ADDERALL ABUSE AT WORCESTER POLYTECHNIC INSTITUTE: A STUDY OF THE UNDERGRADUTE POPULATION

Interactive Qualifying Project Report completed in partial fulfillment

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ABSTRACT

University administrators are concerned with growing trends in abuse of the prescription stimulant Adderall on college campuses. Previous studies show that college students have ignored the risks associated with using Adderall. WPI currently has no data on Adderall abuse; therefore, this project surveyed the undergraduate population, collected online narratives, and interviewed experts and administration. Totally, 13% reported abuse, a comparatively lower rate than other schools. This study offers a typical abuser profile and discusses the attitudes regarding abuse on campus.

AUTHORSHIP

Lucas Brutvan

This author was responsible for scheduling interviews with Erica Tolles and Daniel Kirsch, and transcribing their interviews to a word document. He also wrote and revised the following sections of the research paper: Executive Summary, Introduction, Literature Review sections on Adderall abusers, Methodology section on expert and administrative interviews, and the Results section for expert interviews. He and Nicholas co-wrote the Abstract. In addition, he was responsible for the organization of the IRB proposal. Several other sections were co-edited with other authors of this project. Survey distribution and data collection was handled in a similar manner, with all researchers of the project contributing to these two areas.

From this project, I believe that I learned the most about organizing claims and supporting facts with purposeful prose. Organizing claims with proper, relevant information from sources was something I struggled with greatly and, although I continue to struggle with it, I believe that I have made significant progress on fixing this problem. I learned that the construction, distribution, and analysis of a survey takes considerable effort and resources, as well as the coordination of several parties in addition to the other three researchers.

Nicholas Medeiros

Nicholas Medeiros is responsible for writing and researching multiple sections throughout the paper. Together with Lucas, he was responsible for co-writing the Abstract and Introduction. In the Literature Review, the section entitled “What is ADHD?” and all of its subsections were written by Nicholas, in addition to the review of “Content Analysis”. In the Methodology, the section on “Content Analysis”, in its entirety, was written by Nicholas. He completed research dedicated to online drug forums, content analysis, and reliability tests. In the Results section, he is responsible for the entire section of “Analysis of Drug Forums”, “Survey Data”, and the “Online Website”. The calculation of percentages and significance, in addition to the graphs included in this paper were done by him. The majority of the Discussion, Conclusion, and Future Applications sections were also written by Nicholas. Editing for all parts of the paper, in conjunction with the other researchers, was also done by Nicholas. He was also responsible for meeting with Residential Staff and Professionals in various fields (Dr. Kirsch, Erica Tolles, Art Heinricher, and the AOD Task Force), along with the rest of the researchers. He also took part in helping with data collection.

This project has taught me about several important aspects of writing and research. Through revisions of this paper, I have enhanced my organizational and research skills, in addition to learning more about APA citation. Through construction of the survey, I learned the proper way to pose questions to obtain relevant, analyzable data most relevant to the research questions at hand. More practically, the project has taught me about the drug Adderall, its health effects, prevalence and use in society, and the importance of drug education.

Ross Lagoy

Ross Lagoy is responsible for writing and researching multiple sections in the Literature Review and Methodology. In the Literature Review, he wrote and researched the "Potential Methods for Studying Abuse" section, including the "Survey Generation, Types of Questions, Format, Confidentiality, and Methods of Distribution" subsections. Also in the Literature Review, he wrote and researched the "Statistical Analysis" section, including the introduction paragraphs, "Graphical Summaries" and "Statistical Significance and Analysis" subsections. In the Methodology, he wrote the section entitled "Undergraduate Survey" consisting of the "Survey Layout Considerations" subsection. He is responsible for meeting with Residential Staff and Professionals in the field (Dr. Kirsh, Erica Tolles, Art Heinricher, and The AOD Task Force). He is also responsible for collecting and entering survey data into excel, editing the "Analysis of Survey Data of the WPI Undergraduate Population" subsection, formatting pie-of-pie charts, formatting and compiling the "Appendix" section, and including his references in the "References" section.

I learned many useful skills through the completion of this project. Mainly, I learned how to organize my time, collaborate with people (Doctors, colleagues, supervisors, Deans, and Residential Advisors), and abide by deadlines. Along with gaining experience in writing and formatting a formal paper, I also learned how to research a real problem, collect and organize data, interpret findings, draw conclusions, and understand the potential future applications of this project. Finally, I learned how to work with the Institutional Review Board and abide by strict requirements upon having our survey approved by IRB regulations.

Sandesh Suddapalli

Sandesh was responsible for conducting extensive research on the background of Adderall, its mechanism of action in the human body, and the consequent side effects thereby authoring the section titled "What is Adderall?" This author also helped in survey construction that was administered on the WPI campus and was able to successfully work with the Resident Advisors to organize programs used for data collection. He also authored "Methods of Distribution and Collection" and "Confidentiality". He was also responsible for editing the "Discussion" section and conducted the analysis on "Students' Reported Knowledge of Adderall Side Effects." Upon collecting these surveys, this author was one of the principal organizers of the data and was responsible for constructing some of the pie charts and graphs that highlight the results. In addition to that, Sandesh aided other researchers on the team to conduct expert interviews and kept a file of all the notes and audio recordings of the experts (except Daniel Kirsch). Sandesh also co-edited some of the final sections written by other researchers and formatted the document accordingly.

One of the biggest challenges of this project was to design and create an adequate method to collect data to test for trends in as sensitive a topic as drug abuse. Through each amendment to our methods, I realized how carefully we needed to handle the process. Moreover, with each edit to our paper, I have learned to correctly organize the project, to design it so that it is understandable by the general audience, to cite sources correctly according to the APA citation rules.

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EXECUTIVE SUMMARY

Adderall is a pyschostimulant amphetamine used to treat patients diagnosed with ADHD. A trend observed in college campuses across the United States indicates that students who are not prescribed Adderall are using it to facilitate studying and perform better on exams. Therefore, this project was conducted to examine the undergraduate student body at Worcester Polytechnic Institute and its abuse of the drug Adderall in an academic environment. Furthermore, this report was drafted to profile different types of Adderall users in the undergraduate population.

Most reviewed studies quantified abuse of Adderall on college campuses (DeSantis, 2010, p.2; Checton & Greene, 2010, p.2). However, few studies have reported on students' views on the ethics of this problem and their understanding of the risks and side effects of Adderall

To collect information on these topics, the following methods were employed:

1) Public online drug forums were analyzed to identify individuals' justifications for use, encountered side effects, means of administration, and how Adderall was obtained.
2) Surveys of student use and abuse, attitudes, and knowledge of Adderall side effects were collected through events hosted with Resident Advisors in campus residence halls.
3) An online website was constructed to invite WPI students to post anonymously their experiences with the drug. Information from these personal narratives was analyzed to understand further student struggles, experienced side effects, and experiences with Adderall.
4) Interviews were conducted with members of WPI faculty and one expert psychologist at University of Massachusetts Medical School in order to determine faculty awareness of Adderall abuse at WPI, and typical patient behaviors and a psychologist's opinion on the increasing trend of college students obtaining an Adderall prescription.

Because of the involvement of human subjects, procedures for this project were submitted to the Internal Review Board (IRB).

Analysis of public online drug forums was used primarily as an educational tool for the researchers of this project. Writers of these forums posted detailed stories covering personal use of Adderall. We learned from these sites the wide range of side effects possible from using Adderall, in addition to the ways in which the drug may be obtained and administered. Results from this analysis helped shape survey questions for the WPI undergraduate population.

A total of 414 surveys were collected from undergraduate students at WPI. Survey data level of abuse at WPI on the prescribed and unprescribed use of Adderall in the undergraduate student body was comparatively lower than other reviewed studies. Our findings indicated that 13% of the surveyed students are reportedly unprescribed users of Adderall, and only 4% of the respondents have a prescription for the drug. In comparison, DeSantis' study at the Univesrity of Kentucky found that 34% (680 of 2000) survey respondents had used attention deficit drugs without a prescription (2010, p.2).

Of the surveyed undergraduate students, the majority of students (62%) stated that they did not believe that Adderall as an academic aid was acceptable, while the second largest majority (21%) was unsure. We determined that these statistics would make the success of an anti-Adderall campaign quite probable.

The majority of surveyed undergraduate students (approximately 62%) were non-responsive in the survey question asking them to identify any side effects of Adderall the students were knowledgeable about. This result is possibly indicative of the lack of knowledge and awareness regarding Adderall side effects by undergraduate students. This result also suggests an opportunity to educate undergraduates on the dangers and risks associated with off-label Adderall use.

The primary suppliers of Adderall to surveyed undergraduate students at WPI who reportedly abuse the drug were admittedly friends attending the university. 79% of the reported Adderall abusers reported obtaining Adderall from friends at the university, which may suggest a high level of Adderall trafficking on the campus.

From this study, a general abuser was typified as a busy student who regularly participates in drinking. The number of reported Adderall abusers involved in two or more extracurricular activities was 11% higher than the percentage of non-abusers involved in two or more extracurricular activities. Students who have busier schedules may feel they need to result to stimulants to cope with the stress of such a schedule. Almost all Adderall abusers reportedly drink alcohol. Two-thirds of the respondents reported smoking marijuana, and more than half reported using tobacco products. More abusers were found to be upperclassmen as well as students who were involved in Greek life. The higher percent of Adderall abusers that are involved in Greek life may be credited to the environment in which these students live or interact. Greek houses are off–campus and not governed by Resident Advisors as residence halls are, possibly facilitating the use of this drug.

Narratives submitted to the website constructed for this project gave clear insight into personal stories regarding Adderall use at WPI. Some submissions discussed trafficking of the drug on campus, while others discussed the benefits, as seen by posters regarding Adderall use in the academic setting. Students who reported not taking Adderall, which mainly included attitudes against unprescribed Adderall use, submitted some narratives. As a result these narratives helped to further quantify levels of Adderall abuse through personal experiences.

Interviews were conducted with faculty at WPI, and it was determined that there was a lack of knowledge amongst administration about the drug and its side effects. In a meeting with the Student Development and Counseling Center (SDCC) at WPI, it was discovered that programs geared toward students dealing with alcohol and marijuana problems exist, but programs specifically dealing with Adderall abuse do not. Dr. Kirsch of UMass Medical also agreed that the abuse of Adderall is an under-the-radar problem that universities should expend more resources to resolve, as this abuse affected his clientele directly.

Recommendations

Because of the lack of student knowledge about the dangers and side effects of Adderall, we advise assigning at least one Residential Advisor and/or Community Advisor program to be dedicated to Adderall use, and target the program to first-year students. In addition to side effect knowledge about Adderall, this program would cover the legal risks and include real-life stories regarding Adderall experiences. Examples of abuse from this study also have the potential of being utilized for these programs, so long as the participants are again, kept anonymous.

Because of the large percentage of students in the abuser category who are also upper-class students, we suggest that an educational program be constructed for reported Adderall abusers, akin to the currently implemented marijuana and alcohol programs at the WPI SDCC. These programs are mandated for students with addiction problems (generally). More frequent time-management workshops should be available to students to help them manage an increasingly busy schedule without resorting to stimulant abuse.

Only one medical expert's opinion was taken on the issue of Adderall abuse for this study. Further interviews should be conducted with additional experts in psychiatry in order to determine whether or not there is a change in the threshold for writing a prescription for other doctors.

The data collected from this experiment was one sample from the undergraduate student body at WPI. Because this was the first set of data collected on Adderall abuse at WPI, there are no other data sets with which to compare these findings, and hence, we suggest both surveying a larger quantity of undergraduate students as well as repeating the survey on an annual basis to observe additional trends.

INTRODUCTION

In today's competitive and demanding college atmosphere, students are required to balance academic challenges with involvement in extra-curricular activities and a social life in order to succeed during and beyond college. Because of this hectic lifestyle, students may resort to various substances, including stimulants, tobacco products, alcohol, or marijuana, among others, to help cope. In fact, the National Association of Women Law Enforcement Executives (2006) released the following statement about students in today's generation: "Antidepressants, prescription medication, and other behavior-altering drugs, [make] Gen Y'ers the most medicated generation in history" (p.7). Stimulants, such as caffeinated beverages, including coffee or energy drinks, or prescription drugs, such as Adderall, are particularly prone to abuse as they increase alertness, stave of sleep, and heighten concentration, conditions which are conducive to long study sessions but harmful to health. Serious risks from Adderall include cardiac arrest, insomnia, abdominal pains, and in extreme cases, psychosis.

The results from several studies conducted on college campuses in the US (MedlinePlus, 2011, p.1; Garnier, 2010, p.1; WGBH, 2011, p.1) suggest that a large number of students with prescriptions for drugs have either given or sold their medications to others, and Adderall was found to be the most diverted drug, popular because other students wanted to use it as a study aid.

Although some studies (DeSantis, 2010, p.2) have indicated the abuse of Adderall on college campuses in the United States, and have described student motives and methods for distributing and obtaining the drug (Checton & Greene, 2010, p.2), fewer studies have actually explored students' views on the ethics of this phenomenon or their understanding of the risks and effects of the drug. Furthermore, the extent of Adderall abuse on the WPI campus is unknown. A meeting with the Student Development and Counseling Center revealed that data on Adderall abuse at WPI specifically was nonexistent.

Of particular interest to this project is the off-label employment of Adderall on campus as a study aid, and the attitudes and reasons regarding its use on campus.

This project addresses the following research questions:

- What is the prevalence of both prescribed and unprescribed Adderall in the undergraduate population at WPI?

  This data can be used as base line to study trends in use and abuse over time.

- What are undergraduate student attitudes towards the abuse of Adderall? Do students find it ethically acceptable to use Adderall to improve academic performance and/or for recreational purposes?'

  Student views on the acceptability of this drug will help health workers and administration fashion a campaign tailored to their beliefs. Relaxed opinions on the ethical tolerance of Adderall use could potentially cause an increase in student abuse in the future.

- How much do students know about the side effects of using Adderall?

  Student knowledge about Adderall is an important topic for the administration so they can write appropriate educational content in brochures and other health campaign materials addressed to known research gaps.

- What are the various methods students use to obtain Adderall?

  Some studies suggest friends and acquaintances give or sell their prescriptions. If this is true at WPI, these suppliers can also be targeted so that an anti-peer pressure model health campaign may be constructed for students prescribed the drug.

- Is there a general abuser profile for students at WPI?

  Knowing what kind of student typically abuses Adderall will make it easier to design an educational or rehabilitation program for a specific audience.

The data from this study is available for researchers and faculty interested in designing educational programs as well as health campaigns to help mitigate growth of Adderall as a study-aid phenomenon.

Data was gathered in four ways. First and most important, paper surveys were distributed throughout the student residence halls, in addition to four Greek houses. Second, we designed an online site where students were encouraged to post their experiences with the drug. Students were encouraged to write narratives describing their personal experiences with Adderall via a forum created by the researchers of this project. Results from the survey and online narratives help us understand why and how often student users take the drug, how the drug is obtained, and attitudes about its illegal use.

Third, interviews were conducted with faculty members of WPI as well as a psychiatrist at the University of Massachusetts Medical School to obtain both faculty and expert opinions on the growing problem of prescription Adderall abuse. Lastly, existing online drug forums (on Adderall specifically) were analyzed through content analysis to obtain views about the drug from the general public and from medical students. These analyses helped educate the researchers on other groups' experiences with and attitude toward Adderall use and abuse.

We hope to obtain the following outcomes from our project:

- A general abuser profile
- Statistics on the usage of Adderall (unprescribed and prescribed) at WPI
- Students' opinions regarding the acceptability of both academic and recreational use of Adderall at WPI
- Students level of knowledge of Adderall side effects

The following chapter reviews existing medical literature to define the drug Adderall and the disorder for which it is primarily prescribed, Attention Deficit Hyperactive Disorder (ADHD). Further sections in the chapter examine previous studies conducted of college students' off-label Adderall abuse. The methods from these studies were adapted and extended in order to create a fuller picture of possible Adderall abuse on the WPI campus.

LITERATURE REVIEW

What is Adderall?

Adderall is a brand name, brain-stimulating drug that is typically prescribed for Attention Deficit Hyperactive Disorder (ADHD); narcolepsy, a sleeping disorder; and in some cases, obesity as outlined by the US National Library of Public Health (2010) on their website. Adderall was approved for unrestricted use for ADHD treatment by the Federal Drug Administration (FDA), in March of 1996. According to Swanson (2011), it was since proven to be functionally more potent than its competitors – Concerta, Daytrana, Foclin, Ritalin, and Vyvanse – for treatment in ADHD. This claim is further confirmed by the list of drugs generally prescribed for ADHD provided by the National Institute of Mental Health (2008).

The medication was first released as Adderall IR -- a multi-dose, instant-release tablet derived from Obetrol, a drug introduced in the 1950's for obesity. Shire Pharmaceuticals (2011), an Irish headquartered, United Kingdom based public company manufactures an extended-release formulation of this drug -- Adderall XR in a capsule form as listed on their website. The present range of dosages is five, ten, fifteen, twenty, twenty-five, and thirty milligram extended release capsules as outlined in the same website on pages titled "Adderall Safety Review" and "Product List."

The drug is composed of two active ingredients: amphetamine and dextroamphetamine. They are responsible in regulating conditions in the brain to treat patients with ADHD. Amphetamines exist as of a combination of two differently oriented organic structures in a plane of symmetry. Each type of molecular orientation gives the drug its exclusive properties and is instrumental in determining the reactivity of the drug with the body and the central nervous system. Adderall is a combination of 25% Levoamphetamine and 75% Detroamphetamine. This orientation and combination is what makes the drug substantially more potent than its competitors and unique compared to frequently abused drugs that are similar to Amphetamines. The common structure of an amphetamine is illustrated below along with the dextro- and the levo- amphetamine structures as retrieved from the wikicommons (2007), webster-online dictionary (2007) and neurochem (2011) websites:

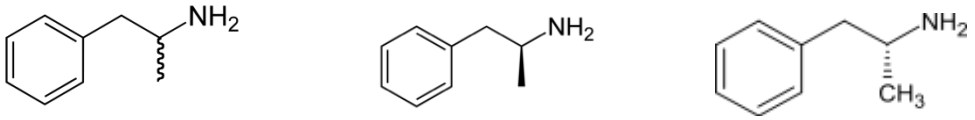

Figure 1. Three dimensional chemical orientations of different isomers of amphetamine molecule. The structure on the left is the amphetamine molecule, with the following two structures depicting the dextroamphetamine and levoamphetamine isomers, respectively (2011).

In addition to the aforementioned active ingredients, the final capsule of Adderall contains chemicals associated with its production, including those used for coloring and coating. According to Shire Pharmaceuticals, the final product is manufactured as either tablets or capsules; Adderall instant release (IR) takes the form of a tablet while the extended release (XR) is produced as a capsule; both are pictured below as retrieved from Adderall Side Effects (2011) and Health Square (2007) websites:

a)  b) 

Figure 2. Drug formulations. Adderall is distributed in the form of a) Adderall IR (tablet) and b) Adderall XR (capsule).

Both Adderall XR and Adderall IR are available from several generic manufacturers. As highlighted in "Generic Medications" section of the Ranbaxy Pharmaceuticals Inc. website (2011), Generics have "the same dosage form, safety, strength, route of administration, quality, performance characteristics and intended use as the branded version of the drug," but is yet cheaper than brand-name versions. The difference in cost stems from the lack of advertising and clinical testing required of the generic drug, allowing the manufacturers to sell at a lower cost. Generic formulations differ from authorized generics in that only authorized generic drugs are manufactured by the original company; however both types are chemically equivalent to the original drug. Companies selling generic Adderall XR include Teva Pharmaceutical Industries, Ltd., Eon Labs, and Ranbaxy Pharmaceuticals known by the same name as discussed on the Ranbaxy Pharmaceuticals website.

As an amphetamine, Adderall is classified as a Schedule II narcotic, meaning that it has a high potential for abuse, is currently accepted for medical use in treatment in the United States, and may result in severe psychological or physical dependence if it is abused according to the University of San Francisco's School of Medicine's "Controlled Substances Data" document published on their website. Other drugs in the same schedule include cocaine, methadone, oxycodone, and morphine. Adderall is distributed only through a prescription by medical doctors, primarily physicians and psychiatrists.

How does it work?

A "Full Prescribing Information" document has been retrieved from the Shire Pharmaceuticals' (2011) website, which discusses that the prescribed route of administration for Adderall: It is generally taken by oral consumption and is broken down in stomach acids. After the intake of Adderall, the blood plasma concentrations peak at approximately three hours for an instant release tablet and approximately seven hours for an extended release capsule. However, the time intervals can be easily affected by food intake and other variables such as patient body weight. The dosage and time are also dependent on the subject's age and health condition. Individuals with ADHD and other diseases are generally administered Adderall through a thorough diagnosis that determines where the patient falls in the array of "special populations", also reviewed in the "Full Prescribing Information" document. The number of pill or capsule intake, and the corresponding dosage is based on age and severity of the disorder.

The website titled The Brain from Top to Bottom (2011) illustrates the exact mechanism of action of Amphetamine in the brain. Amphetamines are readily taken up and transported through the central nervous system to the brain. The white blood cells will not attack these foreign bodies. Once in the body, Adderall stimulates the central nervous system and with time regulates chemical levels in the brain; specifically dopamine. Dopamine is a neurotransmitter (a chemical messenger) produced in the brain that mainly controls emotional response and is released to produce feelings or sensations of desire and motivation – hence termed the "reward chemical." Patients diagnosed with ADHD have low levels of dopamine thereby handicapping their ability to concentrate or focus on simple tasks. The treatment of

ADHD with Adderall therefore aids in regulating these chemical levels. Additional information in treating ADHD is discussed below in the section titled "What is ADHD?"

Dopamine is synthesized by neurons in the middle of the brain but is released throughout the brain in the event of excitement or increased concentration. In the event of such an emotional response the dopamine stored in the end of the neuron called the "extraneuronal space" is released into the presynaptic gap (space between neuron and nerve receptors throughout the brain) stimulating the nerves. Once the feeling passes, the dopamine molecules are reclaimed into the extraneuronal space via "reuptake pumps" attached to the neuron to be reused later. Although the exact mode of therapeutic action in ADHD treatment by Adderall is unknown, Adderall is thought to block the reuptake of dopamine into the neuron. The extraneuronal space is instead replaced by molecules that Adderall is made up of.

Dopamine is also the chemical that is responsible for addiction, which is discussed below. Addicts crave the constant desire to feel the sensation that is provided by the drug. Adderall inhibits the reuptake pump and empties the extraneuronal space of dopamine to trigger the nerve receptors. When the dopamine is reclaimed back into the neuron, the addict misses the sensation and takes more of the drug. Amphetamines are chemicals that substitute for dopamine and trick the brain into releasing the neurotransmitters as discussed in the University of Texas Research website titled "Understanding Addiction Dopamine" (2011). In cases of abuse, Adderall is illegally used in an unmonitored manner for heightened psychological sensations which leads to addiction over time. Figure 3 below illustrates the brain activity (with dopamine release) on Adderall (shown on the left) and without it (shown on the right) retrieved from the article titled "Dangers of Adderall" by Emily Ness from eHow website (2011).

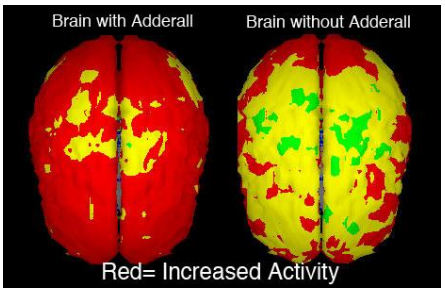

Figure 3. Brain neuroactivity. The scan on the left shows a brain with increased dopamine levels, while the scan on the right shows a brain with normal dopamine levels, not on Adderall.

What are the Physical and Psychological Side Effects?

The side effects of Adderall discussed in medical literature include a loss of appetite, dry mouth, headache, anxiety, and irritability. An increase in brain activity directly correlates to an increase in blood pressure and pulse rate. Some of the less common side effects of Adderall include chest pain, shortness in breath, infection, and weakness. Side effects that could be viewed as "positive" include increased concentration and focus on day-to-day tasks, excitement, brain stimulation etc. A more complete list of all side effects can be found on the PubMed Health website (2011).

Adderall is indisputably one of the most frequently prescribed drugs for ADHD, and there have been up to twenty reported cases of death internationally (12 of which were sudden deaths) prompting Canada to suspend its sales of the drug as reported by many newspapers in 2005. Side effects associated with the drug range from minor headaches to heart attacks and even sudden death according to the US. National Library of Public Health (2010) website. Unprescribed and unmonitored dosage only worsens

these effects. The effects tend to trend towards more physical dysfunction with an increase in dosage, other medications used, or other existing medical conditions the subject may have as understood from "Full Prescribing Information" document from Shire Pharmaceuticals (2011).

Negative psychological effects – typically most prevalent in unregulated use of Adderall – include hallucination, and even psychosis with addiction and chronic abuse. In his article "College students take ADHD drugs for better grades," journalist Aaron Cooper (2011) reports some of the more common psychological sensations that some students on Adderall reported via an interview. These include being "driven", "in a good mood", and typically being able to better concentrate on work. Two professors from The University of Kentucky and Emory University were also cited in the same article, and they claim that students that participated in their studies reported to have achieved a feeling of euphoria, sharper concentration and "uppers," but they note that this is at the expense of desensitizing their brain, leading to future psychological problems.

Reported symptoms of overdose include high blood pressure, seizures, sweating, stomachaches, and panic attacks. In such cases, the patient requires immediate medical attention to avoid physical internal damage or even self-inflicted death. Another risky side effect of Adderall is drug addiction – the need of a subject to re-experience a sensation, thus abusing the drug multiple times. Continuous abuse of the drug may lead to desensitization of the neurotransmitters and neurons in the brain causing psychosis.

As explained in "Understanding Addiction" webpage of University of Texas (2011), Amphetamines and cocaine are two unique drugs that control the flow of dopamine release. Addiction has created a new level of psychological disorders in individuals who abuse Adderall. The affinity of Adderall to replace the chemical dopamine in the brain triggers an extended release, which desensitizes the neurons that read pleasure signals. Over time, the damage to the brain cells can cause prolonged hallucinations, delusions, and even psychosis.

What is ADHD?

Attention Deficit Hyperactivity Disorder (ADHD) is reported as the "most common neurobehavioral disorder of childhood. ADHD is also among the most prevalent chronic health conditions affecting school-aged children" (American Academy of Pediatrics, 2000, p. 1158). Individuals diagnosed with ADHD exhibit inattentiveness, lack of prolonged mental effort, motor and physical impulsivities, and hyperactivity symptoms such as fidgeting or twitching (National Center for Biotechnology Information [NCBI], 2011). There exists no standardized physiological manner of diagnosis for this behavioral disorder, rendering the condition easily mimicked by unaffected individuals.

Causes & Incidences

There exists no definitive evidence that explains the incidence of ADHD in children. Genetic and environmental factors are areas of current study for determining the causes for ADHD. Research from the National Institute of Mental Health (NIMH, 2011) has shown that children with ADHD who carry a particular version of a certain gene have brain tissue that is thinner in the area that influences attentiveness. As the individual progresses to adulthood, the brain returns to the correct level of thickness, resulting in improved symptoms. This may also explain why adults show better control over ADHD symptoms. Environmental factors show only potential links to ADHD causes. These links include cigarette smoking and alcohol use during pregnancy and the exposure to high levels of lead when the child is at a young age (NIMH, 2011).

As noted in the ADHD Harvard Health Letter (2004), "For now experts agree that there's no such thing as adult-onset ADHD" (p.1). If an adult were diagnosed with ADHD, the same symptoms of the disorder (inattention, impulsivity, hyperactivity) that are exhibited by the adult would also have been seen when the adult was a child.

Symptoms

According to the National Center for Biotechnology Information (NCBI, 2011), ADHD symptoms may be categorized into three groups: inattentiveness, hyperactivity, and impulsivity. Inattentive symptoms include failure of the individual to give close attention to details, inability to listen when spoken to directly, incapacity to finish schoolwork, chores, or other duties, is easily distracted and often forgetful, and willfully avoids tasks that require sustained mental effort. Hyperactivity symptoms consist of excessive talking, difficulty remaining quiet, fidgeting, and inappropriate running or climbing. Impulsivity symptoms include blurting out answers to questions prematurely, difficulty awaiting turn, and showing signs of willful intrusion or interruption.

Diagnosis

The American Academy of Pediatrics (2000) published a clinical practice guideline for the diagnosis and evaluation of children with ADHD. The first two of their six recommendations for diagnosis are

> 1) In a child 6 to 12 years old who presents with inattention, hyperactivity, impulsivity, academic underachievement, or behavior problems, primary care clinicians should initiate an evaluation for ADHD; 2) the diagnosis of ADHD requires that a child meet Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria. (p. 1160)

As mentioned in recommendation two, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria must be met. This manual lists the symptoms of inattention, impulsivity, and hyperactivity, and relates them to a specific diagnosis of ADHD. For example, the manual states that six or more of the inattention symptoms must be "present for at least six months to a point that is disruptive and inappropriate for developmental level." The manual then identifies three nominally explicit types of ADHD based on the symptoms met: combined type, predominately inattentive type, and predominantly hyperactive-impulsive type. Different combinations of symptoms are classified into these types of ADHD. For example, a predominantly hyperactive-impulsive diagnosis of ADHD would require that the hyperactivity and impulsivity symptoms be met for at least six months, but does not require that the inattention symptoms be present for six months. The predominately inattentive type, in contrast, requires that only the symptoms of inattention be met. Children with this type of ADHD are not overly active. The combined type is diagnosed in children that exhibit symptoms in all three dimensions. The next two guidelines from the American Academy of Pediatrics (2000) discuss from whom the child's symptoms of ADHD must be reported:

> 3) The assessment of ADHD requires evidence directly obtained from ADHD diagnosis based on parent, teacher, or caregiver reported behaviors as demonstrated by the child in question. Parents or caregivers will provide information regarding the core symptoms of ADHD in various settings, the age of onset, duration of symptoms, and degree of functional impairment (p.1163).

