues surrounding the use of amphetamines in our society.

ARE PRESCRIPTION AMPHETAMINES WARRANTED?

First, we should consider amphetamine use in a medical context. It is understood that drugs like Adderall can alleviate symptoms of attention disorders in a large percentage of patients^{1,5,6,7} and we would be unwise to refute the therapeutic reality of these drugs. However, we should critically examine the grounds on which these patients were diagnosed. Rather than refuting this use of amphetamines through complicated biological arguments, let us address the aforementioned symptoms that serve as the basis of attention disorder diagnosis in order to develop a stance on the clinical use of amphetamines. Recall that symptoms of ADHD include inattention, hyperactivity, and impulsivity. Frankly, this list of characteristics reads more like the typical character of a young child rather than the symptoms of a psychological or psychiatric disorder; in fact, it seems perfectly in order from a behavioral standpoint. Further, it seems we are making a conclusion about a child's cognitive and mental condition based largely on subjective judgment of behavior. Shortly, a decision to medicate with potentially addictive drugs such as amphetamines on such grounds seems flawed. Until better testing for disorders such as ADHD are implemented and more definitive biological markers or symptoms are identified, we should have trouble so readily accepting and advocating the treatment of attention disorders with amphetamines based on a purely behaviorist rationale. Although inappropriate for further discussion here, behaviorist arguments about the human mind have been largely and continually criticized in the modern era by contemporary thinkers. Until more sophisticated methods in brain imaging and cognitive diagnostics for diseases such as ADHD are developed, it remains a struggle to support the widespread use of prescription amphetamines.

Given the unrefined understanding of the causes and pathologies of attention disorders, the use of amphetamines and other psychoactive drugs to treat disorders in children is questionable at best. Although symptoms may be alleviated, we cannot be sure of the long-term effects of amphetamine use or how its use is affecting childhood development. Let us not also forget that the use of such drugs alters the patients' perception and quality of experience, perhaps in an undesirable way. We cannot communicate with the youngest of children, but personal accounts of older individuals medicated for attention disorders definitively report that their experiences with attention drugs are characterized by an altered state of consciousness. They also report undesirable physical and mental effects during the drug's clearance from the body. Given the expanding wealth of scientific knowledge and these personal accounts of experience from patients, we should be more critical and cautious about altering the consciousness of young patients through the prescription of psychoactive drugs for attention disorders.

SHOULD WE BE PRESCRIBING DRUGS TO YOUNGER PATIENTS? IS THERE AN ALTERNATIVE TO PSYCHOSTIMULANT USE?

Development progresses quickly and sequentially in the early stages of life, and this is evidenced by the faster development of adolescents versus the more homeostatic state in adults. Further, our understanding of the developing brain is in its infancy, providing more reason to be wary of treating attention disorders with potentially mutative psychostimulants. If anything, our current knowledge of molecular genetics should prompt us to take a more reserved stance on introducing foreign chemicals to developing bodies, even if they are medically prescribed. In this respect, we are readily discovering that many different compounds can interfere with gene expression, and the compounds discussed in this paper could also be inhibiting the function of essential developmental genes or activating inappropriate ones by saturating the brain with dopamine and subsequently active products. This is not to say that it is impermissible to prescribe medications to developing children in all cases—extenuating circumstances are conceivable. However, since this treatment modality for attention disorders is relatively new, we will not fully understand its consequences and effects until a significant number of people who were prescribed amphetamines at early ages reach a more definitive point in cognitive development. Even then, can we argue that such a person would have lived a worse life without medication? As such, earlier prescription of psychostimulants for disorders that are not well defined in the first place is a point worth considering questionable at best. In addition, psychopharmacology research studies in ADHD model rats have shown evidence for long term harmful effects after adolescent treatment with psychostimulants.¹⁹

Fortunately, there are alternative behavioral strategies to medication that could serve as a first line of therapy in attention disorder cases. These approaches involve deliberate and structured behavioral intervention by human interaction with children showing ADHD symptoms. Some examples of these methods include behavioral intervention training for parents and classroom management training for teachers that educates both parties on using behavioral methods to help children exhibiting attention disorder symptoms.^{12,13} Approaching attention disorders from a behavioral standpoint prior to prescription drug use seems logical and practical. We should focus on more strongly coaching and teaching children who exhibit attention disorder symptoms through behavioral reinforcement before prescribing them psychoactive drugs. It is evident that while prescription amphetamines may sufficient for treatment for attention disorders, it is certainly not necessary in all cases.