> 4) The assessment of ADHD requires evidence directly obtained from the classroom teacher (or other school professional) regarding the core symptoms of ADHD, duration of symptoms, degree of functional impairment, and associated conditions (p. 1165).

Because the guidelines for diagnosis cover children ages six to twelve, it is important that the child's symptoms be reported from the adults who are in contact with the child on a daily basis. As the guideline states, these adults include parents, classroom teachers, and caregivers.

The final two guidelines are as follows:

> 5) Evaluation of the child with ADHD should include assessment for associated (coexisting) conditions ; and 6) other diagnostic tests are not routinely indicated to establish the diagnosis of ADHD but may be used for the assessment of other coexisting conditions (p. 1166-1167).

Guidelines five and six are critical to prevent an improper diagnosis. Other conditions that child might have may imitate ADHD but not be discovered. Furthermore, when behavioral and drug therapy fail in a child diagnosed with ADHD, the child is reexamined for ADHD, along with other possible conditions that are related to ADHD.

There is no standardized physical test for ADHD, such as a blood test for declaring pregnancy. This fault results in false positive or false negative diagnoses, in addition to rendering the disorder easily imitated by unaffected individuals. This suggests it may be easy for college students to imitate ADHD symptoms and get Adderall prescriptions from their doctors, even at older ages. In an interview with psychiatrist Dr. Daniel Kirsch, he stated that if he sees a patient who displays the symptoms of ADHD (i.e., trouble focusing or lack of attention) and the patient asks for some medication to help, there is little he can do determine if the individual is lying. This type of a patient behavior may be the reason why ADHD medication, specifically Adderall, is so prevalent on the college campus (Dr. Daniel Kirsch, personal interview).

Treatment & Prognosis

According to the National Center of Biotechnology Information (NCBI), treatment for ADHD is a combination of behavioral and drug therapy. Between the health care provider, parents, and the affected child, it is important to outline appropriate target goals for treatment and begin medication and behavior therapy. Once the child has begun medication, regular check-ups are required to track results of the treatment and discuss possible side effects of the medication. If no positive results are seen, the health care provider should ensure the therapy plan is followed, re-diagnose the child if needed, and test for other medical conditions with similar symptoms.

Several medications are available for ADHD treatment. Common psychostimulant drugs prescribed for the disorder include Adderall, Focalin, Dexedrine, Destrostat, Vyvanse, Ritalin, Concerta, Metadate, and Daytrana. These drugs all carry a high potential of abuse, as they may all be habit-forming. Strattera, a non-stimulant drug, is also available which may be preferred over stimulants as it has carries a smaller potential for misuse. Strattera may also be prescribed to individuals with ADHD who also have a history of drug abuse, small tolerance for stimulants, or psychological disorders that may be exacerbated by

stimulant medication. Both stimulant and non-stimulant ADHD medications work to increase mental alertness and focus.

Behavioral therapy for ADHD patients is a system of rewards and consequences, taught by his or her parents, which influence child behavior: good behavior should be commended, while providing clear and constant rules. Schedule consistency is also important for parents of children with ADHD. Healthy diet and sufficient sleep is equally critical in treatment of ADHD.

ADHD is a long-term, chronic disorder. The condition is present still in adults, although less apparent as adults have greater ability to control their symptoms. If ADHD is not treated early, its associated symptoms may lead to alcohol and drug abuse, failure in school, inability to maintain employment, and trouble with the law (2011).

Adderall Abusers

Who is abusing Adderall?

Although few studies of Adderall abuse have been conducted in the general public, the majority of Adderall abuse studies focus on the college scene. Current research suggests that the primary group of Adderall abusers is the college-student population, that students who are 2nd 3rd and 4th year may abuse it more than first year students, and that fraternity members may have a higher level of abuse than other groups on campus.

Checton and Greene (2010) reviewed the increasing abuse of Adderall on college campuses by students, and classified the issue as a serious point of investigation for researchers and health experts (p.1).

In a recently conducted CBS news special on Adderall abuse (2010), Katie Couric interviewed Professor Alan DeSantis of the University of Kentucky. In this interview, DeSantis, stated that to the average college student, this drug, although illegal without prescription, is "fair game" (CBSNews, p.3). DeSantis' statistics for unprescribed Adderall usage at his university showed that approximately 34% of 2000 surveyed undergraduates had taken attention deficit drugs without a prescription (DeSantis, 2010, p.2). DeSantis also stated that for the juniors and seniors attending the university, this statistic increased to a dramatic 50 or 60% (DeSantis, 2010, p.2). DeSantis mentions that, "About four percent of our college campus has actual, legal prescription," for these medications (CBSNews, p.4).

From this interview, we speculate that an increase in Adderall use as a result of a class year increase may be attributed to the high-stress environments to which 2nd, 3rd, and 4th year students are exposed, along with a higher exposure to drugs and alcohol to which incoming freshmen may not be.

Some research also suggests there may be a correlation between being involved in Greek life and abusing prescription Adderall. DeSantis' survey analysis of fraternity and sorority houses revealed that 80% of the students in Greek organizations have used a study drug to perform better in classes (DeSantis, 2009, p.2). Whether or not the drug was prescribed was not investigated in this particular study. A study that supported DeSantis' conclusions was conducted by Professor Sussman (2006) at the University of Wisconsin, which reported that 13.3% of students living in a fraternity or sorority house had used Adderall non-medically, in comparison to 3.5%-4.5% students who were not affiliated with Greek life (p.2). This study showed that students living in fraternity or sorority houses used illicitly obtained Adderall anywhere

from up to three times as much as non-Greek students (p.3).

How do they obtain the drug?

Psychologist Garnier (2010) conducted a study of 484 full-time students attending a college in the mid-Atlantic region who had an Adderall prescription. This study quantified the number of students who diverted their prescriptions to other students at approximately 35.8% (p.1). In order to obtain this data, researchers collected personal survey data from students (ages 17-19). Each student underwent a screening survey, had a medical prescription for at least one drug and was given a paid incentive for completing the survey.

For a typical college student, Adderall can be obtained through several methods, which will be discussed below.

- Some students may fabricate ADHD symptoms in order to gain a prescription for the drug.
- Second, "compliance-gaining" strategies can be employed to obtain prescription drugs from friends.
- Third and less commonly than the former two methods, acquaintances attending the same university may be contacted to buy or get prescription drugs. Rarely drug dealers and strangers are employed with selling prescription drugs to college students.
- And only in some studies was it recorded that drugs could be obtained via a combination of online pharmacy stores and from foreign countries.

Abram Magomedov (2006) published an article on *The Exiled,* an e-journal website, detailing a method of fabricating ADHD symptoms to a doctor through a question and answer section (p.1). Magomedov is a frequent writer on the site, and offers advice to readers on how to become falsely diagnosed with ADHD in order to obtain an Adderall prescription. The method described is based on repeating keywords in the DSM-IV classification of ADHD in patient answers to questions asked by the doctor. With enough keywords included in responses, the doctor will be required by the DSM-IV manual to diagnose the patient with ADHD, regardless of whether or not they actually have the disorder. Hence, as all of this information is available publicly, we speculate that students have both the capability and resources available to fabricate symptoms of ADHD in order to obtain a legitimate prescription for Adderall.

Maria Checton and Kathryn Greene (2010) investigated, through a series of survey questions to 720 students at a large, northeastern university, the "compliance-gaining" methods students used to obtain prescription Adderall from peers. The survey was designed to determine how the students justified their requests for their friends' prescriptions, and whether or not they changed their justifications depending on whom they were asking for the prescription. More than a third of the survey respondents knew of friends from which they could obtain the drug (p.3).

This survey was designed to analyze whom users targeted (close friends, acquaintances) to get prescription Adderall; the respondents were given a hypothetical situation in which they needed to get

Adderall. The researchers approached the problem by constructing a 2x4 decision matrix for surveys, 2 (friends or acquaintances) and 4 (party, stay alert, get high, study) for respondents to select one of the above justifications for. Then, they were asked to rate from the following justifications, on a scale from 1-5 (unlikely to very likely) which justification they would most likely use.

- I would explain the reasons why I wanted the person to give me some Adderall or Ritalin (Rationality)
- I would promise to return the favor in the future (Promise)
- I'd put on my happy face and act particularly nice when trying to persuade him or her (Positive feelings)
- I'd suggest that we talk over some compromise and work something out (Compromise)
- I would appeal to the person by referring to the nature of our relationship as good friends/acquaintances (Referent appeal)
- Without going into any details, I'd simply ask "Will you give me some Adderall or Ritalin? (Direct request)
- I'd act sad, hurt, or dejected when influencing him/her to make him/her feel guilty (Negative feelings)
- I would threaten the person if s/he didn't go along with my request (Coercion)

(Checton, Greene, 2010, p.5, p.6)

The most likely-to-use justification was determined to be rationality, and the least likely justification was found to be coercion (p.8). The second most likely-to-use justification was promise, followed by positive feelings, direct request, or negative feelings (p.8-9). Respondent decisions for a specific justification were not changed whether they were approaching friends or acquaintances (Checton, Greene, 2010, p.7). These responses suggest that for this and other similarly conducted studies, students are comfortable with hypothetically obtaining prescription from their peers and acquaintances through friendly rationale and promise. Therefore, it can be surmised that the difficulty to obtain prescription drugs for these students is relatively low.

What are the primary reasons for illegally using prescription stimulant medications?

Checton and Greene also asked students about their motives for abuse. They report the following motives college students selected for abusing Adderall:

- Help focusing in class
- Studying for tests or exams
- Paying attention
- Getting high and partying
- Trying it for the first time (Under peer pressure)

(Cheton & Greene, 2010, p.3)

They report that the most common motive for illicit Adderall use among college students is to help with concentration and studying, and to increase alertness (p. 3).

The motives above can be classified into two groups: grade improvement and to get a sensational, recreational high. Alan DeSantis remarked in his interview that taking prescription Adderall before a party was a common thing, but a main reason for student Adderall abuse is the significant improvement in

grades. Professor DeSantis claimed that "43 percent of the interviewed students (through anonymous interviews) said they raised their grade by one full mark, and approximately that same percent (43) said raised their grade by two full marks," (CBSNews, p.3). Hence, from this particular study, the student-body consensus about Adderall is that it is a wonder study drug.

At Worcester Polytechnic Institute, we would predict strong motivators for Adderall use will most likely be academic reasons, such as studying or completing assignments. We wanted to know whether or not students here would have similar motives or use similar methods for getting Adderall, established in the literature reviewed above. Another important question to answer is whether or not abusers or users of Adderall have defining characteristics:

- Are they under or upper-classmen?
- Involvement in extracurricular activities?
- Do they abuse other substances in conjunction with Adderall?

Student knowledge of Adderall and its side effects was also a research question because accurate knowledge of these risks may help determine their willingness to take the drug or their attitudes towards abuse. Lastly, student opinions on the ethics of off-label Adderall use were investigated. In the previously reviewed studies, student knowledge and opinions on the ethics and effects of Adderall use were not addressed. Our project aims to obtain new data on both student knowledge and whether students (users, abusers or others) find off label use ethical.

Potential Methods for Studying Abuse

Survey Generation

For our project, a survey may be a good tool to collect a wide range of information from college students in regards to the awareness and abuse of Adderall. A survey helps develop insight about the characteristics, behaviors, and opinions of a particular population. Also, a survey allows surveyors to interpret and even project information about a desired sample of the population (Creech, 2007). The ability to generate and conduct an effective survey is an important step in doing so. Creech (2007) says researchers should consider the following when designing surveys: what types of questions to ask and how to structure those questions, how to get a good response rate, how to insure privacy and anonymity of the survey taker, and how to interpret the information once gathering is complete.

Types of questions

Survey question types and structure play a major role in producing unbiased, accurate, and relevant survey responses. Priscilla Salant and Don A. Dillman (1994) say there are four different types of structured questions (open-ended, closed-ended, ranked or ordinal, and matrix and rating types) and it is important to design the survey questions to ensure that the data and research questions will be analyzable. The two types of questions that seem relevant are: open-ended types, and closed-ended types (multiple choice, one answer, or multiple answers).

Open-ended questions allow the respondents to answer in their own words. This type of question is good for gathering information on attitude and feelings, likes and dislikes, memory recall, opinions, or

additional comments. The downside is that people may find it difficult to articulate their feelings, or even skip it because it takes too much time resulting in a larger skip rate and useless information for statistical evaluation (Brace, 2004, p.55-62). This indicated to us that we should limit our use of open-ended questions when possible on a written survey, especially if our survey becomes lengthy.

We are still interested in collecting information about attitudes; however, we would also like to ask open-ended questions somewhere else and not include them on the paper survey. This suggested to us that we could supplement surveys with another means of collecting more lengthy opinions and responses. This could be obtained by creating an online forum where students could sign in and decide which questions they would like to answer on their own time. See the "Open-ended Online Website" section in the methods chapter for more details.

According to Priscilla Salant and Don A. Dillman (1994), closed-ended questions are questions that have predesigned answers with a set number of choices. There may be either dichotomous questions (i.e. yes or no), or multichotomous questions, with more than just one answer choice available. A dichotomous question is the best for setting up a skip logic scenario (i.e. if you answered no to Question 18, please skip to question 21, etc.), consent form, or basic/general information gathering. These questions must offer all possible answers that are expected from the question. If the answers are not mutually exclusive, then the respondent will have a difficult time choosing their answer and could respond in a measurement or nonresponse error (Salant et. al, 1994). These types of questions may help us for setting up skip logic scenarios and to gather information on the following types of topics: acceptable use for non-prescribed users for recreational, social, or academic improvement, awareness of others on campus using the drug without a prescription, and general information gathering (extracurricular activities, grade point average, gender, class year, etc.).

Format

As mentioned before, structure and layout is very important when constructing an accurate survey. The sequence of questions should flow in an easy to answer to more thought and input type of sequence (Iarossi, 2006, p.74-78). The questions should motivate the respondent to reply and complete the survey; therefore, the survey should make sense in an orderly fashion and clear the responder of his/her doubts about the topics covered.

Easy and interesting questions should be placed at the beginning of the survey to spark the respondent's interest and confidence in the researchers and the topic in general. Question flow is equally important in the design of survey questions. Questions should not skip around to different topics; instead, the questions should remain grouped together by topic and in an understandable manner, keeping the particular survey structure in mind (Iarossi, 2006, p.74-78).

In our project, we want to gather information from those who legally use Adderall, those who use Adderall without a prescription, and those who do not have a prescription and have never used the drug. Therefore, we need to group our questions in this way and have respondents skip to the relevant sections.

Lastly, Iarossi (2006) suggests that sensitive questions should be asked towards the end of the survey; this will help ensure that the respondent has built up confidence and interest in the objective and integrity of the survey, p.74-78. These question types ask for personal information that is typically not shared with others (i.e. Have you ever taken Adderall without a prescription?) (Iarossi, 2006, p.74-78). In

our project, we are able to place the more sensitive questions last with respect to the skip logic set-up. In each section of the survey the questions begin easy and build up their sensitivity as it continues. It is very important to make sure respondents answer honestly and to the best of their ability because questions of this type may be the most valuable come time to analyze the obtained data, thus their location within the survey is critical. We would be interested in surveying the college campus through fraternities, sororities, first-year student and residence halls. The exact layout, question types, and content of our survey will be further discussed in the methods section.

Confidentiality

One of the most important facets of collecting data from sensitive surveys is ensuring privacy and confidentiality, which proved to be important in our survey especially because we are dealing with legal concerns. First, researchers must inform the respondents how their responses will be handled. This can be stated in the introduction or at the very beginning of survey distribution, which will put the respondents more at ease, and more confident in the surveys integrity (RampWeb, 2007). Privacy statements should at least detail what personal information is being collected, how the responses plan on being utilized, whether responses will be disclosed with anyone else, how respondents can access their responses, and how respondents can contact the researchers in charge. It is important to inform survey participants that their information will either be confidential, or tracked. The Institutional Review Board (IRB) has additional guidelines among these that need to be followed by the researchers. It is also necessary to explain why the survey is being conducted and how the information will be expressed in results. Whether or not participants will be able to access their information post-survey and edit any previously submitted information stands as another necessary factor for survey design.

Secondly, researchers should try to collect only the minimum amount of sensitive and personal information to achieve maximum response rate and ensure the respondent is confident in the integrity of the survey (Iarossi, 2006, p.74-78). In our survey, we may be able to limit the amount of sensitive questions by focusing the purpose of the study in one direction and on one topic instead of trying to obtain too much sensitive information that we would not be using in our analysis.

Lastly, researchers must be aware of their own privacy requirements, which are regulated by data privacy laws and regulations, as well as internal policies. The generated survey must comply with these requirements, and researchers are directly responsible for enforcing the policies—in our case the IRB. If the above practices are handled, the survey will have the greatest potential to be successful in its distribution, data analysis, and conclusion sharing (RampWeb, 2007). The methods section below will further describe how we went about ensuring confidentiality to ultimately gain approval from the IRB on campus to distribute our survey and that our procedures were correct.

Methods of Distribution

In addition to survey layout and question types asked, the ways in which surveys are administered to people may also alter response rates in higher and lower ways. According to Survey Monkey, researchers found the following distribution methods to be the most reliable in the following order (best to worse):

face-to-face: 80-85% good,
phone: 80% good,
classroom pager: 50+% good,

mail: 50% adequate—60-70% good to very good,
email: 40% average, 50-60% good to very good,
online: 30% average ("Organizing and Formatting Surveys", 2007).

More direct ways of administering surveys leads to a higher response rate, which is important to keep in mind when deciding the ways of survey administration. A "face-to-face" form of administration at WPI would allow us to collect data in an effective way, in regards to response rate. This may be because the better a researcher knows the respondent, the more likely the response rate will be higher, which is important in measuring effects, as previously discussed. Closeness and relationship to the respondent could even lead to another way of maximizing the response rate, which were also noted above, but it is important to remember to keep to an unbiased sample and follow confidentiality regulations and procedures approved by the IRB ("Organizing and Formatting Surveys", 2007). In other words, while knowing a respondent face-to-face and knowing this is the best way to obtain data, keeping association with their survey confidential is important and regulated by the IRB.

Choosing which ways to distribute a survey, whether it is online, through mail, phone, email, classroom paper, or face-to-face is important not only in determining response rate, but also in the researchers and respondents preference. There are many pros and cons to each distribution method and pros of online survey design and generation include being better at addressing sensitive issues, more cost efficient, faster delivery, endless design options, dynamic, ability to track, and randomization of answer choices. The online design seems to be at the same strength as a paper version, but as cons they include spam/privacy concerns, technical issues, multiple submissions per respondent, and no clarification available to for respondents questions or issues (i.e. people could ignore it or not logon). Even though they are sometimes seen as environmentally friendly, they do not serve the same purpose as other methods of distribution might (Yun et. al, 2000). Another way of collecting data is through convenience sampling (stopping people on the street or a campus to collect data) or volunteer sampling, where subjects volunteer to belong to the survey (but these types generally come along with biases). All in all, it is important to choose a way of administering and designing surveys that will work for the study's purpose and objective, which may rule some methods out and others into consideration (Yun et. al, 2000). The methods chapter will further discuss our decisions about distribution.

Statistical Analysis

According to Dhiman Bhadra (2011, lecture 1), being able to draw conclusions from survey answers and to relate the findings back to the population surveyed is where the knowledge of statistics is necessary.

Important Statistical Terms

There are several terms relevant to surveying: subject, population, sample, and variable, which we will define here. A subject is a unit on which observations or measurements are made to obtain data (Bhadra, 2011, lecture 2), typically a person. In our study, this will be the students surveyed. A population, in statistical terms, is a set of all subjects of interest—all the WPI undergraduates, in our case. A sample is a part of the population on which data is actually collected (Bhadra, 2011, lecture 2). For our study, we will gather a small sample size, targeting a few specific populations of students to answer our previously mentioned research goals.

According to Bhadra (2011) a variable is any varying characteristic that describes subjects in a statistical study. In our study, we will use variables such as age, gender, class year, extracurricular activities, and GPA to understand our sample. There are two main types of variables: quantitative, and categorical (Bhadra, 2011, lecture 2). A variable is quantitative if the observations have numerical value representing different sizes (Bhadra, 2011, lecture 2). An example of a quantitative variable in our study is the number of extracurricular activities a student does (i.e. 1, or 2+). A variable is categorical if each of its observations belongs to any one set of categories (Bhadra, 2011, lecture 2). We asked questions that were mostly categorical, such as age, GPA, class year, gender, etc. Abuser, user, and bystander subpopulations were categorized and some variables were compared across these groups.

As stated above, the variables we will be most interested in are class year, extracurricular activities, reasons for abuse, and Greek and non-Greek (fraternity/sorority) involvement of the three subpopulations previously identified. We want to look for correlations between those variables and of which subpopulation such students profiles belong to. We will also focus on calculating a few correlations that have already been established at other University's to compare results. We will gather more data of other variables than necessary, which will allow for others to analyze our results.

Graphical Summaries

Also according to Bhadra (2011, lecture 2) graphical summaries are one of the best ways to understand and summarize large data sets. It is a way to represent information and data pictorially. Categorical variables can be summarized in either a bar graph (which displays a vertical bar for each category and the height representing the percentage of observations in that category, such as age, gender, class year, etc.) or a pie chart (a circle with a "slice" representing each category, and the size of the slice represents the percentage of observations in that category). Bar graphs tend to be better when representing categories that are very similar in percentage, because slight differences in pie chart sections could be difficult to see (Bhadra, 2011, lecture 2).

Statistical Significance Analysis (p-value)

Significance levels show how likely a result is due to chance. From academic publications, the most common level used to determine if a result did not occur by chance is 0.95. In statistics, however, it is never shown as 0.95 or 95%, but as 0.05, meaning that the finding has a 5% likelihood of resulting from chance, where 0.05 is known statistically as the p-value (Bhadra, 2011, lecture 7). As we look for correlations, we will only do some simple testing for significance and will use 0.05 as our cut off point, but other tests are stricter and sometimes want a 0.01 or 99% finding.

In Microsoft Office Excel (2012) the TTEST function is used to calculate p-values, a function which uses multiple parameters. Two of these parameters are called "arrays," which are two sets of data to be compared from the same surveyed population. These parameters will be our variables of interest. The "tails" parameter in the TTEST function is used for what variable we believe is more significant (i.e. if tails = 1 we believe this corresponding array1 of data will be more significant, and if tails = 2 we believe this corresponding array2 is more significant), this is also sometimes called the hypothesis. Lastly, the "type" parameter specifies what type of t-test to preform (Microsoft Office Excel, 2012). We will be using type = 3 for all of our t-tests, which means that both arrays of data are independent of each other (the result of one does not affect the other, i.e. upperclass students who said they took Adderall without a prescription

will not affect the data we will have already have collected for first-year students who said they take Adderall without a prescription).

An example of how we would be interested in determining if there is a significant difference of Adderall abuse across different demographics will be discussed in steps below. Two columns of data, or arrays, would be organized in excel between upperclassmen and first-year students. Both arrays would be highlighted and entered into the TTEST function. Next, say we believe that the upperclass students are more likely to abuse Adderall (array1), then we would enter the number 1 as our tails. Then, we would substitute the number 3 in for type and interpret the outcome. As explained above, if the p-value was less than 0.05 the concluding result would then be significant, meaning there is a strong correlation between one variable—the class year of the student—and reported abuse of Adderall.

Content Analysis

Definition

Content analysis is "a research technique for the objective, systematic, and quantitative description of manifest content of communications" (Berelson, 1952, p.74). This research tool studies the conceptual content of media to arrive at an objective evaluation based on the "presence of words, concepts, themes, phrases, characters, or sentences," that occur within any form of communicative language (Busch et al.). Exemplary forms include "books, book chapters, essays, interviews, discussions, newspaper headlines and articles, historical documents, speeches, conversations, advertising, theater, or informal conversation," (2005). This type of analysis allows researchers to interpret, based on quantitative data, the themes present in the media in question.

Conceptual Content Analysis

Conceptual content analysis of a sample text or texts begins with the statement of a research question. The sample is then coded into appropriate content categories consisting of a single word, group of words, select phrases, or patterns found in the text. This coding reduces the sample into quantifiable data with respect to the pre-determined research questions.

Colorado State University (CSU) describes the methodology for conceptual content analysis into eight steps. The first step requires the researcher to determine the level of analysis required for the sample text, which then determines the coding categories. A researcher, for example, may only want to code for single words, groups of words, phrases, or combinations of the three. Next, it is important that the number of categories be developed before coding begins. If a pre-defined set of categories has been made before a text is analyzed, it allows for little flexibility when coding. If the researcher chooses to add categories as they become apparent in the sample, the entire sample text must be recoded to include this new category. This "coding flexibility allows new, important material to be incorporated into the coding process that could have significant bearings on one's results," (Busch, et al., 2005).

The third step involves the decision of coding for frequency or existence. If a text is coded for frequency, then it becomes important that a specific word or phrase is used multiple times throughout a text. If coding for existence, a word or phrase under one of the pre-determined categories that is found in the text would be counted only once, regardless if it appears several times elsewhere in the text. CSU also explains that a level of generalization must be chosen during the coding process. Given a sample text, the researcher must decide whether a concept must be coded exactly as it is found, or whether its other forms or synonyms may be allowed to be coded under the same category. For example, "expensive" and "economically challenging" may be coded under the same category, as determined by the analyst.

Steps five and six deal with the technical aspects of coding. For example, if it is decided that in one paragraph of the text, "expensive" and "economically challenging" would not be coded under the same category, then throughout the sample, the two must be kept in separate categories. These translation rules result in a coding process that is consistent. Irrelevant information must then be discarded. Typically, conjunction words like "and," "or," or "but" would be ignored as they do not help to quantify important concepts.

The final two steps are to code and analyze the text. Coding may be done manually or via software packages. In this project, sample sizes were small, so all coding was done manually. Once the coding process is complete for the media, interpretations based on quantitative data may be formed to complete the analysis (2005).

METHODOLOGY

Expert and Administrative Interviews

Expert and administrative interviews were conducted to obtain deeper insight into the administration's knowledge of abuse on campus, and to help shape research tools used in the project. Ms. Erica Tolles of the WPI Student Development and Counseling Center (SDCC) was interviewed to discuss current programs in place that might handle student prescription drug abuse and the methods used for counseling students in such cases. Tolles was asked what research, if any, had already been conducted at Worcester Polytechnic Institute on prescription drug abuse with specific emphasis on Adderall abuse. We explained the goals of the IQP to her, including the desire to raise awareness of Adderall abuse on campus and the creation of future studies on the abuse of prescription stimulants at WPI, using the data from this project. Tolles was contacted:

- To learn more about the previous research conducted on prescription drug use at WPI
- To learn whether or not the SDCC has a program implemented for prescription drug abuse
- To understand any important research objectives from her perspective

Dr. Arthur Heinricher, Dean of Undergraduate Studies at WPI, was contacted in order to further understand faculty awareness of Adderall Abuse on campus and for general advice on developing research tools for analyzing such abuse on the campus. Potential distribution methods for paper surveys were discussed, such as specific housing areas or locations on campus.

We also conducted an interview with Daniel Kirsch, a Clinical Associate Professor of Psychiatry (MD) at UMass Memorial Medical Center, in order to better understand an expert's opinion about off label use of prescription drugs. Dr. Kirsch is a doctor of psychiatry practicing at UMass Medical, who primarily works with college students. Our goals were to understand:

- How much of a health risk abusing Adderall was, from his expert opinion
- Whether or not he believes that the off-label use of Adderall is ethical
- Whether or not the current evaluation criteria for ADHD is sufficient for diagnosis

During the interview, the classification of Adderall as an addictive, schedule II narcotic was addressed.

Analysis of Forum Postings

We also studied two online forums in which individuals post their experiences and attitudes on Adderall abuse. We did so to complement what we found out in the Literature Review and to obtain more insight into individuals' reasons for use, experienced side effects, chosen route of administration, and methods of obtaining Adderall. Two sites were studied: Drugs-Forum.com and Student-Doctor.net. Drugs-Forum.com is an international, public website in which individuals create usernames with which they may begin, or add to threads on the forum via postings. To protect their identity, nearly all posters told stories about SWIM, an acronym for Someone Who Isn't Me. Drugs-Forums encourages their users to write all posts about SWIM in order to prevent legal issues when respondents discuss illegal drug use. The site is categorized by forums of different drugs, including "Amphetamine," "Cannabis," "Dissociatives," and "Ecstasy & MDMA." Within each forum exists a breakdown of topics related to the drug. The

Amphetamine forum, for example, is divided into four sub-forums: "Adderall," "Concerta & Ritalin," "Methamphetamine," and "Amphetamine Addiction." Within these sub-forums are threads in which a user will typically post a topic of personal interest or a question related to the sub-forum. Examples of threads within the Adderall sub-forum include "Potentiating Amphetamine," "Overdose," and "Experiences," among several others. To obtain a relevant and wide range of data, the "Adderall Experiences" thread was chosen, and forty-six posts from 2006 to 2011 were analyzed.

Each posting was analyzed for information pertaining to four categories: the users' methods for obtaining the drug, route of administration, reported side effects, and reasons for the drug use. After a complete reading of all posts, certain responses that contained irrelevant information to the analysis of the posts content were labeled "Not Applicable (N/A)" For example, postings that did not discuss Adderall use were not analyzed. Posts labeled (N/A) were completely discarded because they did not discuss Adderall at all and were posts that were submitted which interfered with the topic of the thread.

Coding

A single post was chosen as the unit of coding analysis. In coding for side effects, the letter "S" was used following a number. Each number represented a common side effect noted in the literature. For example, euphoria was listed as S16, and dry mouth was listed as S26. During the coding process, if side effects were included in an individual's post that were not previously listed in the interactive set, it was then added and all posted were reanalyzed for the side effect. This level of coding flexibility allowed for certain effects of the drug to be accounted for that were not originally listed in the interactive set. While analyzing a single post, each side effect was coded only for existence, while the entire thread was coded for side effect frequency. For example, if a user stated that he or she felt energetic while on Adderall, that post would be coded for this side effect once, regardless of the number of times this user discussed or listed this effect in the same post. Then, the number of times this side effect was reported across all posts, by all users, was determined. Thirty-four total side effects were included in the interactive set.

Table 1. Side Effect Coding Abbreviations. The table below lists all side effects mentioned in the forums with their respective abbreviations.

S1	Sleeplessness
S2	Excess Talking
S3	Increased Sociability
S4	Insensitivity to Pain
S5	Repetitive Behaviors
S6	Fitful sleeping
S7	Spotty Memory
S8	Increased Anger
S9	Increased Concentration & Focus
S10	Feeling on Top of the World
S11	Omnipotence
S12	Increased Motivation
S13	Lack of Appetite
S14	Energetic
S15	Calm
S16	Euphoria
S17	Nervousness
S18	Depressed
S19	Anxious
S20	Chills
S21	Hallucinations
S22	Sweats
S23	Decreased Penis Size
S24	Enhanced Music Appreciation
S25	Heightened Sense of Superiority
S26	Dry Mouth
S27	Psychosis
S28	Increased Urination
S29	Increased Happiness
S30	Muscle Soreness/Cramps
S31	Jaw Clenching
S32	Heightened State of Awareness
S33	Increased Confidence
S34	Headache

The same method of analysis was used to code for methods of obtaining the drug, route of administration, and reasons for use. However, if it was not explicitly stated how the drug was obtained, administered, or used, it was labeled as "Not explicit" (N/E).

Reasons for use were divided into four categories: academic reasons, boredom, recreational, or for ADHD treatment. The following chart further defines these categories.

Table 2. Reasons for Adderall use. The table below lists the reasons for Adderall use as mentioned in the forums, along with their definition and respective abbreviation.

U1	Academic	Studying for exams, increased focus in class, homework completetion, reading assigned texts for class
U2	Boredom	Refers to users taking Adderall during periods of boredom
U3	Recreational	Includes playing video games, going to parties, spending time with friends
U4	ADHD Treatment	Users who reported using prescribed Adderall as treatment for ADHD

Different routes of administration, including oral swallowing, parachuting, insufflation, or non-explicit statements were abbreviated ats RI, R2, R3, and R4, respectively. The following chart further describes these categories.

Table 3. Methods of Administration. The table below lists the methods of Adderall administration as mentioned in the forums, along with their definition and respective abbreviation.

R1	Oral Consumption	Users who take the pill orally, as suggested in medical literature
R2	Parachuting	Refers to crushing the pill in a small napkin, wrapping the crushed contents, and swallowing both the napkin and crushed pill together
R3	Insufflation	Refers to crushing the pill and snorting it nasally
R4	Not Explicit	Poster does not explicitly state how the drug was taken

Similarly, the following chart defines the methods by which users obtain Adderall:

Table 4. Obtaining Adderall. The table below lists in what manner Adderall was obtained as described in the forums along with their definition and respective abbreviation.

A1	Respondent has ADHD and doctor prescribed Adderall
A2	Respondent is prescribed Adderall, yet does not have ADHD
A3	Respondent is prescribed Adderall, but it is not stated he/she has ADHD
B1	Respondent found pills (in his/her car, for example)
C1	Respondent bought pills from someone who has a prescription
C2	Respondent obtained pills freely from someone who has a prescription
C3	Respondent bought pills from an unclear source (a stranger, for example)
D1	Not explicitly stated who pills were obtained

Posts that were written about SWIM were labeled as A, while those written in the first person were labeled as I.

Student Doctor.net

Forum postings on the Student Doctor.net were also examined. The Student Doctor Network is a public, international site similar to Drugs-Forum in which users begin threads by posting a topic of interest and other users respond to and comment on the topic. To determine opinions from the student medical community regarding the ethicality of off-label Adderall use , a thread asking other medical students' thoughts on Adderall abuse was chosen for analysis. A total of sixteen posts from 2011 were analyzed.

The methodology for analysis began in the same manner as Drugs-Forum: irrelevant information was discarded and not included in the analysis. Similarly, a single post was kept as the unit of analysis. After the first reading of all posts, the posts were placed under three labels according to the attitudes the writers had about Adderall use. The three labels are as follows:

Table 5. Categorizing Student Doctor.net Posts. The table below defines the three labels used for categorizing posts on the Student Doctor.net.

Positive	Explicitly stated off-label use was acceptable in some way
Negative	Indicated off-label Adderall use was unacceptable
Indifferent	Could be labeled as both a "positive" and "negative" post, but writer did not come to a final conclusion on his/her attitude toward Adderall use

Once the posts were categorized under the three labels, the reasons the posters provided for their opinions were studied, and common reasons were noted.

While these sites may or may not have included posts from WPI students specifically, they were analyzed for several reasons. One, the personal narratives regarding Adderall use and abuse helped educate the researchers about Adderall from a nonmedical literature source. Two, the topics discussed in the thread

helped shape the types of questions to be used in our survey, including questions about additional substance abuse, methods of obtaining the drug, and frequency of use. Finally, the study of forum websites helped us design our own open-ended site to gather personal narratives from WPI students regarding Adderall use.

Reliability Testing

A sample of fifteen posts (31.9% of total posts analyzed from Drugs-Forum, 93.8% from Student Doctor.net) from both websites was coded separately by all researchers. Then, the results from every researchers' analysis was discussed until a final conclusion was reached, The coding sheet was then refined and coding was negotiated after extensive discussion and comparison. One researcher used this information to code the remainder of postings.

Once coding by our research group was completed, a random sample of ten posts from Drugs-Forum.com was given to the advisor of the project, Dr. Higgins, to test for reliability. Reliability testing is important in content analysis to ensure that the original researcher conducting the analysis is evaluating the posts in a way that is replicable by another qualified researcher using the coding sheet. Reliability percentages were calculated for coding side effects, coding methods of obtaining Adderall, coding for methods of administration, and coding reasons for use. Reliability was calculated by dividing the number of agreements in each coding table by the total agreements possible. For example, in the side effects coding table, there are 34 possible side effects. With a sample of ten posts, this represents 340 possible agreements. If, when comparing our group's coding with Dr. Higgins', we had 310 agreements, this would represent 91.2% reliability. We hoped to get reliability of at least 90% in all categories.

Open-Ended Online Website

To obtain deeper insight into the Adderall use at Worcester Polytechnic Institute, information regarding the personal experiences of WPI students using or selling Adderall were sought out. In soliciting these experiences, we wanted information about how a student obtains the drug, personally administers the drug, reasons for using Adderall, and the physical and mental side effects associated with on- and off-label use. Additionally, for those students who do not have ADHD nor use Adderall, opinions and attitudes toward the drug were solicited. Due to the legal ramifications connected with Adderall abuse, it was vital for the researchers not to record personal, identifiable information about the student respondents. Therefore, a website in which students could privately post their personal Adderall experiences, while remaining completely anonymous, was constructed. This type of private response forum was created to compliment the forum analysis previously conducted on public forum sites.

Survey Monkey, a free online survey software and questionnaire tool, was used to construct the website in which users could anonymously post their Adderall experiences. A free account was set up at http://www.surveymonkey.com, using a generic project username. Survey Monkey allows users to design and tailor the survey to the needs of the researchers. The title of "Adderall Experiences" was chosen for the survey. A confidentiality consent agreement was placed on the front page of the website which preceded the questions. Users would click "yes" if they agreed to the terms of the survey. If a respondent clicked "no", he or she would still be able to submit a response, but their responses would not be analyzed. The following figure shows the agreement form portion of the survey and the subsequent open response forms:

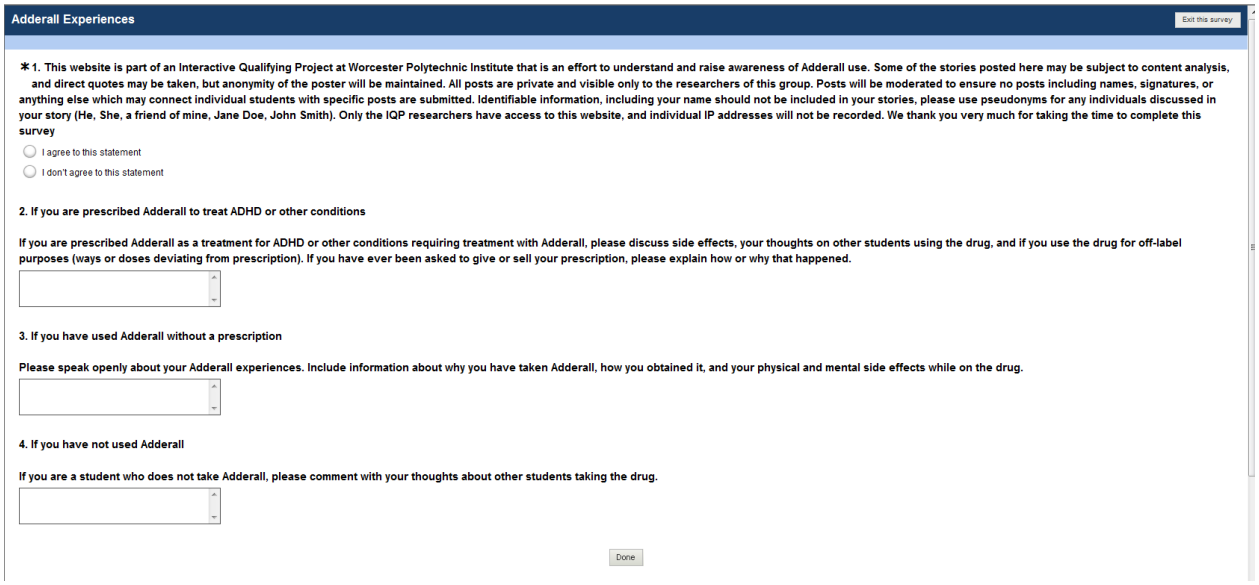

Figure 4. Screenshot of the Online Forum we created for WPI students. The figure above is a screenshot of the website used in this project.

Questions two, three, and four are included to classify respondents. Question two targets students who are prescribed Adderall users. Question three focuses on students who have used Adderall without a prescription. Question four targets students who do not take Adderall and asks the respondents to comment with their attitudes regarding other students using Adderall.

Survey Monkey generated a link to the survey once construction was complete. To prevent repeat respondents, the software allows only one user to post on the survey. If a poster who previously submitted a response to the survey revisited the site on the same computer, he or she would be automatically redirected to the "Thank You" page of Survey Monkey, a window that appears once a survey response has been submitted.

Responses to the survey were sent directly to the database of the project account, organized by date of post. Respondents' names, e-mail addresses, IP addresses, and any other identifying information were not recorded by the researchers, ensuring anonymity and confidentiality of the respondents' posts.

The link to this survey was sent out via the undergraduates@wpi.edu email alias, along with a brief description of this IQP and the purpose of the website. Additionally, to gather more responses, the details of this site were passed around by word-of-mouth to undergraduate students on campus. Collection of responses began on December 19, 2011 and was halted on January 1, 2012, at which time the site was removed from the public domain.

Because we did not expect to garner a great number of responses and because we were simply looking for confirmation of previous research studies we did not do systematic coding of these entries but simply pulled out interesting details to supplement or complement our discussion of the survey results.

Undergraduate Survey

As described previously in the literature review, question types and survey and question structure play a major role in producing unbiased, accurate, and relevant survey responses (Salant et. al, 1994). In the survey generated for this study, two types of structured questions were used: open-ended types, and closed-ended types (multiple choice, one answer, and multiple answer choices).

To gather information on the use of Adderall on campus, a paper survey was constructed for the study of undergraduate student Adderall use at Worcester Polytechnic Institute. The constructed survey attempted to answer the following research questions:

- What is the current extent of Adderall use on the WPI campus (Prescribed and unprescribed)?
- What is the students' current understanding of the psychological and physical effects of Adderall?
- What are the students' opinions of using Adderall to improve academic performance and for recreational purposes?
- What are student motives for on- and off-label Adderall use?
- Demographic Information: Gender, Age, Class Year, GPA, Major of Study, and Extracurricular Activities

The survey also classifies the respondent by determining if he or she has ADHD, was prescribed Adderall, was a student who uses the drug without a prescription, or was a student who did not take Adderall and was not diagnosed with ADHD. These three groups of respondents were labeled as prescribed user, abuser, and bystander, respectively. The survey directed each group of respondents to the appropriate section of the survey with questions tailored specifically to these groups.

Subsequent questions to the prescribed and unprescribed Adderall users were then asked about the frequency of Adderall use, consumption of other substances, and the details regarding the possibility of respondents giving and selling of their Adderall prescriptions to other students.

For students that illegally use Adderall, questions regarding their method of obtaining the drug, reasons for taking Adderall, frequency of use, and consumption of additional substances, are included on the survey.

Finally, for students that neither take Adderall nor are diagnosed with ADHD, were given questions asking their opinions on student Adderall abuse for aid in academic performance were asked. Included in the appendix are examples of the types of questions used in our survey.

Open-ended questions were used as part of the survey to obtain demographic information including the age and major area of study for the student. Another open-ended question was used to determine the level of knowledge students have about the side effects of Adderall. This acts as an awareness-type question. The survey contained a total number of three open-ended questions (numbers 2, 5, 7); the remaining were close-ended. As noted above, the full survey appears in the appendix.

The following table summarizes the correlations discussed above that will be included on the survey:

Table 6. Summary of correlations recorded through the survey.

Correlations Observed
Breakdown of respondent population into three groups.
Breakdown of surveyed population by class year.
Percentage of reported abusers who are first-year and upperclass students.
Percentage of reported abusers who are first-year and upperclass students.
Number of abusers who reported obtaining Adderall from five different suppliers.
Greek vs. non-greek survey respondents.
Reported abusers involved in Greek Life.
Level of extracurricular activity of reported abusers.
Level of extracurricular activity of reported non-abusers.
Number of reported abusers who admitted to taking various substances.
Number of reported users who admitted to taking various substances.
Number of people asking reported prescribed users for users' Adderall prescription.
Perceived acceptability of abusing Adderall for academic improvement.
Perceived acceptability of abusing Adderall in a recreational setting.

Survey Layout Considerations

Survey layout and structure were critical in constructing the survey. We followed design points suggested by the Division of Instructional Innovation and Assessment at the University of Texas at Austin, "Organizing and Formatting Surveys":

1. Make the survey visually appealing and user-friendly.
    a. By following #2, #3, #4, #6, and #7 of this list below.
2. Try not to use small fonts or fonts that are not easy to read. Some participants may have a difficult time reading small print.
    a. We use 11 pt font Times New Roman for readability.
3. To avoid clutter, use white space.
4. Ask only one question per line. If it makes sense you can place questions side by side.
5. Group similar question together or in the same area of the survey.
6. Ask interesting questions in the beginning of the survey to grab the participants' attention. This helps to stimulate interest.
7. Place demographic and/or sensitive questions at the end of the survey. If they are in the beginning, participants may opt out early.
8. Finally, test the survey before going live. A small sample of test respondents can help verify if your survey is working properly. This enables you to revise and edit questions and the survey design.

Once the design of the survey was complete, we self-tested it. This helped us estimate the time necessary to complete the survey, and to also determine the quality of the survey content. The checklist of concerns regarding the survey layout, question flow, and design were the following (taken from: Iarossi, 2006, 30-44):

- Do the respondents understand the survey's objective?
- Do the respondents feel comfortable answering the questions?

- Is the wording of the survey clear?
- Is the time reference clear to the respondents?
- Are the answer choices compatible with the respondents' experience in the matter?
- Do any of the items require the respondent to think too long or hard before responding? Which ones?
- Which items produce irritation, embarrassment, or confusion?
- Do any of the questions generate response bias? Which ones?
- Do the answers collected reflect what you want in regards to the purpose of the survey?
- Is there enough diversity in the answers received?
- Is the survey too long?
- According to your test audience, have any other important issues been overlooked?

Determining the target population, question types to use, and survey layout were critical considerations when designing for an effective study. It was important to be confident in the survey as the makers of it, and to be sure all of the respondents were confident in answering each of the question. Through conducting this process, we found that there was no need to revise or reorganize the survey, but we did reorganize it many times before self-testing.

Survey Data Analysis

The coding sheet used in the section "Analysis of Forum Posting" was consolidated based on similarity between effects to make coding of the open-ended survey question more manageable. Similar to the methods listed in the previous coding section, two researchers analyzed the open-ended question on our survey (Question 6) regarding the subject's knowledge of the side effects of Adderall in order to ensure reliability. The collapsed coding sheet (as shown below) with nineteen side effects was utilized to record the results of the survey data. Upon data collection from the two researchers individually, reliability was calculated based on methods explained in the "Reliability Testing" section.

Table 7. **Positive side effects of Adderall use, for coding analysis.**

Positive
S1 Increased Sociability
S2 Increased concentration, focus, energy
S3 Omnipotence
S4 Calm
S5 Euphoria
S6 Enhanced Music Appreciation
NR No Response

Table 8. **Negative side effects of Adderall use, for coding analysis.**

Negative
S7 Forgetfulness
S8 Increased Anger
S9 Repetative Behaviors
S10 Fitful Sleeping/Sleeplessness
S11 Lack of Appetite
S12 Nervousness/Anxiety
S13 Depression
S14 Chills/Sweats
S15 Hallucinations/Psychosis
S16 Dry Mouth
S17 Increased urination
S18 Physical Body Damage
S19 Addiction

RESULTS & ANALYSIS

Expert Interviews

Erica Tolles

Ms. Tolles stated that the last study on prescription stimulants at WPI was performed in 2004; however the data for that study was lost (when the SDCC moved buildings). Because of this lack of information on off-label drug use at WPI, the administration has no data on use or abuse, and no programs are available for prescription stimulant abuse education.

Tolles said that although faculty members on the WPI Alcohol and Other Drug (AOD) Task Force were generally aware of Adderall abuse on campus, the findings of this project would be directly relevant to the goals of the group and increase members' knowledge. Additional communications and meetings were made in order to accomplish this goal.

Important research objectives that were discussed were the time of completion of the project and whether or not the data collected would be available for members of the SDCC for use. It was determined that the project would be completed by C-term of 2012, including data analysis. Second, it was clarified that all survey data collected be made public information, including future IQP groups, for analysis and use (Erica Tolles, personal communication, September 20, 2011).

Arthur Heinricher

During the interview, Heinricher recommended that the primary method of data collection should be paper surveys. The reasoning behind this decision was that in discussion with Dean Heinricher on the subject of previous IQP surveys, sending an online survey out to the undergraduate class mailing alias did not return favorable numbers of responses. Dean Heinricher provided us with the e-mail addresses for scheduling appointments with both residential services and health services. It was discovered that the faculty, to Dean Heinricher's knowledge, was not very educated on prescription stimulant abuse, specifically, the abuse of Adderall. It was also learned that only one e-mail may be sent to the 'undergraduate@wpi.edu' mailing list per IQP (Arthur Heinricher, personal communication, September 20, 2011).

Daniel Kirsch

Dr. Kirsch was interviewed for his expert opinion on writing prescriptions for Adderall, his medical opinions on abuse of the drug, and his current analysis of systems in place to properly give prescriptions to those patients without ADHD. "I feel I see more students [about prescriptions] every year," remarked Kirsch, after being asked about the prescriptions he has written this year. This both indicated his concern for the increase in students coming to his practice for prescription Adderall and confirmed that some adult students seek prescriptions well after childhood, even though the medical experts suggest that adult-onset-ADHD is rare. Kirsch stated that if a patient meets the criteria of ADHD through his appointment, he would likely prescribe them with Adderall.

Kirsch noted several advantages of prescribing Adderall, including increased brain function, attentiveness, and awareness. Negative side effects included minor symptoms such as headaches, loss of appetite, and diarrhea, which are defined as temporary and short-term. He stated that these side effects generally dissipate with continue use of Adderall as prescribed. When questioned on whether or not there were long-term side effects, Kirsch remarked that in rare, extreme cases, psychosis was a side effect, but the data regarding this was "sketchy." This discussion with him on side effects was surprising because medical literature lists several more negative side effects that arise from Adderall use. However, remembering that he also stated these negative symptoms dissipate quickly, it was implied that the positive side effects supersede the negative ones.

The opinions of Dr. Kirsch do not speak for the entire medical community, and there is a certain possibility of varying opinions among medical experts who diagnose and treat patients with ADHD. Kirsch mentioned during the interview that he tries to only prescribe patients with stimulant treatment if absolutely necessary, which leads to the assumption that other doctors may be more lenient on writing prescriptions for patients.

When questioned about systems for diagnosis of ADHD, Kirsch stated that the current criteria for diagnosis in the DSM-IV manual were both outdated and inefficient in proper ADHD diagnosis. Kirsch stated that the DSM-IV only gives him a small "speed-bump" between the student and writing them a prescription. However, Kirsch reported that a two-day, extensive neuropsychological test was available, although it was not practical because of its expense. This neuropsychological test is being developed because psychologists need a more accurate method of determining whether or not an individual has ADHD, and may become available for practical use in the future. He stated that it is definitely possible that students fake ADHD symptoms in hopes of obtaining a prescription, but he said that he is not able to deny a patient a prescription because he thinks the patient is lying.

Although this brief interview with one doctor can in no way be a generalization of the medical community responsible for prescribing patients with Adderall and its generics, the following questions can be raised:

- Is there variation between what thresholds certain doctors have for writing prescriptions to patients?
- Is there any way to legally, practically, and cost-efficiently determine whether or not a patient is fabricating symptoms of ADHD for prescription drugs?

(Daniel Kirsch, personal communication, November 28, 2011)

Analysis of Online Drug Forums

Drugs-Forum.com

Side Effects

In coding the online postings from Drugs-Forum.com, we discovered that posters' most frequently reported side effect was increased sociability. Adderall is prescribed to elevate dopamine levels in individuals with ADHD, and thus increase concentration and mental focus, but the more apparent side effects are increased sociability and sleeplessness. Of the forty-seven posts analyzed, nearly 50% reported

feelings of increased sociability and talkativeness while on Adderall. 34.0% reported feelings of sleeplessness, and only 27.6% stated an increase in concentration and mental focus. This result is interesting to note in that increased sociability is not a side effect of the drug discussed in medical literature, and only 27.6% of the posters stated they felt the intended effect of the drug, increased concentration. The following quotes from users while on the drug describe the increased sociability effect:

"SWIM also is much more social and talkative when he takes it."
howlongisthenight 12/08/2006

"Took it at 10:00 stayed up all night talking and talking and talking and talking"
juanathan 01/10/2008

"SWIM became slightly more talkative"
ro3bot 02/29/2008

"I notice that I am extremely communicative"
kckool 03/12/2008

> I became the sociable person I used to be. When I picked up my friend, who I was not close to at all and normally just gave her money and then she would come back later with my drugs, I ended up going in the car with her and actually enjoying talking to her.
> lexi21 11/04/2008

These results may also help explain reasons the drug is abused recreationally: its effects may ease anxious social situations, aid in the social aspects of parties or gathering of friends, or facilitate conversation between people that would otherwise not occur if not on Adderall.

Other side effects reported by various users that also are not listed in medical literature include jaw clenching, decreased penis size, and increased anger, among several others.

The following graph displays the frequency of the side effects reported in the thread:

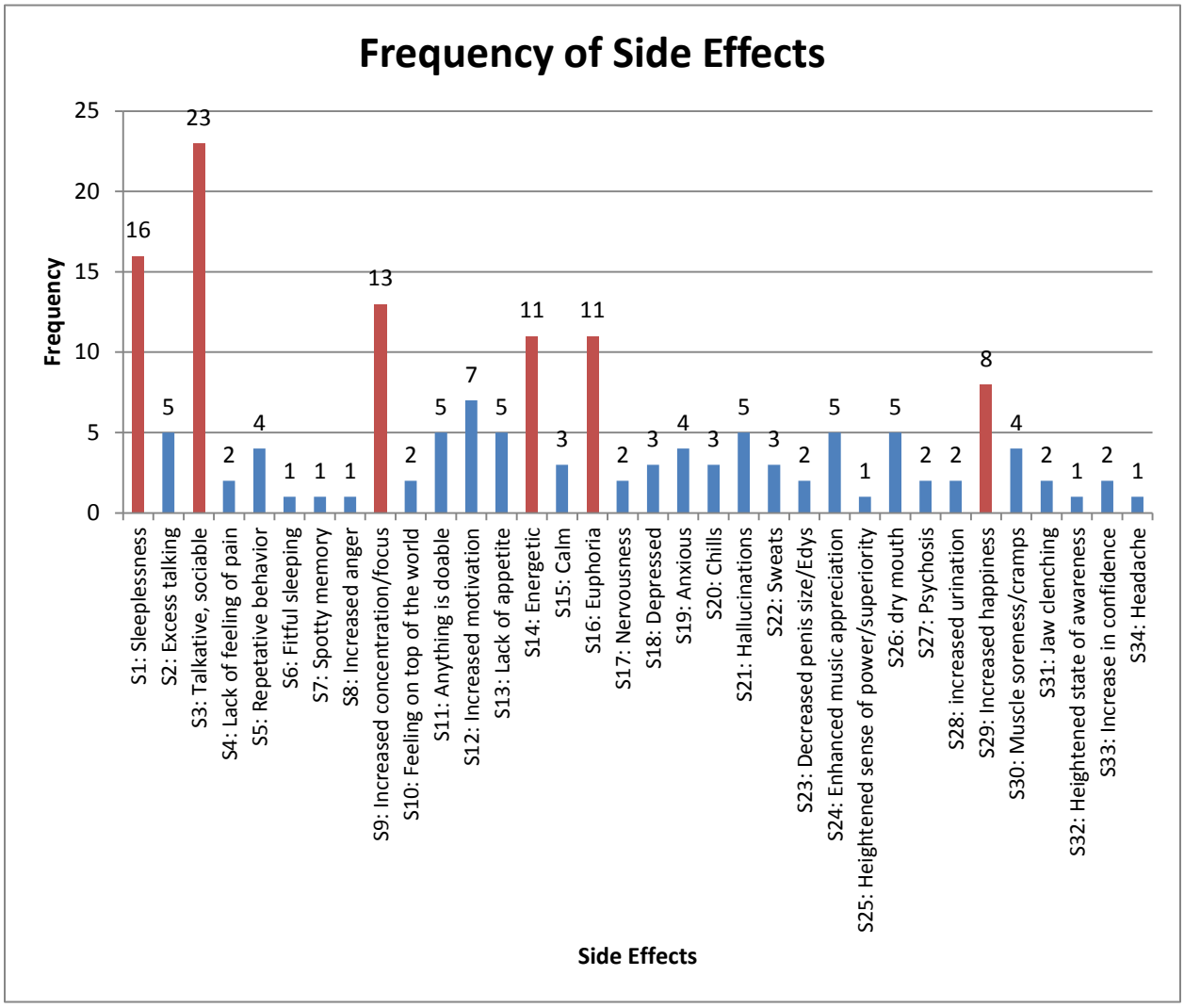

Figure 5. Frequency of Side Effects as Discussed by Members of an Online Forum on Adderall Experiences. Highlighted in red are the most frequent side effects based on the number of times reported in the thread. Ranging from most frequent to least are: increased sociability, sleeplessness, increased concentration and focus, energetic, euphoria, and increased happiness.

Several of the most frequent side effects posted are typical reasons why students may employ Adderall, according to previous literature. Increased focus and energy lends well to long study sessions. For those who use it recreationally, the increased sociability, euphoria, and happiness could aid in social situations. Negatively perceived side effects (i.e., depression or muscle cramps) were the least frequently reported side effects as opposed to positively perceived effects (i.e., increased focus and concentration). This may suggest why Adderall is perceived to be a wonder drug to students. Any other side effects discussed in other sources of Adderall literature that do not appear in the graph above were not reported in any of the posts. While research in the Literature Review suggests that studying is a prime motivator for Adderall use by students, this site suggests reasons of mood enhancement and sociability could be other motivators for Adderall use.

Abuse by Prescribed Users

It is evident from the postings that individuals prescribed Adderall who admit to having ADHD still abuse the drug. Of the five users that reported having ADHD, four of them displayed signs of abuse in their postings. For example, user RadicalMexican wrote a post describing the events of an overdose he experienced in his teenage years. When he was thirteen he was prescribed 10mg Adderall IR, twice daily. Because he was the target of bullying at his school, he frequently feigned sickness to stay at home and skip school. In one of his efforts, he explained that he ingested several Adderall pills, more than he could remember. He eventually went into a psychosis, was brought to the hospital, and treated for overdose via active charcoal and an intravenous sedative. Quotes from the post describe the psychosis:

> Then i saw spiders on my floor and i hate spiders and when i looked right at the floor the brown long legged spiders weren't there...Then suddenly out of no where, BUGS ALL OVER THE FLOOR AND WALLS EVERYWHERE! All different types of bugs and spiders, all white, crawling and moving everywhere and it seemed like i had super hearing because all i could hear was them moving, not my dad screaming what's wrong, nothing. I can say confidently that that very moment was the scariest moment and the greatest moment of terror in my whole life.
>
> RadicalMexican, 04/08/2008

The interview with Dr. Kirsch informed us that data supporting psychosis resulting from an amphetamine overdose is almost nonexistent. He stated that a psychotic fit may be triggered by an Adderall overdose, but may actually be due to an underlying mental disorder such as schizophrenia (Kirsch, personal interview). This personal experience narrative cannot tell us whether the described event was due to the drug alone or to some underlying disorder, such as schizophrenia, however if it is true it suggests that psychosis episodes may in fact occur due to overdose. Doctors may have very different beliefs about the dangers of the drug. Those who do not recognize its dangers may not be as concerned about falsely diagnosing and prescribing. This, coupled with those who mimic symptoms of ADHD, might explain how college students find it so easy to get the drug.