WHAT ABOUT COGNITIVE ENHANCEMENT?

Studies have shown that rates of non-medical use of prescription psychostimulants have reached 25% at some United States colleges and universities.^{14,15} However, these statistics are self-reported, so actual figures may be more striking. Given that there are approximately 20.1 million college students in the United States, this corresponds to as few as about 100,000 (5%) to as many as 5.1 million (25%) students who use

psychostimulants such as Adderall in the United States alone.¹⁶ On the surface, the advantages of psychostimulant use are clear: heightened focus and the ability to work unwaveringly by swallowing a pill. Considering the previous discussion, this seems as impermissible as performance enhancement and drug abuse in general. One can even think of the current performance enhancement scandals in professional sports—like their athletic counterparts, a minority of students are employing the use of an illicit substance to improve their performance relative to those they compete with. This gives stimulant users a clear advantage over nonusers in that they acquire increased levels of cognitive endurance from abusing drugs like Adderall. In a society where academic performance is becoming the standard parameter on which students' merit is judged, stimulant use is an unfair advantage. Nevertheless, this behavior is also physiologically self-injurious for the user and can have undesirable long-term consequences.

HONEST STUDENTS ARE BEGINNING TO COMPETE WITH OPPONENTS WHO WILL STOP AT NO COST TO IMPROVE THEIR PERFORMANCE AND SIMPLY CANNOT MATCH THE ARTIFICIAL COGNITIVE STAMINA ATTAINED BY THOSE STUDYING WITH ILLICIT SUPPLEMENTS.

WHAT CAN BE DONE ABOUT NON-MEDICAL PRESCRIPTION AMPHETAMINE ABUSE IN ACADEMICS?

Unfortunately, preventing the abuse of amphetamines for cognitive enhancement in academics is much more difficult than curbing their prescription in a medical context. In the case of abuse, we are dealing with sporadic, unapproved drug use that often goes largely unnoticed by physicians and close acquaintances. As such, it would be up to the student or the student's peers to intervene and combat abuse. Alternatively, a student abusing performance enhancing prescription medication could seek professional help. However, there remain instances where students continue to use prescription amphetamines for an academic advantage regardless of psychophysical consequences. Thus, academic institutions must intervene if the problem persists and grows. As the number of psychostimulant prescriptions written per year have been increasing since the 1990s^{17,18}, the illicit use of such medications will increase accordingly. Therefore, educational institutions must take aim at performance enhancement prescription drugs with conduct codes and strict prohibited-use policies as a start. Regular student testing would be unrealistic at universities, but higher education should make it a priority to address this issue given the consistently increasing dependence on grades for admission to graduate and professional schools as well as in the job market. Honest students are beginning to compete with opponents who will stop at no cost to improve their performance and simply cannot match the artificial cognitive stamina attained by those studying with illicit supplements. Remaining ignorant to the issue will only exacerbate the problem because more students are likely to try their hand at cognitive enhancement as pressure and prevalence builds.

FINAL THOUGHTS

I hope I have at least bestowed upon the reader a new sense of clarity with respect to the many details underlying psychostimulants and their use in medical and academic contexts. The objective of this piece is to increase awareness and to provoke thought about a topic that has become pertinent in our high schools, universities, and doctors' offices. It is also eminently relevant to our health, minds, and brains. Although science may still be refining its ideas about the more concrete details of the biology of what was discussed, hopefully the arguments have presented to the reader a clear demonstration that willful ignorance of the issue at hand is an injustice to our society at large.

Frank DeVita is a senior Biology and Philosophy major from Valley Cottage, New York. He is currently doing research in clinical nuclear medicine at Boston University School of Medicine and is interested in philosophy of mind, phenomenology and the history of philosophy. He hopes to pursue his philosophical interests at the graduate level in the United States or abroad.

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