Another user, Slowlikehoney, describes her abuse of Adderall from a recreational standpoint. She writes that she was diagnosed for ADD and prescribed 30mg Adderall XR, yet took the drug for extra-academic purposes:

> Over spring break, i obviously had no classes to go to or homework to do, but i popped some anyway. i cleaned my car SO well, had the most enjoyable 2 hour drive of my life, and was cured of my social anxiety at the first party i went to on addie. i never thought i could be such the social butterfly, it felt really nice
>
> Slowlikehoney 3/25/2009

Slowlikehoney also includes her abuse of Adderall for academic purposes. She writes that she continued taking the pills one night, past the prescribed limit in order to finish her homework. After 45mg of Adderall, she felt a weakness in her legs and experienced two to three seconds of no heartbeat. Her fears are summarized in this short quote:

> “i pretty much assumed i would die that night.”
>
> Slowlikehoney 3/25/2009

Despite this fearful episode, Slowlikehoney ends her post with stating she snorted a 25mg Adderall XR pill while writing the post in order to write an essay for school.
These two posts suggest that Adderall abuse may take place both among users who do not have ADHD and those who are diagnosed with the disorder and prescribed the drug.

The graph below summarizes the different reasons the posters reported abuse and use of Adderall:

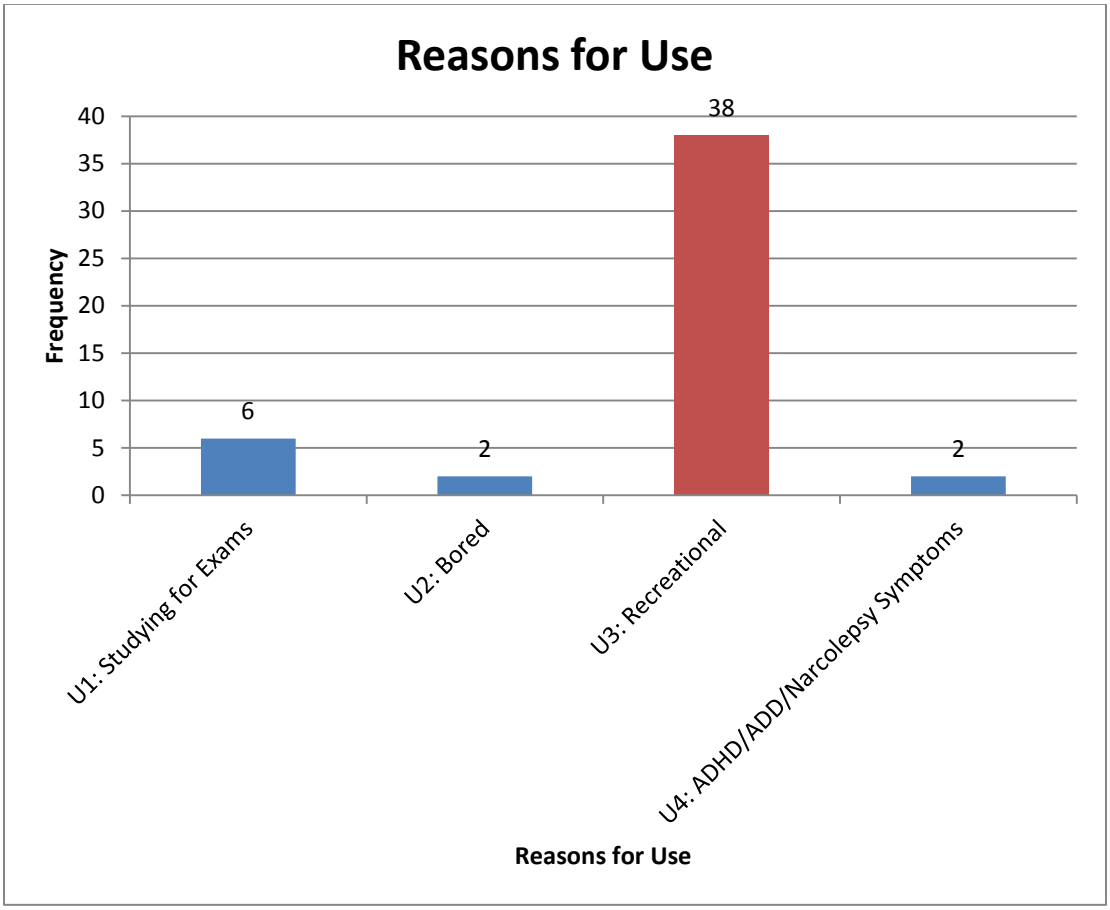

Figure 6. Reasons for Adderall Use Cited in the Online Forum. The graph depicts the different reasons for Adderall use and the frequency in which they were reported in the thread.

Highlighted in red is the column depicting the frequency of recreational users. 80.8% of all posters in the thread use the drug recreationally. 12.7% users stated that they employ Adderall as a study aid, 4.2% use the drug to cure boredom, and another 4.2% use the drug to treat their symptoms of ADHD and ADD.

Recreational use was coded rather liberally in this analysis. Posters who stated they used the drug to improve mood or aid with increasing sociability were interpreted as recreational users. Such motivators for Adderall use could, in further studies, be refined into more strict coding categories. Previous literature researched here did not discuss that the possible factors for students' Adderall use could be feelings of stress, unhappiness, or social ineptness. These factors could be important motivators for Adderall use and should be studied in the future.

Employment of Adderall as Study Aid

As discussed in the Literature Review and briefly mentioned above, Adderall is prescribed to elevate dopamine levels in the brain to increase concentration and focus with individuals who have ADHD. Its ability to heighten concentration and increase focus makes Adderall attractive to students who use the drug for academic purposes. Of the six users in the forum who reported using the drug for academic reasons (studying for final exams, writing papers, reading, or homework) only one user stated she actually had a valid prescription for the drug, yet even still abused it. Posters who use the drug for academic purposes represent 12.7% of the thread population. This group may be tell us something about the student population who abuse Adderall. Quotes from these posters describe the drug as a study aid:

"Finals was next week so he thought "oh goody A's in everything….now I can work like crazy…after all this he got a lot of work done"."

Ranke 6/14/06

> Swim first experience was in college…He was trying to stay up to study for an exam. A friend offered a 15mg pill and he took the offer. He took it and felt on top of the world. He studied for 17 hours straight skipping all his other classes for the exam. Now he doesn't study without it.
>
> Boomx2brian 6/12/2006

> I had a massive amount of work to do last night, and decided to ask a friend of mine with an adderall prescription if I could have some of his. At 6:30 PM the pill was consumed. I realize that I have a 25 page paper to write today and tomorrow, and have not started the reading. I am very confident that I will complete it without a problem, and that the work will be excellent 7:30am: 10 pages of my paper are complete and I have a detailed outline for the next 15. I consider going to bed, then realize I am not tired at all. I simultaneously realize that I have been up for nearly 24 hours and feel absolutely no fatigue.
>
> Rise-against 4/18/2009

These few pieces from threads illustrate the employment of Adderall as a study aid, and even the dangers that are incurred from use. In boomx2brian's post, he stated that SWIM does not study anymore without Adderall. This statement may suggest addiction as Adderall has such a high abuse potential. Moreover, in the last quote, Rise-against writes that he had been up for twenty-four hours, feeling no fatigue, a dangerous side effect. Adderall, here, is summarized as a drug that pushes its users beyond their normal limits.

Methods of Obtaining the Drug

Posters reported several methods for obtaining Adderall, including finding pills, being prescribed the drug, purchasing pills, or being given the pills freely. The majority of the posters (24 out of 48) did not report how they got obtained the drug.

Method of Administration

Posters also reported several methods for administering Adderall, including insufflation, "parachuting", and oral swallowing. "Parachuting" is a colloquial term which involves the pulverizing of

pills into a powder form, then transferring this powder into a small napkin or tissue, and swallowing the couple together. The majority of the posters were not explicit in how they administered the drug. Twelve posters reported swallowing the drug, ten insufflated Adderall, and two parachuted the crushed pills.

Reliability Results

Reliability was tested to ensure coding similarities among researchers. The following reliability percentages were obtained:

Table 9. Reliability testing results from posts on Drugs-Forum.com

Methods of Obtaining	100%
Reasons for Use	95%
Methods of Administration	95%
Side Effects	95%

While reliability percentages were in the acceptable range (>90%) Dr. Higgins suggested that certain coding categories be collapsed because they have essentially the same meaning. For example, in the side effects coding table, "Increased Happiness" and "Euphoria" were kept as two separate categories. For further simplification, it may be worth, in the future, to collapse these into one category.

Student-Doctor Network

Posts from the Student Doctor Network were analyzed for the attitudes and opinions provided in the posts. Posters were separated into three categories, those with positive, those with negative, and those with indifferent opinions toward Adderall use. Opinions and attitudes were grouped to determine if there exist common thoughts on Adderall use.

Negative posters either noted the illegality of off label use of the drug, noted problems when people took it without medical authorization, and/or mentioned the ethical problems (i.e., cheating) with using this drug The first poster in the thread shows his blatant disgust for the use of Adderall without medical authorization. He notes that when medical students themselves abuse the drug, it is unethical for those same students to be responsible for prescribing it to others.

> Am I the only one that is shocked and disgusted that people abuse substances like Adderall and Ritalin to be able to study for a cupple of hours!? Seriously, if you can't study without using amphetamins you do not have anything to do in whatever you are studying? If you have a prescription, I see nothing wrong with using it. Its just the ethical aspect of drug abuse when you will have the responsibility to prescribe drugs later that is shocking imo.
>
> Member 215329 12/07/09

Another poster supports the original post:

"Really surprised to see the number of medical students advocating the use of prescription drugs without medical supervision or indication."

Member 176940 12/9/2009

The first post suggests that using Adderall illegally constitutes cheating and presents an ethical conflict of interest for doctors who abuse the drug when they later will have to prescribe it, while the second post suggests its use by individuals without ADHD is a professional lapse for the doctor prescribing the drug. However, these two quotations show a negative attitude toward off-label Adderall use. These posters suggest that there exists an ethical routine for prescribing Adderall. It may be interesting to research the differing views and ethical protocols among doctors who prescribe Adderall.

Positive posters likened Adderall's stimulating effects to energy drinks and coffee, and stated that if it helps studying and increases concentration, it should be acceptable to use it, regardless of an ADHD diagnosis requirement. In the following post, user Carpe Noctem explicitly states he condones the use of drugs that help increase productivity.

> Here is a bottom line: ANYTHING that can make you a better student is great. Last time I checked, as a civilization, becoming more hardworking or "smarter" is never a problem. This is not sports where you're taking steroids to build muscle mass. So I absolutely condone the usage of any drug that does not harm the brain but increases productivity. Get over it.
>
> Member Carpe Noctem 12/07/09

This post was coded as positive because it supports the use of Adderall for off-label purposes, in this case studying. His attitude may be representative of those held by students who use the drug for aiding in academics. The writer also does not include any possible health risks to taking the drug when not prescribed. However, the poster implies that Adderall does not harm the brain, yet previously coded posts from other websites included narratives of psychotic episodes and hallucinations, suggesting that it does harm the brain.

The following post is another example of a user who condones its use for studying:

"I do agree on the part of people abusing adderall or Ritalin to get ahead and stay up late to study. I currently take it because I need it to focus. It doesnt make me lazy or stupid person."

Member 289010 12/07/2009

Other writers carried an indifferent attitude in their posts, citing both positive and negative effects of the drug, but not arriving at a concise conclusion on the topic. An example of this attitude is shown in the quotation below:

> Adderall is a low level stimulant. It can be very dangerous if abused in high doses and it has its pitfalls. But if someone wants to tweak out for 36 hours before an exam, they can go right ahead and do it as far as I'm concerned. It sounds miserable and will most likely catch up to them eventually.
>
> Member 192733 12/07/09

> Adderall helps and is prescribed to help people concentrate so a lot of students take it to help them concentrate. And if you look at the low threshold one has to pass to get most any ADD/anxiety/SSRI medications, you'd realize that the distinction between having a prescription vs. not having a prescription is negligible and doesn't necessarily constitute abuse.
>
> Member 192733 12/07/09

Both writers touch on the positive and negative points *together in a single post* of off-label Adderall use, but do not provide further personal sentiments on the topic. Both negative and indifferent posters underplay the risks of taking Adderall without a prescription. The writers of these posts are, assumingly, medical students. Knowing that these posters who advocate off-label use are future doctors, it leads us to believe that students with no medical background may not be educated on these harmful effects.

All posts show a range of attitudes on the topic of Adderall. For those medical students who showed a more liberal attitude regarding off-label Adderall use, we wish to know if these views will be kept when the same students become established doctors. And learn more about its effects and about the medical ethics of prescribing too liberally. This ambivalence about prescribing the drug in these students may suggest the same liberal attitude in doctors who actually prescribe the drug. This attitude among doctors prescribing the drug could suggest a lack of educating their patients on what Adderall is and why it can be dangerous.

Because we saw variability in the opinions, attitudes, and knowledge about Adderall abuse even in medical students, we thought it even more important to get information on WPI students' views and knowledge on the topic.

Analysis of Survey Data of the WPI Undergraduate Population

Demographics of Surveyed Population

This project successfully surveyed a total of 414 respondents. Of the surveyed population, 39% (162) were first-year students, 26% (110) were sophomores, 17% (69) were juniors, and 18% (73) were seniors. Sophomores, juniors, and seniors were grouped as upperclass students, representing 61% of the surveyed population. Question 1 and Question 3 on the survey (refer to Appendix, p. 87) allowed us to compare abuse across these populations. A significantly higher percentage of the upperclass students reported abusing Adderall than the percentage of first year students (p-value, 0.0000024). Only four (2.5%) of first-year students reported abusing Adderall, while 19% (48) upperclass students reported abusing the drug. Additionally, first-year abusers represent 8% of the total who reported abuse across all populations, while upperclass-students represent 92% of those who reported abusing. Figures 1 and 2 below represent the total student population surveyed, and the breakdown of abusers:

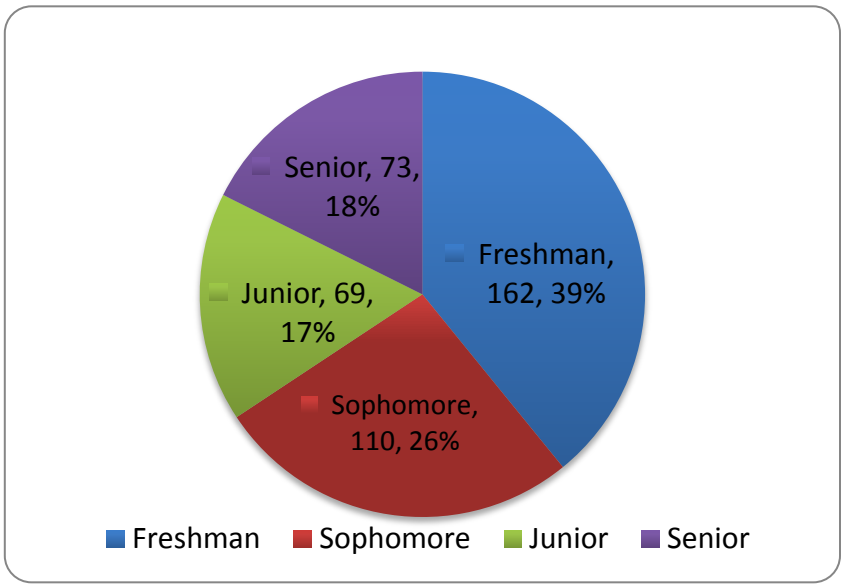

Figure 7. Breakdown of Surveyed Population by Class Year.

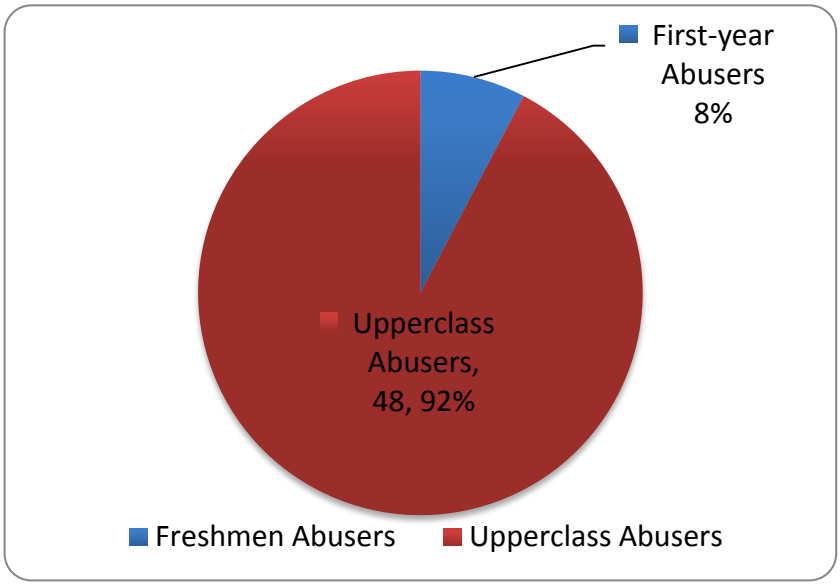

Figure 8. Percentage of Reported Abusers who are First-Year and Upperclass Students.

This finding at WPI is consistent with DeSantis' survey of students at the University of Kentucky, which indicated that reported abuse in the junior and senior student population is 16% higher than the reported abuse by first-year students. In this our study, there was a 16.5% increase in reported Adderall abuse from first-year to upperclass students.

We speculate that an increase in reported Adderall abuse with the transition of first-year students into the second, third, and fourth years may be attributed to a harsher workload required of upperclass students, tempting them to resort to stimulants to cope with such work. Additionally, first-year students simply may not be exposed to such a drug upon entering the college atmosphere. It is likely they are

learning about Adderall from other students. This situation may be likened to alcohol use, in that alcohol abuse increases drastically from entering first-year students to upperclass students.

Percentage of Surveyed Students who Reported Using and Abusing Adderall

Questions 11, 12, and 13 (refer to Appendix, p. 87) allowed us to identify three groups of students. Students who answered yes to Questions 11 and 12 were classified as prescribed "Users". Students who answered yes to only Question 13 were classified as "Abusers" because they reported off-label Adderall use. Students who answered no to all three questions were defined as "Bystanders," as these students stated they do not take Adderall, nor are they prescribed the drug. There are approximately three times as many reported student abusers of Adderall as there are reported prescribed Adderall users. The chart below shows the percentage of student respondents who fell into the three groups.

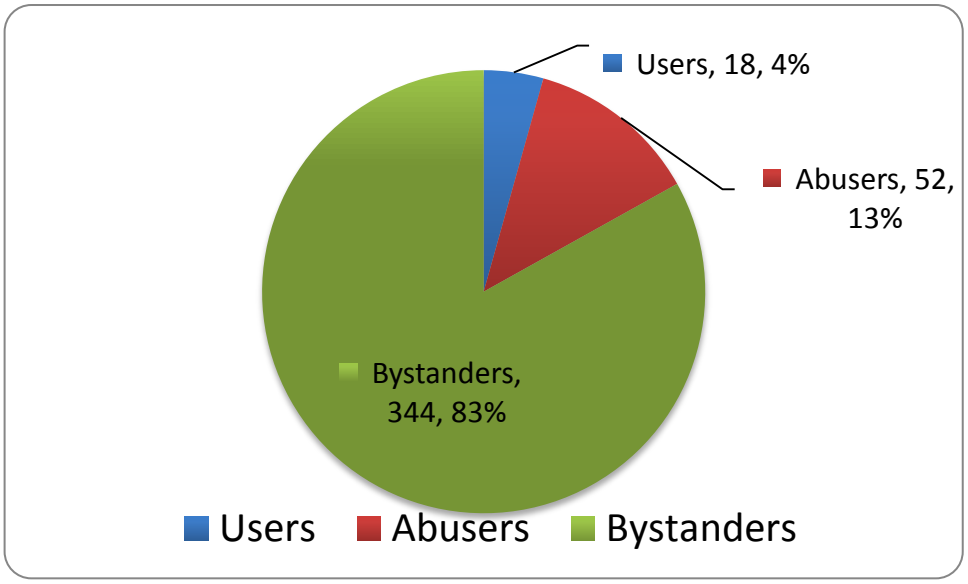

Figure 9. Breakdown of Respondent Population into Three Groups. The pie chart shows the percentage of students who reported taking Adderall without a prescription (abusers), who reported being prescribed and taking Adderall (users), and who reported not taking Adderall nor having a prescription at all (bystanders).

The overall abuse percentage (13%) is lower than in the studies discussed in the Literature Review. This may be attributed to several causes. Our study surveyed only just over 11% of the total undergraduate population, primarily students living in on-campus residence halls. The vast majority of students living off-campus were not surveyed, which may be a future poulation to survey. We conjecture that because off-campus apartments are not regulated by WPI-appointed residential advisors as residence halls are, they may be easier environments for Adderall trafficking. Another cause may be due to the relatively small size of the undergraduate population. A small student population could mean that more students know fellow students and are possibly afraid to use the drug with fear that they may be caught be several of their friends or classmates.

Obtaining the Drug

Responses to Question 18 (refer to Appendix, p. 88) indicated that nearly half (44.4%) of the students who reported having a prescription for Adderall admitted to selling or giving away their Adderall pills. Furthermore, responses to Question 20 (refer to Appendix, p. 89) indicated that, of the 52 reported Adderall abusers, 41 (78.8%) of them reported obtaining Adderall from a WPI friend. This percentage implies a high level of Adderall trafficking on campus. Because there are approximately three times the number of reported abusers as there are reported users, it may suggest that either a single prescribed user is giving his or her pills away to multiple people, or that some prescribed users are simply not admitting to giving or selling their pills. This lack of admission may be attributed to fear of the legal ramifications of selling Adderall. Figure 4 displays the type of person from whom reported Adderall abusers said they obtained Adderall:

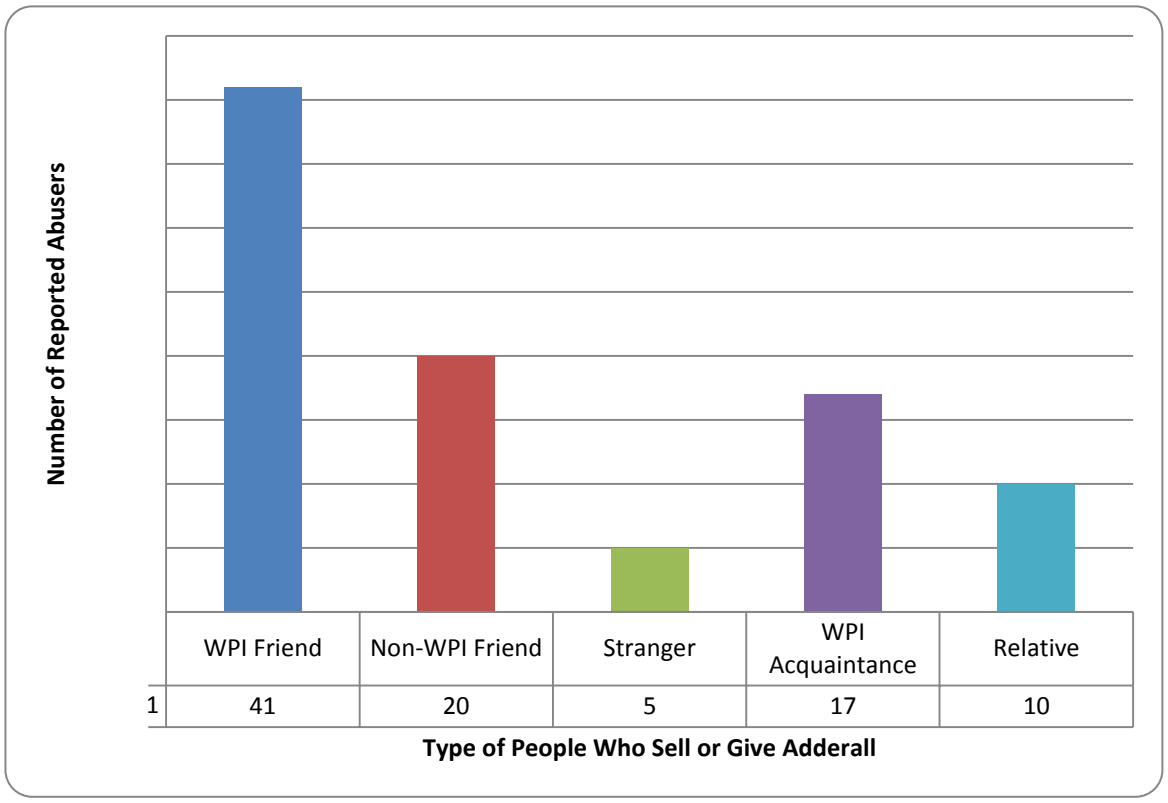

Figure 10. Number of Abusers who Reported Obtaining Adderall from Five Different Suppliers.

Although the number of students who checked-off obtaining Adderall from a stranger was only five total, this number is still alarming. We speculate that these strangers are drug dealers from whom WPI students are buying Adderall. Non-WPI friends represent the second largest suppliers of the drug. It is possible that students buy the drugs from their friends from home before returning to school, or possibly from other schools near WPI. Students who reported obtaining the drug from a WPI acquaintance represent the third largest population. These acquaintances are likely friends of friends who use the drug, and are known to sell Adderall by word-of-mouth.

Reported Abuse in the Greek Life Population

Four Greek houses, both fraternity and sororities, were surveyed. Students involved in Greek life at WPI represent 52.2 % (216) of the total respondent population. Of those in Greek life, 15.3% (33) admitted to using Adderall without a prescription. Students involved in Greek life represent both first-year and upperclass students. Figure 11 below graphically illustrates the surveyed population involved in Greek life and those who are not. The following graph, Figure 12, shows the breakdown of the abuser population.

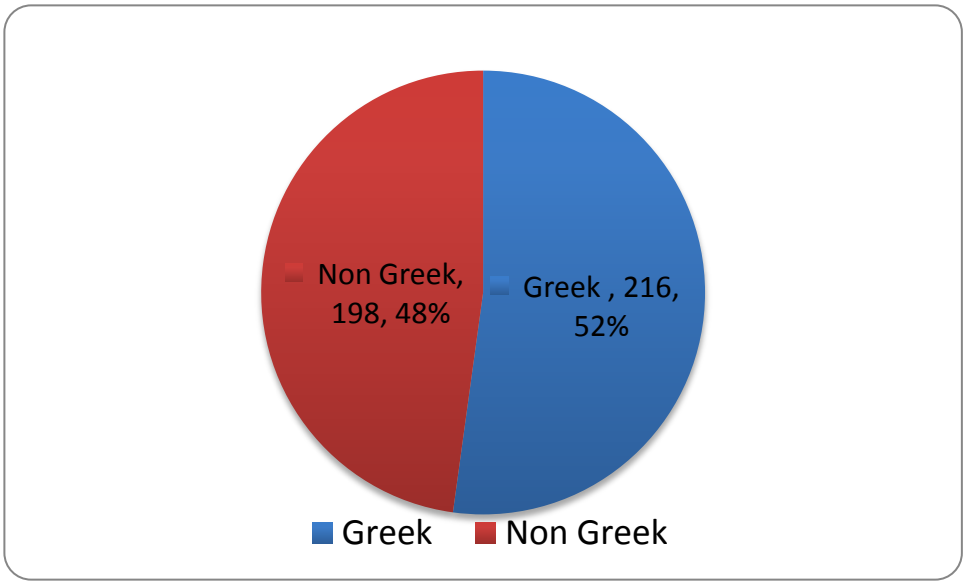

Figure 11. Greek vs. Non-Greek Survey Respondents. This chart shows the percentage of the surveyed population that listed Greek-life as an extracurricular activity.

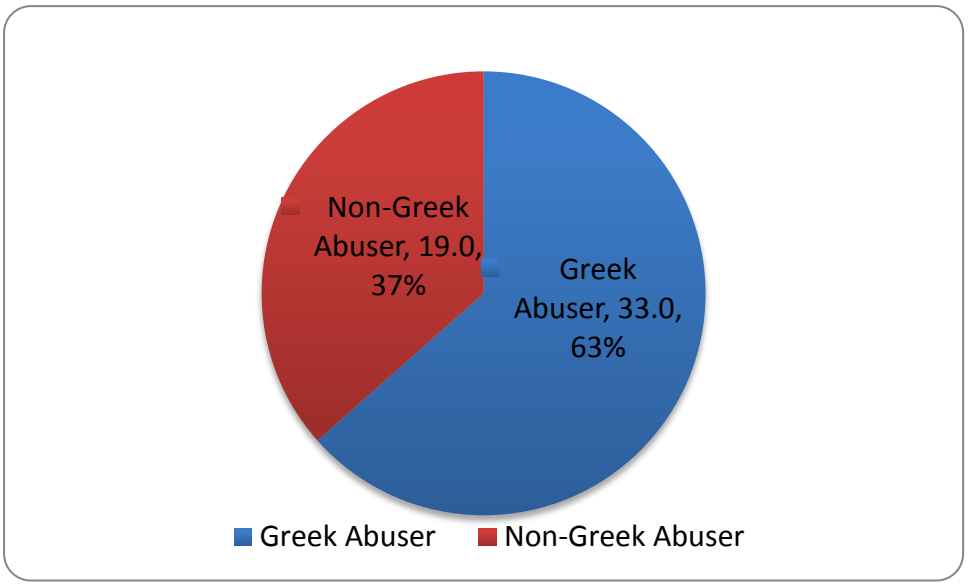

Figure 12. Reported Abusers Involved in Greek Life. This figure shows, of the total reported abuser population, who are involved in Greek Life.

Of the total survey population that is involved in Greek life, 15.2% reported abuse. Of the total survey population that is not involved in Greek life, 9.6% reported abuse. The relationship between those involved in Greek who are reported abuse is slightly significant (p, 0.05).

The higher percent of Adderall abusers that are involved in Greek life may be credited to the environment in which these students live or interact. Greek houses are off–campus and not regulated by resident advisors as on-campus residence-halls are, possibly facilitating the use of this drug. Additionally, fraternity brothers and sorority sisters may also give or sell their prescriptions to fellow members of their organization, thus creating an easy, secretive, and high-trust environment for Adderall trafficking. The relationship between brothers and between sisters of fraternities and sororities, respectively, may also facilitate the giving or selling of Adderall. It is likely that students in Greek life who want Adderall may feel more comfortable obtaining Adderall from another brother or sister in their organization because they have already developed a trustful relationship with this person. Further, the lack of resident advisors or officials that live in these houses can create an environment that fosters Adderall trafficking and increases its accessibility.

The result that students that are involved in Greek Life represent the largest reported abuser population is consistent with research done by Professor Alan DeSantis at the University of Kentucky, although he found that a much higher % of Greeks abused the drug there: His survey analysis of fraternity and sorority houses revealed that 80% of the students in Greek organizations have used a study drug to perform better in classes (CBSNews, p.1).

Reported Abusers and Non-Abuser Involvement in Extracurricular Activities

Question 6 (refer to Appendix, p.87) on the survey was used to determine the extracurricular activities in which students are involved. Students were able to check off as many activities as necessary. The majority of those categorized as reported abusers were relatively active in campus activities. 67.3% of reported Adderall abusers checked off being involved in two or more school-related activities, including athletics, honor societies, clubs, and Greek life. This percentage is more than double the number of reported abusers involved in only one school-related activity. Figure 13 describes the number of activities in which reported Adderall abusers are involved.

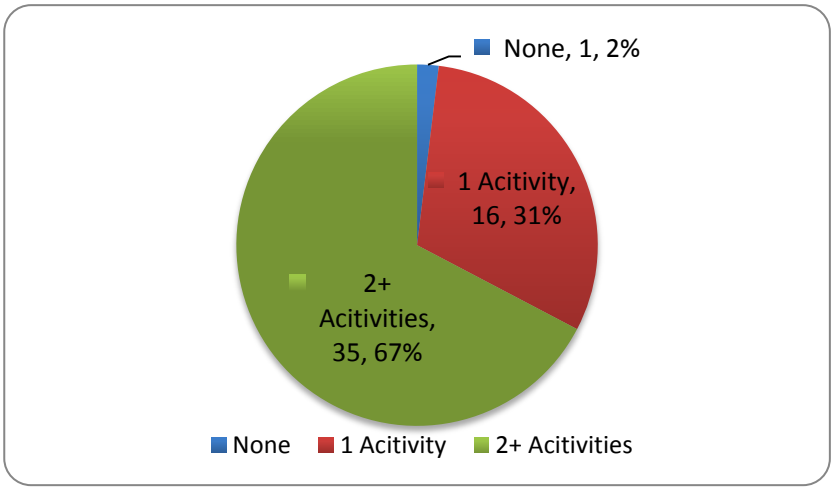

Figure 13. Level of Extracurricular Activity of Reported Abusers.

The jump in the percentage of reported abusers involved in two or more activities versus only one activity could possibly be a result of the added stress of dealing with schoolwork, in addition to the involvement in extracurricular activities. Students that are part of two or more activities plus schoolwork may feel they need an extra boost in motivation and energy. Further, involvement in certain activities, such as athletics and membership to honor societies is strongly dependent on scholarship. Therefore, it is possible that students who want to remain a part of such organizations may abuse Adderall to maintain a sufficient grade point average for participation.

Extracurricular involvement of reported non-abusers was also investigated to determine if reported abusers are involved in more activities on-campus. Figure 14 displays the extracurricular activity level of reported non-abusers:

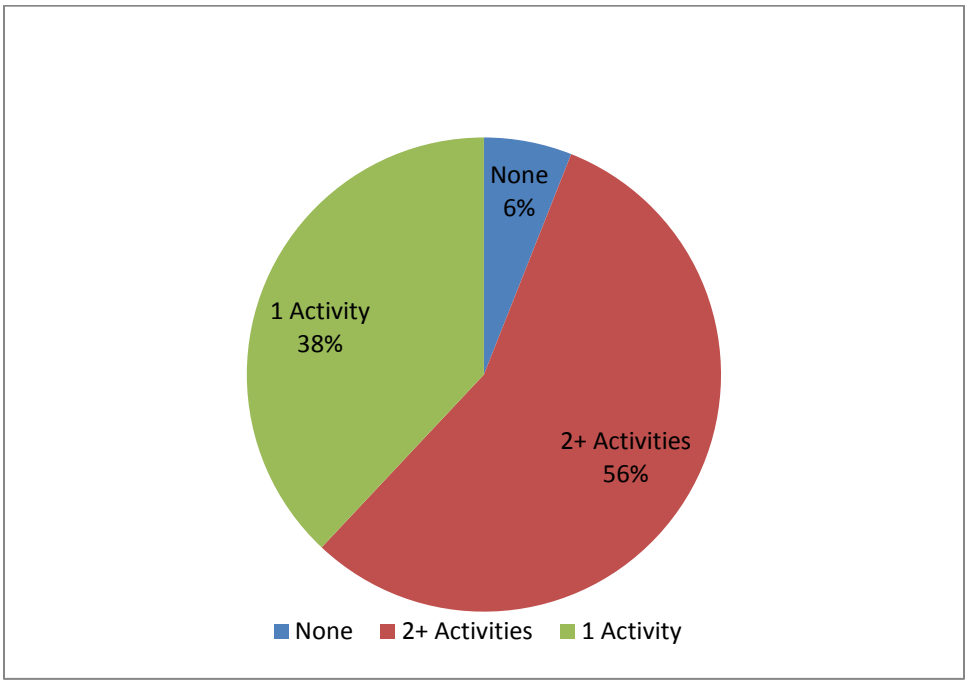

Figure 14. Level of Extracurricular Activity of Reported Non-Abusers.

The percentage of reported abusers involved in two or more activities is higher than those students who reportedly do not abuse the drug and are involved in two or more activities. However, this difference is not significant (p-value, 0.0946). Reported non-abusers involved in only one activity was higher than the reported abusers involved in one activity. Again, this increase was not significant (p-value, 0.1197).

Additional Substance Abuse

Question 23 (refer to Appendix, p. 89) on the survey allowed us to determine which, if any, substances the reported Adderall abusers said they took in addition to Adderall itself. Respondents were allowed to check off as many substances that apply to them specifically, including alcohol, marijuana, tobacco products, cocaine, heroin, prescription painkillers, and prescription sedatives. 98% of the reported Adderall abusers also reported drinking alcohol. 67.3% also checked off smoking marijuana, and 55%

stated using tobacco products. These percentages sum to more than 100% because the same reported Adderall abusers who stated drinking alcohol also reported using other substances. 60% (28) reported abusers admitted taking three or more substances in addition to Adderall. While we cannot determine if reported abusers take these substances at the same time they take Adderall, the result that 60% of these reported abusers also supposedly use three or more of these substances, gives us the profile of what an Adderall abuser is like. We conjecture that a reported Adderall abuser, because he or she took Adderall willingly, will accept the risks associated with other substances known to be unhealthy or illegal.

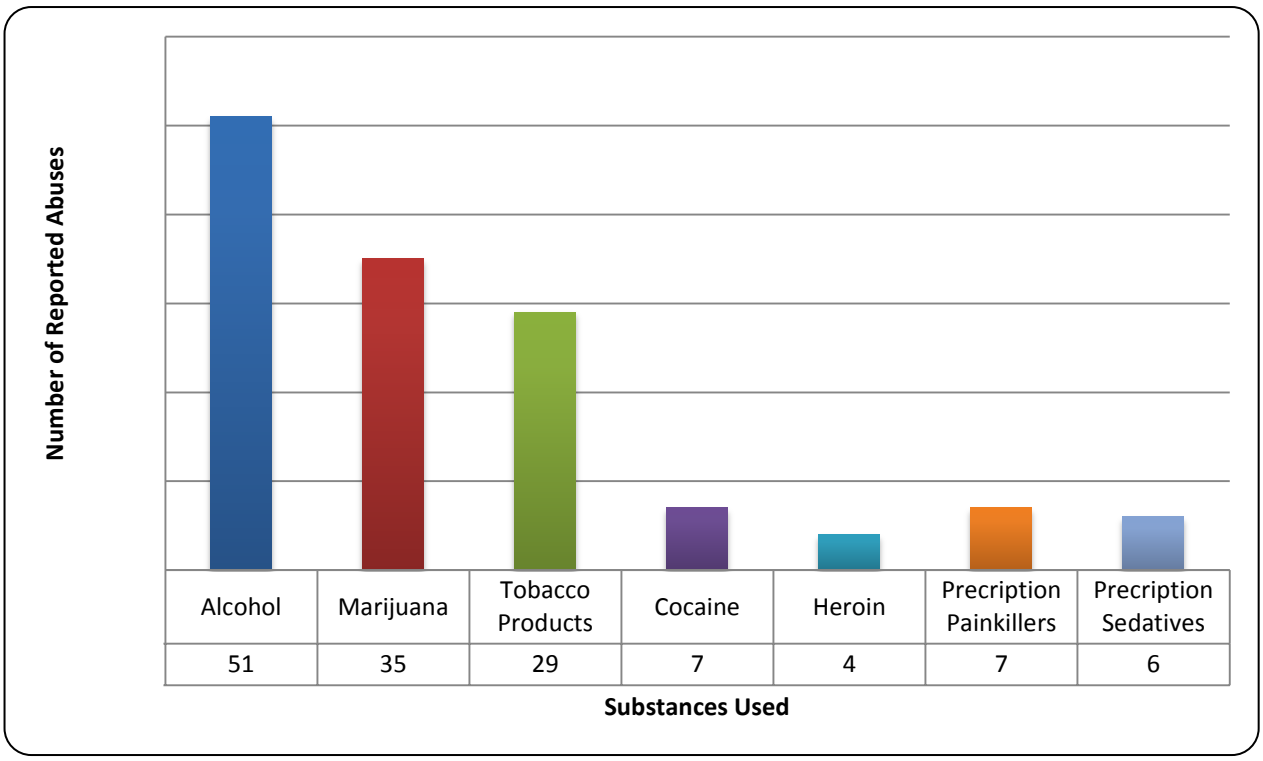

Figure 15. Number of Reported Abusers who Admitted to taking Various Substances. This bar graph shows the different types of substances listed on the survey, and the frequency with which reported Adderall abusers stated using them. For example, 51 reported abusers admitted to using Alcohol, and 35 reported abusers stated using marijuana.

Reported Prescribed User Profile

From Question 14 on the survey, we were able to determine for what reasons students, who were reportedly prescribed Adderall, used it. All but one (17 /18) student stated that he or she was prescribed Adderall to treat ADHD. The one student who was not, reported having narcolepsy. Question 15 asked the respondent if he or she took the Adderall prescription as directed by his or her physician. 50% of the reported prescribed users stated taking their prescriptions as directed by their doctors. 33% stated taking more than the prescribed amount, indicating some abuse. We did not categorize these as abusers, given our definition of that group being only those who take Adderall without medical authorization or prescription. Because this does constitute abuse, additional students might examine this issue further.

The remaining 17% admitted taking the drug less often than as prescribed. The students admittedly taking their prescriptions less than prescribed could be one of the reasons for the buying and selling of

Adderall on the campus. Students have leftover pills in their prescription that they may not want to take, and thus have the ability to sell it.

Coupling of Substances by Reported Users

Question 16 (refer to Appendix, p. 88) was used exactly the same way as Question 23: to determine other substances that reported prescribed users take in addition to Adderall. It was found that reported prescribed users take fewer substances in addition to Adderall as compared to reported abusers. Alcohol use was more prevalent in the reported abuser population, however marijuana use was more prevalent in the prescribed user population. The following chart shows the different substances and the frequency of reported prescribed users taking them.

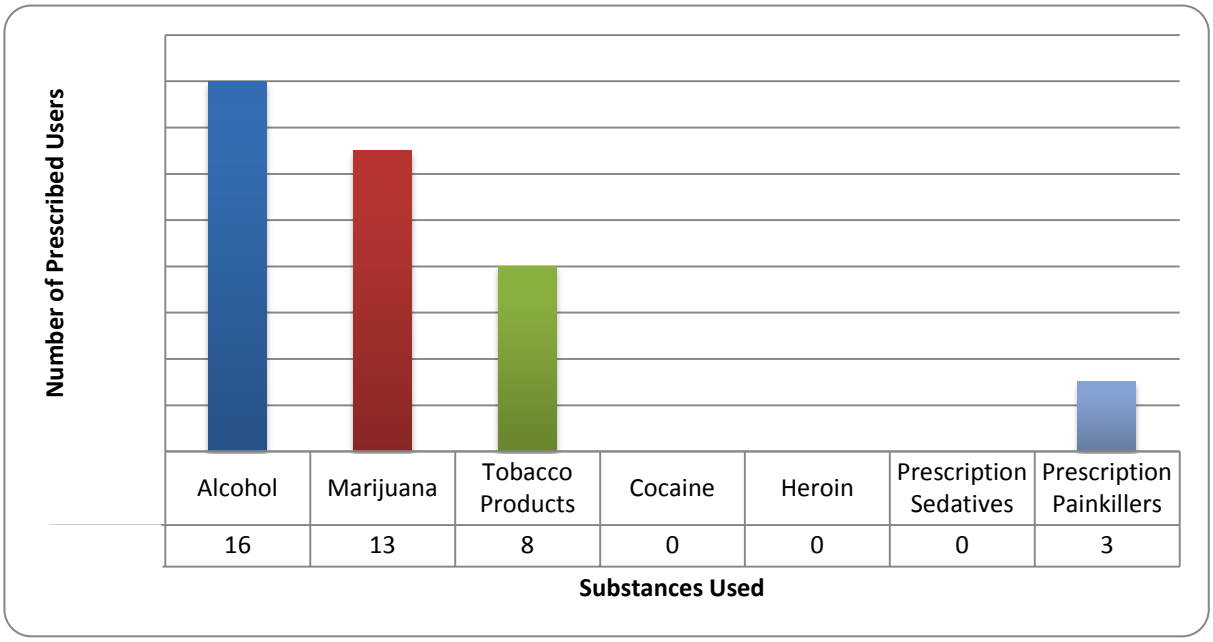

Figure 16. Number of Reported Users who Admitted to Taking Other Substances. This bar graph shows the different types of substances listed on the survey, and the number of students who reported taking each substance. For example, 16 reported prescribed users stated drinking alcohol, and 13 reported prescribed users admitted to using marijuana.

In contrast to Figure 15, which depicts the number of reported abusers that abuse each substance, reported users take fewer substances. Reported users did not check off using cocaine, heroin, or prescription sedatives, while reported abusers did. Additionally, the percentages of alcohol, marijuana, tobacco product, and prescription painkiller use were all smaller than those reported by abusers. We conjecture that those who do not report Adderall abuse are less likely to use these other substances. It is likely that doctors of patients who are prescribed Adderall educate and warn their patients about the risks of drug interactions with substances such as alcohol, marijuana, or tobacco. This data is represented visually using a bar graph rather than in a pie chart displaying percentages because some of the same respondents who reported using alcohol are the same ones who reported using marijuana or tobacco.

Giving and Selling of Adderall by Reported Prescribed Users

Parts a) and b) on Question 17 (refer to Appendix, p. 88) allowed us to determine the different groups of people that ask reported users for their Adderall pills. These groups include WPI Friend, WPI acquaintance, non-WPI friend, stranger, or relative. 13 of the 18 (72.2%) reported prescribed users stated that people have asked them for pills from their prescriptions. The following chart summarizes the number of reported users who stated that various groups of people asked for their prescription Adderall. This data is not reported as a percentage because some reported users stated that people from different groups (i.e., a WPI friend and relative) both have asked them for pills.

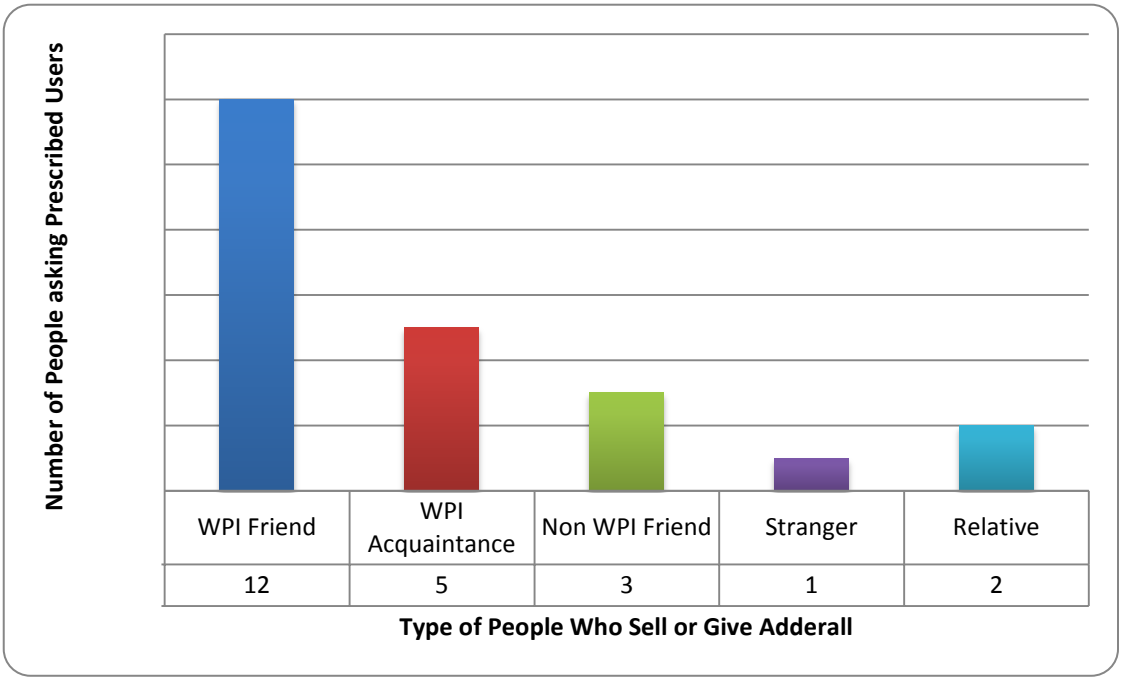

Figure 17. Number of reported users who stated that individuals from 5 Different Groups Asked for their Prescription Adderall.

It is evident that several different types of people sometimes ask the same user for his or her prescription, indicating high demand of the drug. For example, one reported prescribed user stated that WPI friends, non-WPI friends, and relatives have asked him or her for pills. We speculate that, because most of the people asking the reported users for their prescription are WPI friends and acquaintances, there is a high amount of Adderall trafficking on campus.

Only 8 (44.4%) of the reported prescribed users admitted to actually selling or giving pills from their prescriptions away. This number seems like a discrepancy in data because 41 (78.8%) of the reported Adderall abusers stated they obtain Adderall from WPI friends. This difference may be explained with two scenarios: these 8 reported users are giving away their prescriptions to multiple abusers, or some of these reported users are simply not admitting to giving or selling their prescriptions.

Students' Reported Knowledge of Adderall Side Effects

Question 7 (refer to Appendix, p. 87) was an open-ended survey question that prompted the respondents to list the side effects of Adderall to the best of their knowledge. Two researchers analyzed this question to determine the survey respondents' level of understanding regarding the side effects of Adderall (positive or negative).

Of the survey respondents, 62% did not respond to the question. This is potentially indicative of the lack of knowledge about Adderall in the undergraduate student body. Students leaving the question blank could suggest that they are not knowledgeable on any side effects. This percentage may also represent respondents who simply skipped the question out of lack of interest in the survey.

Six categories of side effects were grouped as positive effects. These included: increased sociability (S1), increased concentration, focus, energy (S2), omnipotence (S3), calm (S4), euphoria (S5), and enhanced music appreciation (S6). These categories, delineated in tabular form, are listed in the Methodology.

Approximately 30% of the students identified that Adderall increased concentration, focus, and energy. This was the most commonly identified positive side effect. Of the total respondents, just below 2% were able to identify the side effect of calmness. Every other positive side effect (S1, S3, S5, and S6) were only identified by a maximum of 0.05% of survey respondents. These results may demonstrate that most students are aware only of the increased focus side effect to which Adderall is attributed, a side effect which drives the employment of Adderall as a study aid in universities.

Table 9 shows the total number of students who listed side effects within each category (S1 – S6) and the number of respondents who did not answer the question (NR). For example, Researcher 1 concluded that 257 respondents did not answer the question, and that two respondents listed sociability as an Adderall side effect.

Table 10. Coding analysis of positive side effects with percent reliability.

Positives	**NR**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Researcher 1	257	2	127	1	7	0	0
Researcher 2	258	1	123	1	6	0	0
#Answered/Total Collected Surveys (414) (Researcher 1)	0.621	0.005	0.307	0.002	0.017	0	0
#Answered/Total Collected Surveys (414) (Researcher 2)	0.623	0.002	0.297	0.002	0.014	0	0
Percent Reliability	99.7	99.7	99.0	100.	99.7	100.	100.

Thirteen categories of side effects were grouped as negative effects. This list comprises the following side effects: forgetfulness (S7), increased anger (S8), repetitive behaviors (S9), fitful sleeping/sleeplessness (S10), lack of appetite (S11), nervousness/anxiety (S12), depression (S13), chills/sweats (S14), hallucinations/psychosis (S15), dry mouth (S16), increased urination (S17), physical body damage (S18), and addiction (S19).

Nearly 10% of the survey students identified the side effect of fitful sleeping/sleeplessness (S10), while approximately 8% identified lack of appetite as an Adderall side effect (S11). These were the most

popularly listed negative side effects. All other effects within the negative branch of the coding tables were identified by only small percentages of the students that did answer the question. For example, of those who did answer the question, only 1.4% listed nervousness/anxiety (S12) as a side effect. This result is comparable to the coding analysis from the public forums in that sleeplessness and lack of appetite were two of the most common side effects reported.

Table 11. Coding analysis of the negative side effects with percent reliability.

Negatives	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
Researcher 1	2	6	1	40	30	12	3	0	1	0	0	11	6
Researcher 2	2	2	0	41	31	6	0	1	2	0	0	13	12
#Answered/Total Collected Surveys (414) (Researcher 1)	0.005	0.014	0.002	0.097	0.072	0.029	0.007	0	0.002	0.	0	0.027	0.014
#Answered/Total Collected Surveys (414) (Researcher 1)	0.005	0.005	0	0.099	0.075	0.014	0	0.002	0.005	0	0	0.031	0.029
Percent Reliability	100	99.0	99.7	99.7	99.7	98.5	99.2	99.7	99.7	100.	100.	99.5	98.5

Of the general student population, most survey respondents did not respond to the question, while the second largest majority of students listed only two or three side effects. Tables 11 and 12 divide the respondent population by class year to determine if responses could be correlated to an increase or decrease in class year. The first row of Table 11, denoting "# of Side Effects Listed", represents the numerical amount of side effects listed by respondents, either 0, 1, 2, 3, or more than 3 listed per answer to the question. The row of the table divides the respondents by class year.

Table 12. Students reported knowledge of the number of negative side effects of Adderall.

# of Side Effects Listed	0	1	2	3	>3
Senior	49	13	8	3	0
Junior	52	14	2	1	0
Sophomore	90	16	2	2	0
First-Year	144	13	4	0	1

Table 13. Students reported knowledge of the number of positive side effects of Adderall.

# of Side Effects Listed	0	1	2	3	>3
Senior	7	66	0	0	0
Junior	7	61	1	0	0
Sophomore	9	97	4	0	0
First-Year	11	147	4	0	0

As summarized in tables above, of the 73 total senior class respondents, 90% (66 respondents) listed at least 1 positive side effect of Adderall and only 7 respondents left the question unanswered. Similarly 88% of the junior class, 88% of sophomore class and 90% of first-year class listed at least one

positive side effect. No respondents in any class listed more than 2 positive side effects. The result that the vast majority of students in all classes listed only one side effect of the several possible effects to which Adderall is attributed, could suggest minimal knowledge among the surveyed undergraduate population regarding Adderall side effects.

Moreover, 67% of senior class, 75% of the junior class, 81% of the sophomore class and 88% of the first-year class did not list any negative side effects. Additionally, the number of negative side effects identified was generally lower than the number of positive side effects reported across the whole respondent population. From an average of results from researchers one and two, we found that positive side effects were reported more often than negative side effects. Approximately 85% of respondents reported positive side effects, while approximately 71% of respondents reported negative side effects. These percentages sum to more than 100% because some respondents listed both negative and positive side effects about which they were knowledgeable. The result that more positive side effects were reported may suggest that more students recognize the positive side effects of Adderall, instead of the negative effects. The results obtained here may be indicative of its use without legal prescriptions: students may not possess the required knowledge of both the positive and negative side effects of Adderall, which could possibly deter students from using it illegally. No definitive correlations were drawn that related class year with reported student knowledge of side effects.

Perceived Ethics of Abusing Adderall

Questions 8 and 9 (refer to Appendix, p. 87) allowed us to determine if respondents thought it acceptable to use Adderall to improve academic performance or for recreational use, respectively. The majority of the entire surveyed population (62%) stated they thought using Adderall to alter or improve academic performance was unacceptable. 17% reported that using Adderall for academic improvement was ethical, while the remaining 21% was unsure. The following figure shows this graphically:

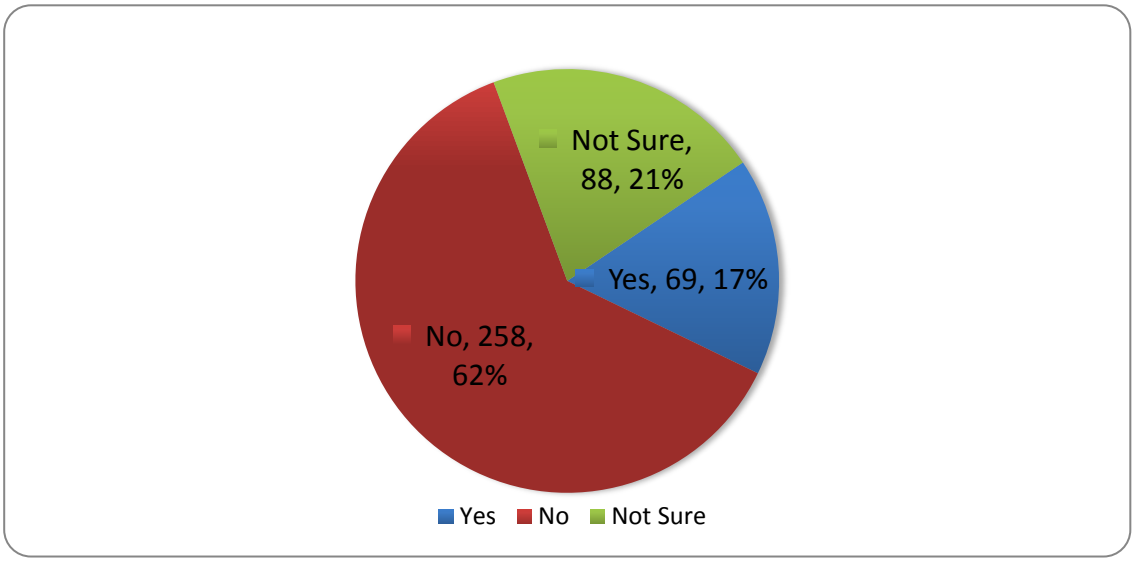

Figure 18. Perceieved Acceptability of Abusing Adderall for Academic Improvement. This pie chart shows the percentages of students who stated using Adderall to improve academic performance was acceptable or not acceptable.

The percentage of those who stated it was acceptable to use Adderall to improve academic performance is 5% greater than the actual students who reported illegally using Adderall. This could mean that, although some students did not report taking Adderall illegally, they still may think it is ethically acceptable for others to use it illegally. The 21% of students that checked off "Not Sure" for the acceptability of academic Adderall use could possibly represent the student population that is not educated on what Adderall is or why students use it to improve academic performance. It may also represent students who are ambivalent or indifferent to the topic.

- Within the abuser population itself, 54% (26/48) answered "Yes," meaning this percentage of reported abusers believes that using Adderall for academic improvement is acceptable.
- Of those who have legitimate prescriptions for Adderall, 39% (7/18) answered, "Yes."
- Of the total bystander population, those who neither use nor abuse Adderall, 10% (36/348) answered "Yes."

A higher percentage of the total abuser population may believe using Adderall for academic purposes is acceptable because this is the group that is doing just that. The result that nearly 50% of the abuser population does not think using Adderall for academic improvement is acceptable, suggests that they may feel guilty for using the drug in such a situation. We also conjecture that only a very small percentage (10%) of the reported bystander population reportedly believes that Adderall use is acceptable for academic improvement because this population represents the group of students who have never used Adderall.

The following chart displays the percentages of respondents who thought it was or was not acceptable to use Adderall for recreational purposes.

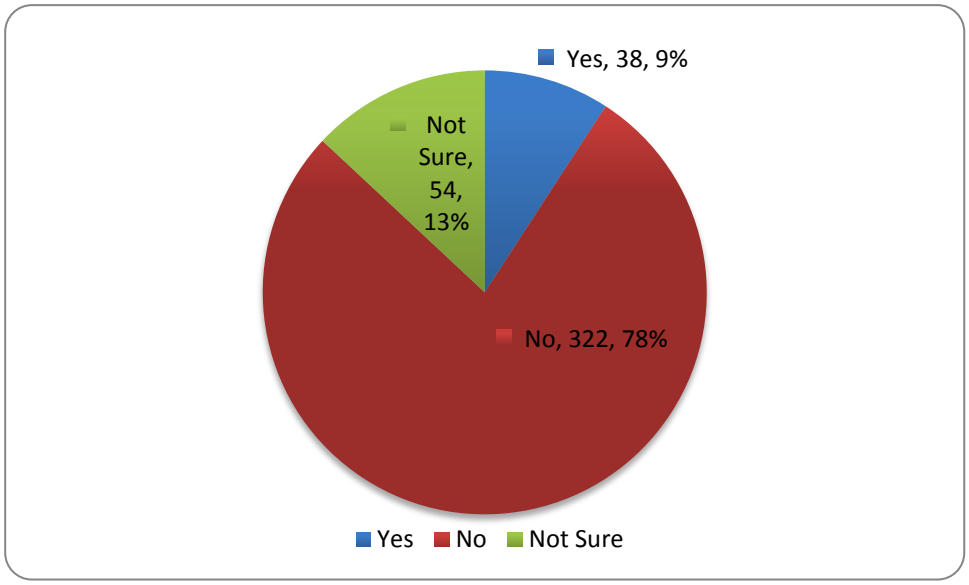

Figure 19. Response on Ethicality of Adderall use in Recreational Setting. This pie chart shows the percentages of students who stated using Adderall in a recreational setting was acceptable or not acceptable.

The 9% of students who stated it was acceptable to use Adderall for recreational purposes could also be the same people that couple other substances while taking Adderall. As discussed in the Content Analysis section of this chapter, several individuals use Adderall in social or party settings to help them

become more sociable or talkative. The 13% of those who checked off "Not Sure" could, as in the chart before, represent the student population that are not aware of the employment of Adderall in the recreational setting, or simply have never heard of the drug before taking the survey. The "Not Sure" percentages from both charts suggest the need for the formation of programs to educate the student population on what Adderall is.

- Of the total abuser population, 27% (13/48) answered "Yes," meaning this percentage of reported abusers believed that using Adderall for academic improvement is acceptable.
- Of the total user population, 28% (5/18) answered "Yes."
- Of the total bystander population, 6% (20/348) answered "Yes."

Similar to above, we conjecture that only a very small percentage of reported bystanders (6%) believes that using Adderall for recreational purposes is acceptable, because these are the students that have never used Adderall. The 6% however, could suggest a group of students that may be inclined or tempted, due to their opinions, to try the drug in a recreational setting. Only a small population of the total reported abuser population believed that using Adderall recreationally was acceptable. This suggests that more of the reported abuser population is using the drug for academic purposes, such as studying and homework, rather than recreational reasons, such as partying.

Summary of Key Survey Findings

Prevalence of Abuse

- 13% of the total respondent population reported abusing Adderall.
- 4% of the total respondent populations reported having an Adderall prescription.
- There are approximately three times as many reported Adderall abusers as there are reported prescribed Adderall users.
- 33% of those students who are reportedly prescribed Adderall stated taking more than the prescribed dosage, indicating a type of abuse we did not originally intend to study.

Abuser Profile

- 2.5% of first-year students reported abusing Adderall, while 19% of upperclass students reported abusing the drug
- Of those students involved Greek life, 15.3% admitted to using Adderall without a prescription, a percentage slightly higher than those who admitted Adderall abuse in the population as a whole.
- The percentage of reported abusers involved in two or more extracurricular activities was 11% higher than the percentage of reported non-abusers involved in two or more activities.
- Nearly all of the reported Adderall abusers reported drinking alcohol, two-thirds reported smoking marijuana, and over half reported using tobacco products. Alcohol use was more prevalent in the reported abuser population than in the reported non-abuser populations, yet marijuana use was more prevalent in the reported non-abuser population. Only reported abusers stated using more high-risk drugs including cocaine, heroin, and prescription sedatives.

Obtaining the Drug

- Nearly half of the students who reported having a prescription for Adderall admitted to selling or giving away their Adderall pills.
- Of the reported users, approximately 67% reportedly asked for Adderall pills from WPI friends, while 28% were reportedly asked for Adderall pills from WPI acquaintances.
- 79% of reported Adderall abusers stated they obtain Adderall from a WPI friend. 33% of reported Adderall abusers stated they obtain Adderall from a WPI acquaintance. Other sources of obtaining the drug include non-WPI friends, strangers, or relatives but these were less prominent.

Opinions on Ethical Acceptability of Adderall Use

- A seemingly large anti-abuse attitude was reported by our respondent population, as 62% of the respondent population reported that using Adderall for academic improvement was unacceptable, while 21% was unsure.
- An even higher percentage of students, 78%, stated that using Adderall for recreational use was unacceptable, while 13% was unsure.

Reported Knowledge of Adderall Side Effects

- 62% of the respondent population did not list any Adderall side effects when prompted by the survey. Positive side effects were more commonly reported as answers to this part of the survey.
- The most commonly reported side effects were increased concentration, focus, and energy, with 30% of respondents listing these effects as their answer.
- Approximately 85% of respondents reported the positive side effects of Adderall about which they were knowledgeable, while 71% of respondents reported negative side effects.

Analysis of Personal Narratives Submitted via Online Website

A total of nine personal narratives were submitted to our website constructed by SurveyMonkey. Similar to how survey respondents were categorized by population group, each website submission was placed in one of three categories: posts written by a reported abuser, by a reported prescribed user, and by a reported bystander. Content of the post was analyzed to answer several questions:

- For reported abusers, what were the side effects, methods of obtaining Adderall, and reasons for use as discussed in the posts?
- For reported users, is Adderall being taken as prescribed? Do reported users give or sell their pills to others?
- For reported bystanders, what are their thoughts on other students abusing the drug?
- Can narrative content support the conclusions made from the WPI survey data? Are these posts indicative of a wider range of students within the same abuser, user, and bystander categories?

Submissions from Reported Bystanders

All reported bystanders were individuals who answered Question 4 on the website. Four responses were received. Three of the four posters stated explicitly that it was unacceptable for Adderall to be used by students without a prescription to improve academic performance. One of these posters likened the use of the drug by students to use of steroids by athletes. All four narratives are below:

> I think its completely unreasonable for some students to be able to take Adderall to aid in studying and thereby getting good grades. It sort of is like cheating because they are physically and mentally enhancing themselves to achieve something; much like athletes try to take steroids to improve their game. ADHD's diagnosis is really badly managed. They should be more strict on prescription. It is kind of sad that if i go in mimicking symptoms i will be able to get it. Thats probably the only way to police people....by limiting prescriptions and researching on a thorough diagnosis.
> *Post 1*

> I think Adderall is abused a lot, and there should be awareness programs that target freshmen in college. If you can access freshmen, they will learn about the dangers of the drug and that it is very illegal.
> *Post 2*

> I have never used Adderall without a prescription. I think that it is unethical and I think that the only thing that would help is an Adderall Awareness program targeted towards first year students. Most kids, I think, take the drug because they cant handle the stress and the work of college on their own and they need a little something to help them along. Also I heard that it helps some people but others have completely different side effects. Don't take adderall if you dont need it! Its not good for your body and it can send you to jail!
> *Post 3*

> "I don't use Adderall and I don't think students should take it if they aren't prescribed it."
> *Post 4*

Two stated that awareness programs targeted toward first-year students should be implemented to educate students on the dangers of Adderall. One poster suggested that prescriptions should be limited and that diagnosis methods for ADHD should be researched more thoroughly due to the ease of obtaining the drug currently. Opinions provided in these submissions are similar to those found from posts on the Student-Network forum. However, none of the posts on our website contained opinions from bystanders that condoned the off-label use of Adderall. This may be that only those students who submitted narratives to the site felt strongly enough against Adderall to publicize their opinions.

Submissions from Reported Users

All reported users were individuals who answered Question 2 on the website. Two responses were received.

> I have ADHD and was diagnosed with the disorder when I was in the 6th grade. As I got older I got better at handling symptoms...focused a little better...got into trouble less....less frequent outbursts. I still took Adderall though, but when I got to college, I didn't need it as much. I still take it today, I'm in my second year of college. I take much less than prescribed. I should be taking it daily, but take it maybe once a week when I have a long night of homework or studying I need to do. I end up with a build up of pills. I sell those off to people I know personally at school. I have about 5 people I sell them to regularly, usually $2/pill. If I renew my prescription as scheduled but dont use all my pills, I end up having excess bottles filled with pills that I can sell/give away.
> *Post 1*

> When i don't take my medication i get headaches and i find it very tough to do my homework. I think that adderoll makes me more awake, and increases my attention in class. I have been approached by floormates about my prescription, but i told them that i didn't have enough to sell and it affects my concentration too much.
> *Post 2*

The first narrative supports our conjecture that students who are prescribed the drug distribute it to one or several students on campus, leading to high levels of Adderall trafficking on campus. Both posts mention students who want to buy the pills from these prescribed users. This may suggest that these students are either not educated on the ramifications of buying Adderall illegally, or simply disregard these consequences. Monetary gain from selling the pills may also be a strong motivator these students.

Submissions from Reported Abusers

All reported abusers were individuals who answered Question 3 on the website. Three responses were received.

> I was about to fail a course last year, so on the second exam and final I took adderall prior to the exam night and crammed for 20+ hours of studying (right up until the exam). I found that Adderall allowed me to stay awake for a very long period of time, and the course material came a lot easier to me after taking adderall. I obtained adderall by buying some from my friend for 5$ a pill. A day after an exam I usually skipped class and missed breakfast because I felt very 'hungover' and tired. I passed my class because of adderall, and don't feel that it's illegal to take it to perform better in school.
> *Post 1*

This post shows the type of attitudes that some students may carry regarding the acceptability of taking Adderall for academic improvement. The effects of Adderall, as discussed in this post, paint it as a "wonder drug" for academic improvement, and underplay its harmful side effects. This attitude may be the reason why several other students take it for academic purposes.

The following post focuses more on the harmful side effects of abusing the drug:

> I first took Adderall when I was a freshman. My friend gave me a pill before a final...she got the pills from another mutual friend who had a prescription for Adderall because of her ADHD. I took the pill before the final, and felt amazing when it kicked in. When I was taking my exam, I did the whole thing in 15 minutes. And then re-did the whole exam again. I was amazed at how much faster you can read, write, and process information on Adderall. I kept taking Adderall off and on throughout the rest of the year. During B-term of sophomore year I began taking it more heavily, probably 3 times a week just to handle the work load of homework and tests. I stopped taking it at the end of B-term because I was experiencing horrible side effects. I couldn't sleep the same night I took the drug. My feet and hands felt cold and numb. My muscle were tense and sore. My jaw hurt from grinding my teeth. I chain smoked on Adderall...I don't know why, I just always had the urge to smoke. It was like smoking calmed me down from the high of Adderall. I didn't eat on Adderall, and then felt like my stomach was destroyed the next day. I got horrible dry mouth, chapped lips, bad skin. Horrible! I have since stopped taking the drug and have never touched it again. Fun when you're on it, and it works great for studying and getting stuff done, but the come-down and the day after are the worst!
>
> *Post 2*

These symptoms of sleeplessness, lack of appetite, and increased focus, are similar to those reported in the posts analyzed from the online forum Drugs-Forums.com. This reported abuser states the drug works well for studying, but also mentions several negative side effects that arose for abusing the drug, even others that were not included in the online forum posts, such as bad skin or numb feet.

> I obtain Adderall from multiple friends who are prescribed for mild ADHD. I only take it in times of tests -- rarely for recreational use. During times of tests i feel Adderall provides the concentration needed to absorb all the information from whatever it is i am studying. It also helps me stay up late (or all night, even) to complete all my studying. While i on the drug i have never come across any noticeable side effects. Its kind of like other drugs sometimes where your mouth gets dry and you are not really hungry for a while. But other than that its never anything serious. Recreationally though, i take Adderall to get even more excited to party! Plus it can keep me up almost all night and hang out with friends. My friends and I generally take other drugs for that purpose, but if they are not readily available i take Adderall. It only happened like a few times though.
>
> *Post 3*

This was the only post of the three reported abusers that included recreational use as a reason for using Adderall. The reason for using it recreationally, partying, was the same reason included in the Drugs-Forum.com posts. Posters on that site who used it recreationally were mostly for partying (instead of video games or cleaning, for example).

DISCUSSION

Given the prevalence of widespread prescription drug abuse, and reports of Adderall abuse on other college campuses nationwide, we began this project with a concern about possible Adderall abuse on the WPI campus. Through administrator interviews, we learned that there is no available research on the issue and that some faculty members are not aware that this could become a possible problem among student populations. Therefore, it seemed relevant and important to survey as many undergraduates as possible about abuse of Adderall and present the results and recommendations to the entire campus community to help raise awareness.

Prevalence

The general results of the survey were positive: In comparison to other universities that have studied the prevalence of Adderall abuse on their campuses, WPI has a much lower level of abuse. Of the total surveyed population in our study, 13% of the respondents reportedly abuse Adderall. In our review of existing literature, we read that 34% of undergraduates at the University of Kentucky had reportedly taken attention deficit drugs without a prescription, and at the University of Wisconsin, a total of 16.8% students had reportedly used Adderall non-medically. It is possible that other universities that found a high population of reported student abusers conducted their studies because they were already aware of such a problem on campus.

Abuser Profile

We also sought information regarding the type of students who abuse the drug and developed a profile of students who reportedly abuse the drug. Our greatest population of abusers (92%) was in the sophomore, junior, and senior years of WPI. While we found that a significantly higher percentage of upper-class students reportedly abuse the drug as opposed to first-year students, there was no positive or negative correlation between the sophomore, junior, and senior year students and any reported Adderall abuse (i.e., we did not find that junior year students abused more than sophomores, for example). We speculate that an increase in reported Adderall abuse with the transition of first-year students into the second, third, and fourth years may be attributed to a harsher workload required of upperclass students, tempting them to resort to stimulants to cope with such work. Additionally, first-year students simply may not be exposed to such a drug upon entering the college atmosphere. It is likely they are learning about Adderall from older students who may have more experience with Adderall.

To form further the abuser profile, we looked at the number of extracurricular activities in which students are involved to determine if the involvement related to any Adderall abuse. The percentage of students who reportedly abused Adderall and who are involved in two or more extracurricular activities, a reasonably hectic schedule, is 11% higher than the percent of students that reported no Adderall abuse and who are involved in two or more activities. Students that are part of two or more activities plus schoolwork may feel they need an extra boost in motivation and energy. Further, involvement in certain activities, such as athletics and membership to honor societies is strongly dependent on scholarship. Therefore, it is possible that students who want to remain a part of such organizations may abuse Adderall to maintain a sufficient grade point average for participation. How hectic students' schedule is and their possible dependence on drugs to handle it may be a variable for a major future study.

The use of other drugs by reported Adderall abusers was also studied and compared to any substance abuse reported by the non-abuser population. In the reported Adderall abuser population, cocaine, heroin, and prescription painkillers were admittedly used, whereas in the reported non-abuser population, they were not. This may suggest that students in the reported abuser category are high risk-takers. It is likely that doctors of patients who are prescribed Adderall educate and warn their patients about the risks of drug interactions with substances such as alcohol, marijuana, or tobacco. Unprescribed users however are at a potentially great risk of continuous abuse and overdosing because they may be unaware of the dangers associated with the drug when mixed with other substances.

Some students grouped into the reported user population (i.e., students prescribed Adderall), indicated some abuse also: about one-third of this population admitted to taking more than the prescribed dosage of Adderall, as directed by their doctors. This result could lead to another future study that focuses on Adderall abuse by those students who are legally prescribed Adderall to treat a valid ADHD diagnosis. Improvement in Adderall abuse should be focused not only on the strictly abuser population, but also on those patients who abuse the recommended dosages.

In the reported abuser category of respondents, students involved in the Greek community were a large number. Of the total survey population that is involved in Greek life, about 15% reported abuse. Of the total survey population that is not involved in Greek life, approximately 10% reported abuse. This statistic that students involved in Greek Life represent the largest reported abuser population is consistent with research done by Professor Alan DeSantis at the University of Kentucky, although he found that a much higher percentage of Greeks abused the drug there: His survey analysis of fraternity and sorority houses revealed that 80% of the students in Greek organizations have used a study drug to perform better in classes (CBSNews, p.1).

The higher percent of Adderall abusers that are involved in Greek life may be credited to the environment in which these students live or interact. Greek houses are off–campus and not governed by Resident Advisors as residence halls are, possibly facilitating the use of this drug. Members of Greek organizations may give or sell their prescriptions to fellow members, thus creating an easy, secretive, and high-trust environment that makes Adderall trafficking possible. The relationship between brothers and between sisters of fraternities and sororities, respectively, may also facilitate the giving or selling of Adderall. It is likely that students in Greek life who want Adderall may feel more comfortable obtaining Adderall from another brother or sister in their organization because they have already developed a trustful relationship with this person.

Obtaining Adderall

Further information regarding reported abusers' methods of obtaining the drug was also researched. Nearly 80% of reported abusers stated they obtained Adderall from a WPI friend. This data suggests drug trafficking on the campus. The small undergraduate population might facilitate the buying and selling of Adderall. Moreover, the majority of our respondent population was students who live in on-campus residence halls. Each of these halls has WPI-appointed Residential Advisors who maintain the rules of the residence halls. We suspect the students living in off-campus apartments may live in an environment even more suitable to drug trafficking as there are no people maintaining rules and drug regulations in these areas as Residential Advisors do. However, it is possible that these students who live off-campus may not have access to large groups of students as those who live in residence halls do.

The number of reported users who admitted to giving away their prescriptions to WPI students is small, yet the percentage of reported abusers who stated that they obtain the pills from WPI students is high. This leads us to believe that either some reported users are not admitting that they sell or give away their pills for fear of legal ramifications, or that some of the reported users are distributing their prescriptions to multiple students. All of the narratives submitted to our constructed website from reported abusers of Adderall included details of these students obtaining Adderall from friends. The students obtained the drug by either buying the pill from friends, or getting it freely from their friends. From a previously conducted study by Checton and Greene, sellers were generally compatible with the compliance gaining strategies of rationale and promise. Furthermore, it was determined that the relative difficulty of obtaining Adderall prescription from peers or fellow students was very low. Therefore, it can be surmised that there are two major reasons for students diverting Adderall medication: ease of offloading and pressure from buyers of the drug through compliance gaining strategies. Such compliance gaining strategies may be applicable to WPI students as well. A future study could examine those Adderall users who sell or give away their pills to understand the motives behind this type of student drug trafficking. A future study of this nature could determine if students view selling Adderall as a profitable business endeavor or whether they feel pressured to sell these drugs to their schoolmates who ask for them. Another aspect of such a study would be to determine if these sellers are knowledgeable about the legal consequences associated from illegal trafficking.

Reasons for Use

Analysis of personal narratives to our website revealed details of why students reportedly use Adderall illegally. All of the reported abusers who submitted narratives to our website stated they took the drug for academic improvement. However, posts analyzed on public forums showed that the most common reason for Adderall use was for recreational purposes. This inconsistency with the forum created by our project could be that our website was open only to WPI students, and the public forum at Drugs-Forum.com we studied was open to people of all demographics, both students and non-students.

88% of the reported abuser population stated that they use Adderall for academic reasons (studying for exams, homework, projects, for example), while approximately 38% stated using it for social reasons (partying, for example). The academically competitive nature of WPI coupled with the intensity of the four-term school year may support the result that we saw the utilization of Adderall for academic purposes as the largest motive for use. The percentage of recreational users, however, is still a large figure. The large level of recreational use may be that students, because of such a hectic schedule, additionally use Adderall to "unwind" during the weekends or in a social setting. It is likely that these reported recreational users utilize Adderall as a de-stressing tool. Also, using the result that we saw sociability as the most frequently reported side effect on the public forums, Adderall could be used by WPI students as another tool to help students socialize with others.

Knowledge about Adderall: Students' Perception of Side Effects

On our website prompting students to discuss their experiences with Adderall, respondents detailed several negative side effects of the drug including sleeplessness, dry mouth, and lack of appetite, among others. These symptoms were consistent with those found in the online forums researched in the early stages of this project. Despite these negative side effects, reported abusers noted the positive effects of the drug in terms of academic employment: all stated that it increased their focus, allowed them to study for long periods of time, and even saved them from failing a course. This data was also consistent with

findings from our survey with respondents more frequently recognizing positive side effects such as increased concentration and focus and negative side effects such as sleeplessness and lack of appetite. These types of positive attitudes toward Adderall abuse could be representative of the reasons why several other reported abusers take the drug. Additionally, this mindset of focusing more on the positive effects of the drug, in spite of the negative side effects that occur, could possibly be making students believe that Adderall is really a wonder drug. Several negative implications arise from this attitude. Students who reportedly use the drug without medical indication could become addicted to the drug, may be caught illegally with the pills, or may eventually suffer from the detrimental health effects that come from unprescribed use.

Non-response to the survey question regarding students' knowledge of Adderall side effects may be attributed to the unfamiliarity of the subject or simply laziness or indifference with answering the question. Respondents reported positive side effects more than negative side effects, suggesting that the general consensus among students is that Adderall can be abused without risk. This could potentially result in increased abuse of Adderall on campus because students may be more prone to make uninformed decisions about the drug. We did not find any correlation between class year and knowledge of side effects (i.e., fourth-year students did not report more Adderall side effects than, for example, sophomore year students). This suggests that Adderall education is required across all class years at WPI. One method of Adderall education would be to create an Adderall abuse program similar to existing alcohol abuse programs at the WPI SDCC. This organization is responsible for counseling students on alcohol and general drug abuse via educational programs already in place. The creation and installation of an Adderall-only abuse program would allow the SDCC to target the abuser population found in this study specifically.

Students' knowledge of Adderall side effects could be the major focus of a future study. We recommend the following for such a study:

I) When testing for the students' knowledge of the side effects of the drug, researchers use an equal number of respondents from each class to observe the specific trends in the analysis.

II) Quantify the responses on a less general scale that incorporates more specific side effects as opposed to grouping the side effects to facilitate coding, as done in this project. For example, we grouped like-side effects into one coding category (i.e., fitful sleeping and sleeplessness was one category, but may be two separate categories).

III) To increase the number of students who will actually answer the question regarding side effects, it may be useful to create a list of side effects: both positive and negative, that are specific to Adderall, but include health side effects completely unrelated to Adderall. Then, have students, on the survey, circle which ones they think are specific to Adderall. Because this is not posed as an open-ended question, it will likely increase the response rate.

Perceived Acceptance

The majority of the respondent population (62%) reported that using Adderall for academic improvement was unacceptable. While this large percentage shows a strong anti-abuse attitude, still 17% reported that they thought it was acceptable, while 21% was unsure. The percentage of those students who believe that it is acceptable to use Adderall for academic purposes is problematic as it stands. Moreover, the group of reportedly "unsure" students may be persuaded by health materials to refrain from using Adderall in the future. However, it is still possible that these students are, because of such an unsure attitude, that much more vulnerable to being persuaded in the other direction, toward abusing Adderall.

One possible method of lowering these two percentages may be through the construction of Community Advisor (CA) or Residential Advisor (RA) programs for the first-year students. As explained in the Methodology, CAs and RAs are required to hold programs throughout the semester that address various aspects of first-year student life, including time management, alcohol and drug abuse, and safe-sex education. We suggest that at least one program be dedicated to the discussion of Adderall, associated side effects, and the health and legal ramifications of off-label use. Informing first-year students early in their time at WPI may be an effective drug abuse prevention technique as this group is where we saw the least amount of abuse.

As part of these programs, CAs and RAs may want to include real-life examples of Adderall abuse. These examples could be the same online narratives that we analyzed during our research, particularly ones in which these abusers had bad experiences on the drug. The insight and detailed experiences offered by these posts are informative and may even instill fear in students that may motivate them not to use the drug.

Academic advisors should suggest that first-year students limit the number of extracurricular activities in their schedules during particularly difficult terms. For upperclass students, those completing multiple-term IQP or MQP projects, an agreeably stressful time, may want to lighten their extracurricular activities also. Advisors may suggest taking less demanding classes coupled with these projects.

We saw the largest group of reported abusers was in the upperclass student population. While using the same abuse-prevention techniques we recommend for first-year students may not be as effective in this demographic, we suggest the school offer several time-management workshops, available to all upperclass students. Because we saw a higher abuse rate in students with busier schedules, showing students how to organize their day and manage their time may help prevent them from resorting to stimulant abuse to cope with such a demanding schedule.

WPI should also distribute literature regarding Adderall. This may be in the form of posters around the school or brochures that discuss side effects, drug and alcohol interactions with Adderall, and legal ramifications of possession and distribution, all of which are topics especially important to a student abuser of Adderall.

CONCLUSIONS

In conclusion, we recommend first that programs be generated by Resident and Community Advisors to educate first-year students on Adderall, with emphasis on the health and legal ramifications associated with off-label use. Educating students early in their WPI career may help prevent Adderall abuse, rather than later when it could become an actual problem.

Results from this project may be useful by the Student Development and Counseling Center, an organization that handles drug and alcohol counseling for students. Currently at the SDCC there exist no programs dedicated solely to Adderall education. Research done in this program could aid those in the SDCC that are responsible for constructing programs that help educate students on drug abuse. Adding such a program will expand the breadth of how the SDCC helps students. Furthermore, the results of this project should be used by the SDCC for a WPI baseline record. Currently, there are no available statistics regarding Adderall abuse at WPI, and so this project will stand as the basis of comparison to future data that may be useful to this organization.

Campaign literature to be used as an education tool regarding Adderall could be created via another Interactive Qualifying Project. Utilizing WPI students to create this literature is especially recommended, for various reasons. Students, rather than faculty, are likely more cognizant of the buying and selling that is occurring on the campus. Students who would potentially work on any extension of the project are already integrated into the student body that is using Adderall. This would give students a unique background for the project that faculty likely do not have.

Surveys could be distributed annually and trends could be observed on a year-to-year basis. Analysis of the changing student body would indicate whether or not Adderall abuse levels on campus were increasing or decreasing on a much larger scale than our current data. More importantly, future researchers should aim for a larger respondent population to obtain a more accurate data set. With a larger data set, further correlations amongst majors, GPA, and student activities and likelihood of abuse could be generated. Results from this project represent just over 11% of the total undergraduate population at WPI.

Also, this IQP may serve as a model for other schools that may want to survey their own undergraduate population to determine the frequency of Adderall abuse at their respective universities. Our paper survey and online website may serve as model research tools that could be implemented in other schools to gather similar data.

Data collected in this project revealed that the abuse of Adderall within the undergraduate student body at WPI is a present issue. This project provides the administration with the necessary background to proceed with the steps to try to mitigate this abuse, while also standing as a model for other schools to quantify any possible Adderall abuse on their campuses. In an attempt to lower Adderall abuse on the collegiate level, showing students the negative effects of stimulant abuse, while simultaneously promoting better time-management skills, would help the same students compete in the demanding college atmosphere that exists today, but in a healthier environment.

REFERENCES

Adderall IR. [Photograph] (2011) .Retrieved September 2, 2011, from: http://cdn.aboutlawsuits.com/wp-content/uploads/barr-adderall-220.jpg.

Adderall XR. [Photograph]. (2011). Retrieved September 2, 2011, from: http://www.everydrugs.com/doc/images/catalog/268/adderall-xr-2_c.JPG.

American Academy of Pediatrics: Clinical practice guidelines: Diagnosis and Evaluation of the Child with Attention-Deficit/Hyperactivity Disorder. (2000). *American Academy of Pediatrics, 105, 1158-1170.*

Amphetamine. [Drawing of chemical model]. (2008). Retrieved September 2, 2011, from: http://en.wikipedia.org/wiki/File:Amphetamine-2D-skeletal.svg.

Berelson, Bernard. (1952). *Content Analysis in Communication Research*. New York, NY: Free Press.

Bhadra, Dhiman. (2011). Applied Statistics I: MA 2611. Lecture Notes (1-7). Retrieved from my.wpi.edu.

Brace, I. (2004). *Questionnaire Design: How to Plan, Structure and Write Survey Material for Effective Market Research*. London: Market Research in Practice Series.

Brain on Adderall. [Digital image]. (2011). Retrieved September 2, 2011, from: http://www.ehow.com/about_5418505_dangers-adderall.html.

Busch, C., De Maret, P.S., Flynn, T., Kellum, R., Le, S., Meyers, B., Saunders, M., White, R., Palmquist, M. (2005). Content Analysis. Writing@CSU. Colorado State University Department of English. Retrieved November 15, 2011 from http://writing.colostate.edu/guides/research/content/.

Centers for Disease Control and Prevention (2010). Attention-Deficit/Hyperactive Disorder (ADHD). Retrieved November 21, 2011, from: *http://www.cdc.gov/ncbddd/adhd/diagnosis.html.*

Checton, M. & Greene, K. (2010). College students' use of compliance-gaining strategies to obtain prescription stimulant medications for illicit use. Retrieved August 31, 2011, from: http://hej.sagepub.com/content/early/2010/08/09/0017896910375879.

Cooper, A. (2011). College students take ADHD drugs for better grades. *Cable News Network*. Retrieved August 31, 2011, from: http://www.cnn.com/2011/09/01/health/drugs-adderallconcentration/index.html

Couric, K. CBSNews (2010). Popping Pills a Popular Way to Boost Brain Power. Retrieved August 29, 2011 from http://www.cbsnews.com/stories/2010/04/22/60minutes/ main6422159 _page4.shtml?tag=contentMain;contentBody

Creech, S. President (2007). Sample Size. Retrieved March 1, 2007, from Statistical Consultant for Doctoral Students and Researchers: http://www.statisticallysi gnificantconsulting.com/Sample-Size-Help.htm

DeSantis, A. D., Noar, S. M., & Webb., E. (2009). Non-medical ADHD stimulant use in fraternities. *Journal of Studies on Alcohol & Drugs, 70, 952-954*

DeSantis, A. D., Webb, E. M, & Noar, S. M. (2008). Illicit use of prescription ADHD medications on a college campus: A multi-methodological approach. *Journal of American College Health*. 57, 315-324.

Dextroamphetamine. [Drawing of chemical model]. (2007). Retrieved September 2, 2011, from: http://upload.wikimedia.org/ wikipedia/commons/thumb/1/11/Dextroamphetamine-2D-skeletal.png/640pxDextroamphetamine -2D-skeletal.png.

Diagnostic and statistical manual of mental disorders, DSM-IV-TR.. (4 ed.). (2000). Arlington, VA: American Psychiatric Publishing, Inc.

Division of Instructional Innovation and Assessment (2011). The University of Texas at Austin. Organizing and Formatting Surveys. Instructional Assessment Resources. 2007. Retrieved September 2, from: http://www.utexas.edu/academic/ctl/assessment/iar/research/plan/method/survey.php.

Dubuc, B, & Diagen, A. (2002). Amphetamines - The brain from top to bottom. Retrieved September 22, 2011, from: http://thebrain.mcgill.ca.

Garnier, L. et. Al. (2010). Sharing and selling of prescription medications in a college studentsample. Retrieved January 11, 2012, from: http://www.ncbi.nlm.nih.gov/pmc /articles /PMC2845992/

Hall. K. et. Al. (2010). Illicit Use of Prescribed Stimulant Medication Among College Students. Retrieved January 11, 2012, from: http://www.tandfonline.com/doi/abs/10.3200/ JACH.53.4.167-174.

Harvard Health Publications (2004). ADHD Harvard health letter. Retrieved November 14, 2011, from: http://www.health.harvard.edu/press_releases/adult_adhd_treatment.

Harvard Health Publications (2004). ADHD not just a children's disease, says Harvard Health Letter. Retrieved November 4, 2011, from: http://www.health.harvard.edu/press_releases/ adult_adhd_treatment.

Health Education Journal (2010). College students' use of compliance-gaining strategies to obtain prescription stimulant medications for illicit use. Retrieved September 3, 2011 from http://hej.sagepub.com/content/early/2010/08/09/0017896910375879.

Heinricher, A. (Dean of Undergraduate Students at Worcester Polytechnic Institute) in discussion with the authors, November 2011.

Iarossi, G. (2006). The Power of Survey Design: A User's Guide for Managing Surveys, Interpreting Results, and Influencing Respondents. Washington, D.C.: The World Bank.

International Society For Complexity, Information, and Design (ISCID) (2005). Dopamine. Retrieved September 22, 2011, from: from http://www.iscid.org/encyclopedia/Dopamine.

Journal of Attention Disorders (2009). Nonmedical Prescription Stimulant Use Among a Sample of College Students: Relationship with Psychological Variables. 13:284 Retrieved September 4, 2011 from http://jad.sagepub.com/content/13/3/284.

Journal of Attention Disorders. (2010). ADHD in the College Student: Is Anyone Else Worried? Retrieved September 2, 2011 from http://jad.sagepub.com/content/14/1/3.abstract.

Jun, M. (2005). Alcohol, tobacco and other drug use by Indiana children and adolescents: the Indiana prevention resource center survey. Retrieved September 4, 2011 from http://www.drugs. indiana.edu/publications/survey/indianaSurvey_2011.pdf

Kirsch, D. (M.D. of Boston University School of Medicine, 1979 in Psychiatry, Psychopharmacology, Psychotherapy) in discussion with the authors, December 2011.

Levoamphetamine. (2007). Retrieved September 2, 2011 from: http://www.neurochem.comyr. com/epi_ra_files/levoamphetamine.png

Magomedov, A. (n.d.). How to Convince Your Shrink You Have ADD/ADHD (2006). Retrieved December 14, 2011, from: http://exile.ru/print.php?ARTICLE_ID=8226&IBLOCK_ID=35

MedlinePlus. (2010). Dextroamphetamine and Amphetamine. Retrieved January 11, 2012, from: http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601234.html

Meyer, J. (2004). Effect of verbal aggressiveness on the perceived importance of secondary goals in messages. Retrieved September 1, 2011 from Communication Studies 2004: 55: 168-84.

Microsoft Office Excel. (2012). "TTEST" Applies to: Microsoft Office Excel 2003. Retrieved January 11, 2012 from http://office.microsoft.com/en-us/excel-help/ttest-HP005209325.aspx

National Center for Biotechnology Information. (2011). Attention Deficit Hyperactive Disorder (ADHD). Retrieved October 9, 2011 from http://www.nimh.nih.gov/health/publications/attention-deficit-hyperactivity-disorder/complete-index.shtml

National Institute on Drug Abuse. (2002). Director's Report to the National Advisory Council on Drug Abuse. Retrieved September 3, 2011 from http://www.apa.org/about/gr/science/spin/ 2011/09/drug-abuse.pdf

National Institute of Mental Health. (2008). Retrieved November 11, 2011 from http://www.nimh.nih. gov/health/publications/attention-deficit-hyperactivity-disorder/complete-index.shtml

Ness, E. (2012). Dangers of Adderall. Retrieved January 25, 2012 from http://www.ehow.com/abo ut_5418505_dangers-adderall.html

RampWeb Web Accessibility Consulting. (2007). Retrieved January 25, 2012, from: http://www.RampWEB.com

Salant, P. & Dillman, D. (1994). How to Conduct Your Own Survey. Hobroken, NJ, Wiley.

Sheehan, K. (2001). E-mail Survey Response Rates: A Review. Journal of Computer Mediated Communication, 6 (2).

Shire Pharmaceuticals. (2011). Retrieved from http://pi.shirecontent.com/PI/PDFs/AdderallXR_USA_ ENG.PDF

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2009). The NSDUH Report: Nonmedical Use of Adderall® among Full-Time College Students. Retrieved September 1, 2011 from http://oas.samhsa.gov/2k9/adderall/adderall.htm

Sussman, S. et. al. (2006). Misuse of "study drugs:" prevalence, consequences, and implications for policy. Retrieved January 11, 2012 from http://www.substanceabusepolicy.com/content/1/1/15

Student Doctor Forums. (n.d.). Student Doctor Network Forums. Retrieved November 2, 2011 from http://forums.studentdoctor.net/index.php

Swanson, J. et al. (1998). Analog Classroom Assessment of Adderall® in Children with ADHD. Journal of the American Academy of Child & Adolescent Psychiatry, 37, 5, 519-526, ISSN 0890-8567, DOI: 10.1097/00004583-199805000-00014

The NSDUH Report. (2009). Nonmedical use of Adderall among full-time college students. Retrieved August 14, 2011 from http://oas.samhsa.gov/2k9/adderall/adderall.pdf

Tolles, E. (Head of the Student Development and Counseling Center) in discussion with the authors, November 2011.

Understanding Addiction. (2011). Dopamine – A Sample Neurotransmitter, Retrieved from http://www.utexas.edu/research/asrec/dopamine.html

United States National Library of Medicine/PubMed Health. (2010). Dextroamphetamine and Amphetamine. Retrieved August 28th, 2011 from http://www.ncbi.nlm.nih.gov/pubmedhealth /PMH0000166/

Yan, S. (2006). Understanding Generation Y. Retrieved January 11, 2012 from http://www.oberlin.edu/stupub/ocreview/2006/12/08/features/Understanding_Generation_Y.html

Yun, G.W. & Trumbo, C.W. (2000). Comparative Response to a Survey Executed by Post, E-mail, and Web Form. Journal of Comuter Mediated Communications 6(2).

APPENDIX

Table A-1. Excel data sheet of all collected IRB approved undergraduate surveys. This is the full coded data sheet organized in Microsoft Excel of the distributed surveys to the undergraduate population at WPI.

Q1=GENDER; 1=MALE, 2=FEMALE
Q2=AGE;1=17,2=18,3=19,4=20,5=21,6=22
Q3=CLASSYEAR;1=2012,2=2013,3=2014,4=2015
Q4=GPA;1=2·2.49,2=2.5·2.99,3=3·3.49,4=3.5·4
Q5=MAJOR;1=BME,2=ECE,3=CHE,4=BIOCHEM,5=MANAGE,6=RBE,7=CHEM,8=MA,9=ME,
Q6=EX.ACTIVITIES;1=ATHLETICS,2=GREEK,3=CLUBS,4=HONORARY,5=NONE,6=OTHER
Q7=OPENRESP;1=80%,2=60%,3=40%,4=20%
Q8=ACADEMICS;1=YES,2=NO,3=NS
Q9=SOCIAL;1=YES,2=NO,3=NS
Q10=KNOW_ANYONE_THAT_TAKES_WITHOUT;1=YES,2=NO
Q11=HAVE_ADHD;1=YES,2=NO
Q12=HAVE_A_PRESCRIPTION;1=YES,2=NO
Q13=YOU_TAKE_WITHOUT;1=YES,2=NO

ID	Q1	Q2	Q3	Q4	Q5	Q6 TOTAL	ATHLETICS	GREEK	CLUBS	HONORARY	NONE	OTHER	Q7	Q8	Q9	Q10	Q11	Q12	Q13
S1	1	2	4	3	ECE	1			1					4	3	2	2	2	2
S2	2	2	4	2	CH	2		1	1					4	2	2	2	2	2
S3	1	3	4	3	MNG	1			1					4	2	2	2	2	2
S4	2	2	4	2	BME	2		1	1					1	2	2	1	2	2
S5	1	2	4	4	CHE	1	1							3	2	2	2	2	2
S6	1	2	4	3	ME	0					0			4	2	3	2	2	2
S7	1	2	4	4	UN	1						1		4	2	2	2	2	2
S8	2	1	4	4	BIOCHEM	1			1					4	2	2	2	2	2
S9	2	3	4	4	ME	2			1			1		4	2	2	2	2	2
S10	2	2	4	4	ECE,CS	1			1					2	3	2	2	2	2
S11	1	2	4	4	ECE	1			1					4	2	2	2	2	2
S12	1	2	4	4	ME	1			1					3	2	2	2	2	2
S13	1	2	4	3	ME	0					0			4	2	2	2	2	2
S14	1	2	4	3	CS	0					0			3	2	2	2	2	2
S15	1	2	4	3	BIOTECH	1	1							4	1	2	1	2	2
S16	1	3	4	2	CE	1	1							3	3	2	2	2	2
S17	2	2	4	4	ME	2	1		1					4	2	2	2	2	2
S18	2	3	4	4	CH	2		1	1					4	2	2	1	2	2
S19	2	3	4	3	BME	2		1	1					1	2	2	2	2	2
S20	2	2	4	4	BME	2		1	1					4	2	2	2	2	2
S21	1	3	4	2	RBE, ECE	1			1					4	2	2	2	2	2
S22	2	2	4	4	RBE, ECE	1			1					4	2	2	2	2	2
S23	1	3	4	2	BME	1			1					4	2	2	2	2	2
S24	1	2	4	2	CHE	1						1		4	2	2	2	2	2
S25	2	2	4	2	CS	1			1					3	3	3	2	2	2
S26	2	2	4	3	BME	3	1	1	1					3	2	2	1	2	2
S27	2	2	4	3	BME	1		1						4	3	2	2	2	2
S28	1	3	3	4	MNG	3	1	1	1					4	3	3	2	2	2
S29	2	3	3	4	ME	3			1	1		1		4	2	2	2	2	2
S30	2	2	4	4	ME	2		1	1					4	2	2	2	2	2
S31	1	3	4	4	AE	2	1		1					4	3	3	2	2	2
S32	1	2	4	3	AE	1						1		4	2	2	2	2	2
S33	2	3	4	3	BIOCHEM	2	1		1					3	1	2	1	2	2
S34	1	3	3	4	AE	2	1		1					4	3	3	2	2	2
S35	2	2	4	3	CE,EE	2		1	1					4	2	2	1	1	2
S36	1	2	4	2	MA	0					0			4	2	2	2	2	2
S37	1	2	4	4	CS	1	1							2	1	2	2	2	2
S38	1	2	4	3	CS	0					0			4	3	3	2	2	2
S39	1	2	4	3	CS	1			1					4	3	3	2	2	2
S40	2	3	4	2	ME	1	1							4	2	2	2	2	2
S41	2	3	4	3	BME	3	1	1	1					3	2	2	2	2	2
S42	2	2	4	3	BME	2	1		1					4	2	2	2	2	2
S43	2	2	4	4	CE	2	1		1					4	1	2	1	2	2
S44	2	2	4	3	BME	1	1							4	1	1	1	2	2
S45	2	2	4	3	BME	2		1	1					4	1	1	1	2	2
S46	2	2	4	2	CS	1			1					4	3	3	2	2	2
S47	2	2	4	4	BME	1			1					4	2	2	2	2	2
S48	2	3	4	4	UN	1			1					4	2	2	2	2	2
S49	2	2	4	4	CHE	2		1	1					4	1	2	2	2	2
S50	1	3	4	4	PH	0					0			4	2	2	2	2	2
S51	1	2	4	4	CS	0					0			4	3	3	2	2	2
S52	1	3	4	3	IMGD	1	1							4	3	3	2	2	2
S53	1	2	4	3	CS	0					0			4	3	3	2	2	2
S54	1	2	4	2	CE	1	1							4	2	2	2	2	2
S55	1	2	4	3	IMGD	1			1					4	1	1	2	2	2
S56	1	3	4	3	AE	2	1		1					4	3	3	2	2	2
EAST																			
R1	1	6	4	3	RBE	0	0	0	0	0	0	0		4	2	2	1	2	2
R2	1	4	2	4	CS	1	0	0	1					4	1	1	2	2	2
R3	1	3	3	3	ME	1			1					3	1	1	1	2	2
R4	2	3	3	3	BB	2		1	1					4	2	2	2	2	2
TKE																			
R5	1	5	1	2	ChE	2		1	1					4	3	2	1	1	2
R6	1	5	1	3	Civil	2		1	1					3	1	2	1	2	2
R7	1	6	1	4	ECE	2		1		1				4	1	1	2	2	2
R8	1	7	1	2	RBE	2	1	1						4	2	2	2	2	2
R9	1	5	1	3	ChE	1		1						2	1	2	1	2	2
R10	1	5	1	1	RBE	1		1						4	3	3	2	2	2
R11	1	5	1	4	ME/RBE	3		1	1	1				4	2	1	1	2	2
R12	1	5	1	3	MAC	3	1	1	1					4	3	2	1	2	2
R13	1	5	2	3	CS	3	1	1	1					4	2	2	1	2	2
R14	1	5	1	2	AE	2		1	1					4	2	2	1	2	2
R15	1	5	2	3	MA	2		1	1					3	2	2	2	2	2
R16	1	5	1	3	RBE	4	1	1	1	1				3	2	2	1	1	2
R17	1	4	1	2	ME	3	1	1	1					4	1	1	1	2	2
R18	1	4	2	4	ECE	2		1	1					4	3	3	1	2	2
R19	1	4	2	3	ME	2	1	1						4	2	2	1	2	2
R20	1	4	2	4	EnvE	2		1	1					4	2	2	1	2	2
R21	1	4	3	3	BME	3	1	1	1					4	2	2	2	2	2
R22	1	4	3	3	CH	2		1	1					4	3	3	1	2	2
R23	1	4	3	3	ECE	1		1						4	1	3	1	2	2
R24	1	4	2	2	ActMA	1		1						4	1	2	2	2	2
R25	1	4	2	4	ChE	2		1	1					4	2	2	1	2	2
R26	1	3	3	3	RBE	2		1	1					4	2	2	2	2	2
R27	1	3	3	1	AE	1		1						4	3	3	1	2	2
R28	1	3	3	2	MAC	1		1						4	3	3	2	2	2
R29	1	3	3	3	ChE	2		1	1					4	2	2	1	2	2
R30	1	3	3	2	ME	2		1	1					4	1	1	1	2	2
R31	1	3	3	4	PH	3		1	1	1				4	1	1	1	2	2
R32	1	3	3	3	ME/MGE	2	1	1						4	2	2	1	2	2
R33	1	5	2	2	BC	1		1						3	1	2	1	1	1
R34	1	5	2	2	ChE	2		1	1					4	2	2	2	2	2
R35	1	5	2	3	CEE	2		1	1					4	1	3	1	2	2
R36	1	5	1	4	ECE	1		1						4	1	1	1	2	1
R37	1	5	1	3	Hum	2	1	1						3	1	1	1	1	2

AZD																		
R38	2	5	1	4 BME.premed	4	1	1	1	1			3	2	2	1	2	2	1
R39	2	3	3	3 BIOCHEM	2	1	1					4	2	2	2	2	2	1
R40	2	5	1	2 BIOCHEM	2		1	1				4	1	2	1	2	2	1
R41	2	4	1	4 Civil	3	1	1	1				2	2	2	1	1	1	2
R42	2	6	1	4 ME.	5	1	1	1	1		1	4	2	2	2	2	2	2
R43	2	6	1	3 ME/FPE	2		1	1				4	2	2	1	2	2	2
R44	2	6	1	4 Civil	2		1	1				4	3	3	2	2	2	2
R45	2	6	1	4 BME..	4	1	1	1	1			3	2	2	2	2	2	2
R46	2	6	1	4 BME..	3		1	1	1			4	2	2	1	2	2	2
R47	2	5	1	3 ME.	2		1	1				4	3	2	1	2	2	2
R48	2	5	1	4 BIOCHEM	2		1	1				4	2	2	2	2	2	2
R49	2	5	1	4 AE	1		1					4	2	2	1	2	2	2
R50	2	5	2	4 BIOCHEM	3		1	1	1			4	2	2	1	2	2	2
R51	2	5	1	3 EVE	2		1	1				4	2	2	1	2	2	2
R52	2	5	1	3 ChE	2	1	1					4	2	2	1	2	2	2
R53	2	5	1	4 ChE	3		1	1	1			4	2	2	1	2	2	2
R54	2	5	1	2 MAC	1		1					4	3	2	1	2	2	2
R55	2	5	1	3 ME/FPE	4	1	1	1	1			4	2	2	1	2	1	2
R56	2	5	1	3 ME.	2		1	1				4	3	2	1	2	2	2
R57	2	5	1	3 ME..	3		1	1	1			4	2	2	2	2	2	2
R58	2	5	1	4 ECE/RBE	3	1	1	1				4	2	3	2	2	2	2
R59	2	5	1	3 BME..	3	1	1	1				4	1	2	1	2	2	2
R60	2	5	1	3 BB	3		1	1	1			3	2	2	1	1	1	2
R61	2	4	2	2 ChE	2		1	1				4	2	2	2	2	2	2
R62	2	4	2	3 MIS	2		1	1				4	2	2	1	2	2	2
R63	2	4	2	4 ME..	2	1	1					3	3	2	2	2	2	2
R64	2	4	2	3 BB	3		1	1	1			3	2	2	1	2	2	2
R65	2	4	2	2 Civil	3	1	1	1				4	2	2	2	2	2	2
R66	2	4	2	4 ChE	3		1	1	1			4	2	2	1	2	2	1
R67	2	4	2	2 Manage	2		1	1				3	2	1	1	2	2	2
R68	2	4	2	4 ChE	3		1	1	1			4	2	2	2	2	2	2
R69	2	4	2	2 BioChem	2		1	1				4	2	2	2	2	2	2
R70	2	4	3	2 BME..	2		1	1				4	2	2	1	2	2	2
R71	2	4	2	2 BB	2	1	1					4	2	2	2	2	2	2
R72	2	4	2	3 ME..	4	1	1	1			1	4	2	2	2	2	2	2
R73	2	4	2	3 BB	4	1	1	1			1	4	3	2	2	2	2	2
R74	2	2	3	3 MG	3	1	1	1				4	2	2	2	2	2	2
R75	2	3	3	2 ME..	3	1	1	1				4	1	2	1	2	2	2
R76	2	3	3	3 IE	2		1	1				4	1	2	1	2	2	2
R77	2	3	3	3 BME..	2		1	1				4	2	2	1	2	2	2
R78	2	3	2	3 Act.	1		1					4	2	2	1	2	2	2
R79	2	3	3	2 BIOCHEM	3	1	1	1				4	2	2	2	2	2	2
R80	2	3	3	4 BME..	2		1	1				4	3	2	2	2	2	2
R81	2	3	3	4 BME..	2		1	1				4	3	2	2	2	2	2
R82	2	3	3	4 ChE	2		1	1				4	3	3	2	2	2	2
R83	2	3	3	3 ChE	3	1	1	1				4	2	2	1	2	2	2
R84	2	3	3	2 Civil	2		1	1				4	2	2	1	2	2	2
R85	2	3	3	3 BME..	2		1	1				4	2	2	2	2	2	2
R86	2	3	3	3 BME..	2		1	1				4	2	2	1	2	2	2
R87	2	3	3	4 IMGD	3	1	1				1	3	2	2	1	2	2	2
R88	2	3	3	3 EVE	2	1	1					4	1	2	2	2	2	2
R89	2	3	3	3 Civil	2		1				1	4	2	2	2	2	2	2
R90	2	3	3	4 BME...	3	1	1	1				4	2	2	2	2	2	2
R91	2	3	3	4 BME..	3	1	1	1				4	2	2	2	2	2	2
R92	2	3	3	3 BME...	3	1	1	1				4	2	2	2	2	2	2
R93	2	3	3	4 BME...	2		1	1				4	2	2	2	2	2	2
R94	2	3	3	4 CH/EVE	3	1	1	1				4	2	3	2	2	2	2
R95	2	3	3	3 CE/EVE	4	1	1	1			1	3	2	2	1	2	2	2
R96	2	3	3	2 BME..	2	1	1					4	2	2	2	2	2	2
AP																		
R97	2	5	1	3 ME..	1		1					4	3	2	1	2	2	1
R98	2	3	3	3 ChE	2		1	1				3	3	2	1	2	2	1
R99	2	3	4	2 ME..	2	1	1					4	2	2	2	1	2	2
R100	2	5	1	2 Civil	1		1					3	1	2	1	1	1	2
R101	2	5	1	3 ME..	2		1	1				1	2	2	1	1	1	2
R102	2	3	3	2 ChE	3	1	1	1				3	1	2	1	1	1	2
R103	2	3	3	4 ChE	3	1	1	1				4	2	2	1	2	2	2
R104	2	3	3	3 Act.	2		1	1				4	2	2	1	2	2	2
R105	2	3	3	3 BME...	2		1	1				4	2	2	2	2	2	2
R106	2	3	3	2 BME...	3	1	1	1				4	3	2	2	2	2	2
R107	2	5	1	2 BME...	2		1	1				3	2	2	1	2	2	2
R108	2	4	2	3 MGE	3	1	1	1				4	2	2	2	2	2	2
R109	2	4	2	4 ChE	3		1	1	1			3	2	2	2	2	2	2
R110	2	2	4	3 BIOCHEM	3	1	1	1				4	2	2	2	2	2	2
R111	2	2	4	4 BME...	2		1	1				4	2	2	2	2	2	2
R112	2	2	4	3 CH..	2		1				1	4	2	2	2	2	2	2
R113	2	2	4	4 ChE	1		1					4	2	2	2	2	2	2
R114	2	2	4	3 ChE	3	1	1	1				4	2	2	2	2	2	2
R115	2	2	4	3 BME...	3	1	1	1				4	2	2	2	2	2	2
R116	2	2	4	3 BME...	2		1	1				4	2	2	1	2	2	2
R117	2	2	4	2 UN	3	1	1	1				3	3	2	2	2	2	2
R118	2	2	4	3 CH..	2	1	1					4	2	2	2	2	2	2
R119	2	2	4	4 BME...	2		1	1				4	2	2	2	2	2	2
R120	2	2	4	3 BME...	3		1	1			1	4	2	2	1	2	2	2
R121	2	2	4	2 Biotech	1		1					4	2	2	2	2	2	2
R122	2	3	4	3 Civil	3		1	1	1			3	2	2	1	2	2	2
R123	2	3	3	4 ME..	2		1	1				3	2	2	1	2	2	2
R124	2	3	3	2 ME..	3		1	1			1	4	3	2	1	2	2	2

LCA																			
R125	1	5	1	3	ChE	3	1	1	1				3	1	2	1	2	2	1
R126	1	5	1	3	MA--	2		1	1				4	1	1	1	2	2	1
R127	1	4	2	2	Civil	2		1	1				3	2	2	1	2	2	1
R128	1	4	2	3	ChE	2		1	1				1	1	1	1	2	2	1
R129	1	5	1	2	Civil	3		1	1	1			3	3	2	1	2	2	2
R130	1	6	1	3	ME--	3		1	1	1			3	2	2	1	2	2	2
R131	1	5	1	3	AE	1		1					2	2	2	1	2	2	2
R132	1	5	1	4	AE	3		1	1	1			4	2	2	1	2	2	2
R133	1	5	2	1	MGE	3		1	1			1	4	2	2	2	2	2	2
R134	1	5	1	2	BBT	2	1	1					4	2	2	1	2	2	2
R135	1	5	1	2	ME--	3	1	1	1				4	2	2	1	2	2	2
R136	1	5	1	3	EVE	2		1	1				3	1	2	2	2	2	2
R137	1	5	1	3	ME--	2	1	1					4	2	2	1	2	2	2
R138	1	4	2	4	CS	3	1	1	1				3	1	2	2	2	2	2
R139	1	4	3	2	ME--	1		1					3	2	2	2	2	2	2
R140	1	4	2	3	Act--	1		1					4	2	2	1	2	2	2
R141	1	4	2	4	ME--	3	1	1	1				4	2	2	2	2	2	2
R142	1	4	2	3	Civil	3	1	1	1				4	3	3	1	2	2	2
R143	1	4	2	4	ME--	3		1	1	1			4	1	2	2	2	2	2
R144	1	4	2	2	Civil	3	1	1	1				4	2	2	2	2	2	2
R145	1	3	3	2	Civil	1		1					4	2	2	1	2	2	2
R146	1	3	3	4	EVE	3	1	1	1				4	2	2	1	2	2	2
R147	1	3	3	4	ME--	3	1	1	1				4	2	2	2	2	2	2
R148	1	3	3	4	BME--	2		1	1				3	3	1	1	2	2	2
R149	1	3	3	3	ME--	2		1	1				4	2	2	1	2	2	2
Riley																			
R152	2	3	2	3	ChE	1						1	4	2	3	2	2	2	2
R153	2	4	3	3	ChE	1			1				4	2	2	2	2	2	2
R154	2	3	3	2	MAC	2	1		1				3	3	2	2	2	2	2
R155	2	4	4	4	IE	2	1		1				4	1	1	2	2	2	1
R156	1	2	4	3	RBE	1			1				3	3	3	1	2	2	1
R157	1	3	4	3	ECE---	2	1		1				4	3	3	2	2	2	2
R158	2	3	4	4	MA--	1			1				4	1	2	2	2	2	2
R159	1	3	4	3	UN	2	1	1					4	1	2	2	2	2	2
R160	1	2	4	3	RBE	2	1		1				4	2	2	2	2	2	2
R161	1	2	4	3	RBE	2		1	1				4	2	2	1	2	2	2
R162	1	2	4	3	ChE	1	1						4	2	2	2	2	2	2
R163	1	2	4	4	ME--	1	1						4	2	2	2	2	2	2
R164	1	2	4	3	ChE	2	1		1				4	3	3	2	2	2	2
R165	1	2	4	4	CS	2		1	1				4	2	2	2	2	2	2
R166	1	2	4	3	CS	1		1					4	1	2	2	1	2	2
R167	2	2	4	3	CS	1			1				4	3	3	2	2	2	2
East																			
R170	1	3	3	4	MGE	3	1	1	1				4	1	1	1	2	2	1
R171	1	5	1	3	RBE	1			1				3	1	2	1	2	2	2
R172	1	3	2	4	ChE	2		1	1				3	2	2	1	2	2	1
R173	1	5	1	2	ME--	1			1				4	2	2	2	2	2	2
R174	1	6	1	4	Civil	3		1	1	1			1	2	2	1	1	2	1
R175	1	5	1	3	BME--	1					1		4	2	2	1	2	2	2
R176	1	5	1	4	ECE---	0							4	2	2	2	2	2	2
R177	2	5	1	4	Civil	2			1	1			3	2	2	1	2	2	2
R178	2	4	2	3	PH/MA	2		1	1				4	2	2	2	2	2	2
R179	1	6	1	2	CS	1			1				4	3	2	2	2	2	2
R180	1	4	1	3	ECE---	1						1	4	2	2	2	2	2	2
R181	1	6	1	1	CS	1		1					4	2	2	2	1	2	2
R182	1	5	1	4	RBE	1			1				4	2	2	2	2	2	2
R183	2	4	2	3	MA--	1					1		3	3	2	2	1	1	2
R184	1	5	1	3	MA--	1			1				4	3	2	2	2	2	2
R185	1	3	2	4	MA--	1			1				4	2	2	2	2	2	2
R186	2	4	2	3	BIOCHEM	3	1	1	1				4	2	2	2	2	2	2
Founders																			
S58	1	4	3	3	BIOCHEM	1			1				4	2	2	1	2	2	1
S59	1	4	3	3	CS	1						1	4	3	2	2	2	2	2
S60	1	3	3	3	CS	1	1						4	2	2	2	2	2	2
S61	2	4	3	3	BIOCHEM	3	1	1	1				4	1	1	1	2	2	1
S62	1	3	3	4	CS	2			1			1	3	1	2	2	2	2	2
S63	1	3	3	1	BIOCHEM	1			1				4	2	2	2	2	2	2
S64	2	3	3	3	BME	2		1	1				3	2	2	2	2	2	2
S65	1	4	3	4	CS	0					0		3	3	2	2	2	2	2
S66	1	4	3	2	CHE	1			1				3	1	2	1	2	2	2
S67	1	3	3	4	ECE	1						1	1	2	2	2	2	2	2
S68	2	3	3	4	BME	2			1			1	3	2	2	2	2	2	2
S69	2	3	3	4	BME	3	1		1			1	4	2	2	2	2	2	2
S70	1	3	3	2	ECE	1			1				4	3	2	2	2	2	2
S71	2	3	3	3	ME	1	1						4	2	2	2	2	2	2
S72	2	3	3	3	MA	0					0		4	2	2	2	2	2	2
S73	1	3	3	3	BIO	1		1					4	3	2	2	2	2	2
S74	1	4	3	1	CE	1			1				4	2	2	2	2	2	2
S75	1	5	2	4	ME	1						1	4	2	2	2	2	2	2
S76	2	3	2	4	CE	2			1	1			4	2	2	2	2	2	2
S77	1	5	2	3	ENV	1			1				4	3	3	2	2	2	1
S78	1	4	3	3	RBE	0					0		4	2	2	2	2	2	2
S79	1	3	3	4	ECE	0					0		2	2	2	2	2	2	2
S80	1	3	3	4	RBE	2	1	1					4	2	2	2	2	2	2
S81	2	3	3	4	AE	1	1						4	2	2	2	2	2	2
S82	1	4	3	3	AE	1		1					3	2	2	2	2	2	2
S83	1	3	3	3	CS	2	1		1				4	3	3	2	2	2	2
S84	1	4	2	3	CE	1	1						3	3	2	1	2	2	2
S85	2	4	2	3	BIOCHEM	3		1	1	1			3	3	2	1	2	2	1
S86	1	4	3	4	ME	2	1		1				4	3	2	2	2	2	2
S87	1	3	3	3	ME	1	1						4	2	2	1	2	2	1
S88	2	5	1	3	CHE	4	1		1	1		1	3	2	2	1	2	2	2
S89	1	4	3	2	BME	2	1		1				4	2	2	2	1	2	2
S90	1	4	2	3	BME	1			1				4	3	2	2	2	2	2
S91	1	3	4	4	CS	2	1		1				4	2	2	2	2	2	2
S92	1	4	2	3	BME	1	1						4	3	3	2	2	2	2
S93	1	2	2	4	ECE	3	1		1	1			4	2	2	2	2	2	2
S94	1	3	3	4	BME	1			1				4	2	2	2	2	2	2
S95	1	3	3	4	BIOINFO	1			1				3	2	2	2	2	2	2
S96	1	4	2	3	BIOTECH	1			1				3	2	2	2	2	2	2
S97	1	4	2	4	MATH	1			1				2	3	3	2	2	2	2
S98	1	5	2	2	ECE/RBE	2	1		1				4	2	2	2	2	2	2
S99	1	3	3	3	AE	2	1		1				4	2	2	2	2	2	2
S100	1	3	3	3	CS	0					0		4	2	2	2	2	2	2
S101	1	3	3	4	CS	1						1	4	2	2	2	2	2	2
S102	1	3	3	3	BIOTECH	2	1		1				3	2	2	2	2	2	2
S103	1	3	3	2	ME	2	1		1				4	3	2	2	2	2	2

Morgan'4																				
S104	1	3	4	3	CHE	1			1					4	2	2	2	2	2	2
S105	1	2	4	4	CS	2		1	1					3	2	2	1	2	2	2
S106	1	2	4	3	RBE	2	1		1					4	2	2	2	2	2	2
S107	1	3	4	3	ME	1			1					3	2	1	2	2	2	2
S108	1	2	4	3	BME	1			1					4	3	3	2	2	2	2
S109	1	3	4	4	ME	1			1					4	1	1	2	2	2	2
S110	1	2	4	3	ME	0					0			4	3	2	1	2	2	2
S111	1	2	4	4	ME	2	1	1						3	3	3	2	2	2	2
S112	1	2	4	4	ECE	1			1					4	2	2	2	2	2	2
S113	1	2	4	4	CHE	1			1					4	2	2	2	2	2	2
S114	1	2	4	4	ME	2	1		1					4	3	3	2	2	2	2
S115	1	3	4	3	PH	2			1				1	4	2	2	2	2	2	2
S116	1	3	4	3	BME	0					0			4	2	2	2	2	2	2
S117	1	2	4	3	CE	1	1							4	2	2	2	2	2	2
S118	1	2	4	4	RBE	1			1					3	3	2	2	2	2	2
S119	1	3	4	4	ME	2	1						1	3	2	2	2	2	2	2
S120	1	2	4	3	RBE/CS	2	1		1					4	2	2	2	2	2	2
S121	1	3	4	3	AE	2	1		1					4	2	2	2	2	2	2
S122	1	3	3	4	ME	2		1	1					3	2	2	1	2	2	2
S123	1	2	4	3	ECE	2			1				1	3	1	1	1	2	2	1
S124	1	2	4	3	CH	1	1							3	2	2	2	2	2	2
S125	1	2	4	3	RBE	1			1					4	3	3	2	1	2	2
S126	1	2	4	3	RBE/BME	2	1		1					4	2	2	2	2	2	2
S127	1	2	4	2	UN	2	1		1					4	3	3	2	2	2	2
S128	1	3	4	3	CHE	1			1					4	2	2	2	2	2	2
S129	1	2	4	4	ME	1			1					3	2	3	1	2	2	2
S130	1	2	4	4	ECE	1			1					4	2	2	2	2	2	2
S131	1	2	4	4	RBE	0					0			3	2	1	2	2	2	2
S132	1	3	4	3	ECE	3	1		1				1	4	3	3	2	2	2	2
S133	1	2	4	3	AE	1			1					3	2	2	2	2	2	2
S134	1	3	4	3	RBE/ME	0					0			4	1	1	2	2	2	2
S135	1	2	4	4	ME	1			1					3	2	2	2	2	2	2

Daniels																				
L2	2	2	4	2	ECE	2		1	1					4	3	3	2	2	2	2
L3	1	2	4	2	CHE	2	1	1						4	2	2	2	2	2	2
L4	1	2	4	4	BIOCHEM	0								4	3	3	2	2	2	2
L5	2	2	4	4	MANAGE	4	1	1	1	1				4	2	2	2	2	2	2
L6	1	2	4	3	ME	3	1	1					1	3	2	2	1	2	2	2
L7	1	2	4	4	ME,PH	2	1		1					4	2	2	1	2	2	2
L8	1	2	4	3	AE	1							1	4	2	2	2	2	2	2
L9	1	2	4	4	CE	1			1					4	2	2	2	2	2	2
L10	1	2	4	4	ME	2	1		1					3	2	2	2	2	2	2
L11	1	2	4	3	CE	1	1							4	2	2	2	2	2	2
L12	2	2	4	4	MAC	3	1	1	1					3	1	2	2	2	2	2
L13	2	2	4	3	AE	1		1						3	2	2	2	1	1	2
L14	2	2	4	3	CE	2	1	1						3	2	2	2	2	2	2
L15	2	4	4	3	CE	1			1					4	2	2	2	2	2	2
L16	1	3	4	3	ME	1			1					4	3	1	1	1	1	2
L17	2	2	4	3	ME	1			1					3	2	2	2	2	2	2
L18	2	2	4	4	ME,PH	2	1		1					4	2	2	2	1	1	2
L19	1	2	4	3	MA	1			1					4	3	3	2	2	2	2
L20	2	2	4	3	UND	1			1					2	2	2	2	2	2	2
L21	1	3	4	4	IE	1					1			4	2	2	2	2	2	2
L22	1	2	4	2	IE	1			1					4	2	2	2	2	2	2
L23	2	2	4	3	ME	3	1	1	1					4	2	2	2	2	2	2
L24	1	2	4	2	CHE	1					1			4	3	2	2	2	2	2
L25	1	2	4	3	ME	1			1					4	1	2	2	2	2	2
L26	2	2	4	4	CHE,MA	1		1						4	2	2	2	2	2	2
L27	2	2	4	3	EVE	3		1	1				1	4	2	2	2	2	2	2
L28	2	2	4	2	RBE	2		1	1					4	2	2	2	2	2	2
L29	1	3	4	4	ME	2	1		1					4	2	2	2	2	2	2
L30	1	2	4	3	ECO	1			1					4	2	2	2	2	2	2
L31	2	1	4	4	CE,IE	1			1					4	3	2	2	2	2	2
L32	2	2	4	3	BME	2		1	1					4	2	2	1	2	2	2
L33	1	2	4	3	ME	2		1	1					3	3	2	2	2	2	2
L34	1	2	4	4	AE	1			1					4	2	2	2	2	2	2
L35	2	2	4	3	BME	1		1						4	2	2	2	2	2	2
L36	2	2	1	3	CS	2	1		1					3	2	2	2	2	2	2
L37	1	2	4	2	RBE	1			1					4	3	3	2	2	2	2
L38	1	2	4	4	ME	1			1					4	3	3	2	2	2	2
L39	1	2	4	2	BIOCHEM	2	1	1						4	1	1	1	2	2	2
L40	1	2	4	3	ECE	1	1							4	2	2	2	2	2	2
L41	1	2	4	4	UND	2		1	1					4	2	2	2	2	2	2
L42	1	2	4	4	IMGD	1			1					4	3	2	2	2	2	2
L43	1	2	4	3	CS	0					0			3	3	3	2	2	2	2
L44	1	4	3	4	ECE	2			1				1	4	2	2	2	2	2	2
L45	1	3	4	3	IE	1		1						4	2	2	2	2	2	2
L46	1	2	4	3	EVE	1			1					4	3	3	2	2	2	2
L47	1	3	4	3	ME	2		1	1					4	2	2	2	2	2	2
L48	1	2	4	4	IE	2	1		1					4	2	2	2	1	1	2
L49	1	2	3	3	CHE	2	1	1						3	2	2	2	2	2	2
L50	1	3	4	4	BME	2	1		1					4	2	2	2	2	2	2
L51	2	2	3	4	CHE	1			1					4	3	2	2	2	2	2

RANDOM																			
N1	1	3	3	3	BIOCHEM	1		1				4	2	2	1	2	2	2
N2	2	3	3	3	CHE	1			1			2	3	2	1	2	2	1
N3	1	5	1	4	AE	1		1				3	1	2	1	2	2	1
N4	2	4	1	3	CE	1			1			4	1	2	1	2	2	1
N5	1	3	2	2	BIO/BIOTECH	1					1	4	1	1	1	2	2	1
N6	1	3	3	3	BIOCHEM	1		1				4	3	3	1	2	2	1
N7	2	5	1	3	BME	1			1			1	1	1	1	1	1	2
N8	1	6	1	2	MGE	2	1		1			4	2	2	1	2	2	1
N9	2	4	2	3	BB	3	1	1	1			4	2	2	1	2	2	1
N10	1	5	1	2	ECE	2	1		1			4	2	2	1	2	2	1
N11	1	4	1	3	BME	3	1	1	1			4	2	2	2	2	2	2
N12	1	4	3	2	BME	2			1	1		3	1	1	1	2	2	1
S137	2	4	2	3	ME::	1			1			3	1	2	1	2	2	1
S138	1	3	3	4	CHE:	1		1				4	1	2	1	2	2	1
S139	1	4	2	4	CHE:	2	1	1				4	1	1	1	2	2	1
S140	1	5	1	4	BBT	2		1	1			4	1	2	1	2	2	2
S141	1	4	2	3	CE::	1			1			3	1	2	1	2	2	1
S142	1	5	1	2	ME::	1					1	4	1	1	1	2	1	2
S143	2	4	2	4	BIOCHEM	1			1			3	2	2	1	1	1	2
S145	1	5	1	3	RBE:	1			1			4	2	2	2	2	2	2
S146	1	3	2	3	PH	1					1	4	2	2	1	2	2	2
S148	2	4	2	4	BIOCHEM	1			1			4	2	2	1	2	2	2
S151	1	4	3	3	CHE:	2			1	1		4	2	1	1	2	2	2
S152	1	5	1	3	AE	2		1	1			4	1	1	1	2	2	1
S153	2	4	3	2	ME::	2	1		1			4	1	1	1	2	2	2
S155	2	5	3	4	CHE:	3	1	1	1			4	2	1	1	2	2	2
S156	1	2	3	2	BIOCHEM	1	1					4	2	1	1	2	2	2
S157	2	3	3	2	ME::	1					1	4	2	2	1	2	2	2
S154	1	2	2	3	CE::	3	1		1	1		4	1	2	1	2	2	1
S150	2	3	3	3	AE	1			1			4	3	3	2	2	2	1
S149	2	2	2	3	BME	3	1	1	1			4	1	1	1	2	2	1
S147	2	4	3	2	ACT	2	1		1			4	1	2	1	2	2	1
S144	1	3	3	3		2	1		1			4	1	1	1	2	2	1
S158	1	3	2	3	CE::	2	1	1				4	3	2	2	2	2	2
S159	1	4	2	2	AE	1			1			4	2	3	2	2	2	2
S160	2	4	2	2	BIOTECH	1			1			4	2	2	2	2	2	2
S161	1	5	1	3	MA:	2	1		1			4	2	2	2	2	2	2
S162	2	2	3	2	PH	1			1			4	2	2	2	2	2	2
S163	1	3	2	3	BB:	3	1	1	1			4	3	3	2	2	2	2
S164	1	3	3	3	CH::	1			1			4	2	2	2	2	2	2

Table A-2. Excel data sheet of all collected IRB approved abuser undergraduate surveys. This is the full coded data sheet organized in Microsoft Excel of the distributed surveys to the undergraduate population at WPI that responded as abusers of Adderall.

Q20=FROM_WHO;1=WPI_FRIEND,2=NOT_WPI_FRIEND,3=STRANGER,4=WPI_AQUAINTANCE,5=RELATIVE
Q21=WHATPURPOSE_1=ACADEMIC,2=SOCIAL,3=MANAGE,4=OTHER
Q22=WHEN;1=DAILY,2=WEEKLY,3=MONTHLY,4=RARELY,5=OTHER
Q23=OTHER_SUB;1=ALCH,2=MARJ,3=TOBACCO,4=COCAINE,5=HEROIN,6=PRE_SED,7=PRE_PAIN,8=NA

ID	Q20							Q21					Q22	Q23							
	PRE¦PAIN	WPI$FRIEND	NA	NOT¦WPI$FRIEND	STRANGER	WPI$AQ	RELATIVE		ACADEMIC	SOCIAL	MANAGE	OTHER			ALCH	MARJ	TOBACCO	COCAINE	HEROIN	PRE¦SED	
R1					1						1			5		1	1	1			
R5				1						1				4		1	1				
R6				1		1				1				3		1		1			
R8		1			1		1	1		1		1		2			1	1			
R9		1								1				3		1		1	1	1	
R14		1								1		1		3		1		1			
R22		1			1			1		1		1		4		1					
R25		1			1			1		1				4		1		1			
R29		1								1				5		1		1			
R30		1								1				1		1					
R33		1								1			1	1		1		1		1	1
R35		1						1		1				3		1		1			
R38		1							1	1				4		1					
R39					1					1				5		1					
R40		1					1	1		1			1	4		1		1	1	1	1
R66		1								1				1		1					
R97		1			1					1				4		1					
R98		1								1				5		1		1			
R125		1								1				5		1		1	1		1
R126		1									1			5		1		1	1		1
R127					1						1			5		1		1	1		
R128		1						1		1	1	1		2		1		1			
R155		1								1				1		1					
R156		1								1				5		1		1	1		
R170		1			1			1		1	1			2		1		1		1	1
R172		1			1					1				2		1		1	1		
R174		1								1				5		1		1		1	1
S58					1		1			1	1			1		1		1			
S61					1			1	1		1	1		2		1		1			
S77					1		1	1		1		1		2				1	1	1	
S85					1					1		1		4		1					
S87					1		1	1		1	1			2		1		1			
S123					1				1	1		1		4		1		1	1	1	1
N10		1								1				3		1		1	1		
N9		1								1	1			3		1		1			
N8		1						1		1				3		1			1		
N6		1			1					1				3		1		1	1		
N5		1			1			1		1	1			1		1		1	1		
N4		1						1		1				2		1					
N3		1								1				5		1		1			
N2		1								1				2		1					
N12		1								1				1		1		1			
S144		1						1	1	1		1		1		1		1			
S139		1			1					1	1	1		2		1		1		1	1
S138		1								1				3		1		1			
S137		1								1				2		1					
S152		1						1		1	1	1		1		1		1			1
S144		1						1		1	1	1		2		1					
S147		1								1				1		1					
S149		1						1		1	1	1		2		1		1			
S150							1	1	1		1	1		4		1			1		1
S154					1				1	1				1		1		1			

Table A-3. Excel data sheet of all collected IRB approved user undergraduate surveys. This is the full coded data sheet organized in Microsoft Excel of the distributed surveys to the undergraduate population at WPI that responded as users of Adderall (The following table may be copied into excel for future reference).

Q14=REASON;1=OBEASE,2=NARCO,3=ADHD
Q15=INSTRUCTIONS;1=EXACT,2=LESS,3=MORE,5=OTHER
Q16=OTHER_SUB;1=ALCH,2=MARJ,3=TOBACCO,4=COCAINE,5=HEROIN,6=PRESED,7=PRE_PAIN,8=NA Q17a=ASK_FOR_PILLS;1=YES,2=NO
Q17b=IF_YES;1=WP_FRIEND,2=NOT_WP_FRIEND,3=STRANGER,4=WP_AQUAINTANCE,5=RELATIVE Q18=EVER_GIVEN_AWAY;1=YES,2=NO
Q19=REASONS;1=ACADEMIC,2=SOCIAL,3=MANAGE,4=UNAWARE,5=OTHER

ID	Q14	Q15	Q16	ALCH	MARJ	TOBACCO	COCAINE	HEROIN	PRESED	PRE_PAIN	NA	Q17a	Q17b	WP_FRIEND	NOT_WP_F	STRANGER	WP_AQU	RELATIVE	Q18	Q19	ACADEMIC	SOCIAL	MANAGE	UNAWARE	OTHER
R28	3	1	1	1	1							1	1					1		1		1	1		
R36	3	1	1	1								1				1				1			1		
R37	3	1	1	1								1	1												
R41	3	4	1	1								1	1		1				1	2					
R60	3	1	1	1	1							2													
R100	3	2	1	1	1							1	1		1			1	1	1		1		1	
R101	3	1	1	1					1			1	1					1		2					
R102	3	3	1	1	1							1	1					1		1		1			
R133	2	1	1	1					1			2													
R183	3	3	1						1			1	1							1					1
L13	3	1	1	1	1							2								2					
L16	3	2										2													
L18	3	1										2													
L48	3	3	1									1	1		1					2	1		3		
N7	3	3	1	1	1							1	1							1		1			
S143	3	3	1									1	1							1		1			
S142	3	3	1	1	1							1	1					1		2					

Table A-4. Excel data sheet of the reliability testing from question #7 (open-ended) on the IRB approved survey. This is the full coded data sheet organized in Microsoft Excel of the reliability testing from question #7 in the distributed surveys to the undergraduate population at WPI.

ID#	NR	POS	S1	S2	S3	S4	S5	S6	NEG	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
S1	1																					
S2	1																					
S3	1																					
S4				1									1	1								
S5				1																		
S6	1																					
S7	1																					
S8	1																					
S9	1																					
S10				1																		
S11	1																					
S12				1																		
S13	1																					
S14				1	1																	
S15													1									
S16				1																		
S17	1																					
S18	1																					
S19											1		1	1	1							
S20	1																					
S21	1																					
S22	1																					
S23	1																					
S24	1																					
S25				1																		
S26				1									1									
S27	1																					
S28	1																					
S29	1																					
S30	1																					

S31	1																					
S32	1																					
S33				1		1																
S34	1																					

S35	1																						
S36	1																						
S37				1									1										1
S38	1																						
S39	1																						
S40	1																						
S41				1																			
S42	1																						
S43	1																						
S44	1																						
S45	1																						
S46	1																						
S47	1																						
S48	1																						
S49				1																			
S50	1																						
S51	1																						
S52	1																						
S53			1																				
S54	1																						
S55	1																						
S56	1																						
EAST																							
R1				1									1										
R2																							1
R3				1																		1	1
R4				1																			
TKE																							
R5	1																						
R6				1							1			1									
R7											1			1									
R8	1																						
R9				1						1	1		1	1									
R10	1																						
R11				1																			

R12				1																		
R13				1																		
R14	1																					
R15				1										1	1							
R16													1			1						
R17	1																					
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R21	1																					
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R30																		1				
R31				1																		
R32	1																					
R33				1							1			1								
R34	1																					
R35															1							
R36	1																					
R37				1																		
AZD																						
R38				1									1	1								
R39	1																					
R40				1										1							1	
R41				1							1										1	
R42				1																		
R43	1																					
R44	1																					
R45				1																		1

R46				1																		
R47				1																		
R48													1	1								
R49	1																					
R50	1																					
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R68	1																					
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R95				1		1																	
R96				1																			
AP																							
R97				1											1								
R98				1									1	1									
R99	1																						
R100													1	1									
R101				1									1										
R102														1	1								
R103				1										1									
R104				1		1																	
R105	1																						
R106				1																			
R107				1									1										
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R110	1																						
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R118	1																					
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R120	1																					
R121	1																					
R122				1									1	1								
R123				1										1								
R124																						
LCA																						
R125	1																					
R126	1																					
R127				1																		
R128			1	1										1								
R129				1									1									
R130				1																		
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R134				1																		
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R136				1									1									
R137	1																					
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R139	1																					
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R142	1																					
R143												1										
R144	1																					
R145				1																		
R146	1																					
R147	1																					
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R149				1																		
R150	1																					
Riley																						
R151	1																					
R152	1																					
R153	1																					
R154	1																					
R155	1																					
R156																1						1
R157	1																					
R158	1																					
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R160	1																					
R161	1																					
R162				1																		
R163				1																		
R164	1																					
R165	1																					
R166	1																					
R167	1																					
R168	1																					
East																						
R169				1									1									
R170	1																				1	
R171																						
R172				1									1	1							1	
R173	1																					
R174				1									1									
R175	1																					
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R177				1										1								
R178				1																		
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R180	1																					
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R182	1																					
R183													1	1	1						1	
R184	1																					
R185													1									
R186	1																					
R187	1																					
Founders																						
S57	1																					
S58	1																					
S59	1																					
S60	1																					
S61				1																		
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S67													1	1	1						1	
S68				1																		
S69	1																					
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S97				1									1	1								
S98	1																					
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S100	1																					
S101	1																					
S102				1																		
S103	1																					
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ID#	NR	POS	S1	S2	S3	S4	S5	S6	NEG	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
S104	1																					
S105				1																		
S106	1																					
S107				1																	1	
S108	1																					
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S136				1											1								
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L51	1																						
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S137				1											1								
S138	1																						
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S161	1																					
S162	1																					
S163	1																					
S164				1																		
	NR		S1	S2	S3	S4	S5	S6		S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
L	257	0	2	127	1	7	0	0	0	2	6	1	40	30	12	3	0	1	0	0	11	6
S	258	0	1	123	1	6	0	0	0	2	2	0	41	31	6	0	1	2	0	0	13	12
414																						
	NR/414	POS	S1/414	S2/414	S3/414	S4/414	S5/414	S6/414	NEG	S7/414	S8/414	S9/414	S10/414	S11/414	S12/414	S13/414	S14/414	S15/414	S16/414	S17/414	S18/414	S19/414
	0.6208		0.0048	0.3068	0.0024	0.0169	0.0000	0.0000	0.0000	0.0048	0.0145	0.0024	0.0966	0.0725	0.0290	0.0072	0.0000	0.0024	0.0000	0.0000	0.0266	0.0145
	0.6232		0.0024	0.2971	0.0024	0.0145	0.0000	0.0000	0.0000	0.0048	0.0048	0.0000	0.0990	0.0749	0.0145	0.0000	0.0024	0.0048	0.0000	0.0000	0.0314	0.0290
%	100	100	100	99	100	100	100	100	100	100	99	100	100	100	99	99	100	100	100	100	100	99

1.Gender: □M □F

2.Age:_____

3.Class Year:□'12□'13□'14□'15

4.Current GPA:□2.00–2.49□2.50–2.99□3.00–3.49□3.50–4.00

5.Major:_____

6.Extracurricular Activities: (Check all that apply)

□Athletics

□Greek Life (Fraternities, Sororities)

□Clubs and Organizations (Outing Club, SHM, BMES, etc.)

□Honorary Societies (Rho Beta Epsilon, Tau Beta Pi, etc.)

□ None

□ Other:_____

7. If you are familiar with the drug Adderall, please list all side effects you are aware of (positive or negative) on a person who has taken it. If you are not familiar with any of the drug's side effects, leave the following space blank.

8.In your opinion, is it acceptable for students to use Adderall without a prescription to alter (improve) their academic performance? □ Yes □ No □ Not Sure

9. Is it acceptable for students to use Adderall without a prescription for recreational or social reasons? □ Yes □ No □ Not Sure

10. Do you know any students (personally) at WPI who take Adderall, or a generic equivalent, *without* a medical prescription? □ Yes □ No

11. Have you been diagnosed with Attention Deficit Hyperactive Disorder (ADHD)? □ Yes □ No

12. Do you have a medical prescription for Adderall or any of its generics? □ Yes □ No

*If you answered **yes** to question **12**, please skip to question **14**. If you answered **no**, please continue with the next question.*

13. Have you taken Adderall without a prescription? □ Yes □ No

*If you answered **yes** to question **13**, please skip to question **20**. If you answered **no** to question **13**, you have completed the survey. Do not answer any more questions after question 13. Please **stop** here, and turn in your survey as instructed. Thank you*

14. What is the primary reason for your Adderall prescription? (Choose one)

□ Obesity □ Narcolepsy □ ADHD

15. How closely do you follow your doctor's instructions for taking Adderall? (Choose one)

□ I follow them exactly (scheduled times)

□ I sometimes take it more often than instructed

□ I sometimes take it less often than instructed

□ Other: _____

16. Have you ever consumed any of the following substances? (Check all that apply)

□ Alcohol

□ Heroin

□ Marijuana

□ Prescription Sedatives

□ Tobacco Products (Cigarettes, Chew, etc.)

□ Prescription Painkillers

□ Cocaine

□ N/A

17. a) Has any WPI student ever asked you for any amounts of your Adderall pills? □ Yes □ No

b) If yes, from whom? (Check all that apply)

□ WPI Students who are friends

□ WPI Students who are acquaintances

□ Friends or acquaintances outside of WPI

□ Relatives

□ Strangers

*If you answered **yes** to question **17**, please continue below. If you answered **no** to question **17**, you have completed the survey. Please **stop** here, and return your survey as instructed. Thank you*

18. Have you ever given/sold any of your Adderall pills to another WPI student? □ Yes □ No

*If you answered **no** to question **18**, you have completed the survey. Please **stop** here, and return your survey as instructed. Thank you*

19. In response to question 18, what reasons (if any) did the buyer give for obtaining Adderall from you? (Check all that apply)

□ Academics (Studying for exams, completing projects, paying attention).

□ To manage personal tasks or to generally function better throughout the day.

□ Social and recreational reasons (Partying, gaming, increased sociability, decreased anxiety).

□ I am unaware of what they were going to use it for.

□ Other: _____

*You have now completed the survey. Do not answer any more questions after question **19**. Thank you for taking the time to complete this survey for our Interactive Qualifying Project in an effort to raise awareness of Adderall usage. Your feedback is important to us. Please return your finished survey as instructed.*

20. From whom have you obtained Adderall? (Check all that apply)

- ☐ WPI Students who are friends
- ☐ WPI Students who are acquaintances
- ☐ Friends or acquaintances outside of WPI
- ☐ Relatives
- ☐ Strangers

21. For what purpose do you use Adderall? (Check all that apply)

- ☐ Academics (Studying for exams, completing projects, paying attention).
- ☐ To manage personal tasks or to generally function better throughout the day.
- ☐ Social and recreational reasons (Partying, gaming, increased sociability, decreased social anxiety).
- ☐ Other: _____

22. *When* do you use generally use Adderall? (Choose one)

- ☐ Daily
- ☐ Rarely
- ☐ Weekly
- ☐ Other: _____
- ☐ Monthly

23. Have you ever consumed any of the following substances? (Check all that apply)

- ☐ Alcohol
- ☐ Heroin
- ☐ Marijuana
- ☐ Prescription Sedatives
- ☐ Tobacco Products (Cigarettes, Chew)
- ☐ Prescription Painkillers
- ☐ Cocaine

You have now completed the survey. Thank you for taking the time to complete this survey for our Interactive Qualifying Project in an effort to raise awareness of Adderall usage. Your feedback is important to us. Please return your finished survey as instructed.

Appendix 5. Final IRB approved Adderall survey distributed at WPI. This is the final IRB approved Adderall survey that was distributed to undergraduates at WPI to understand the user, abuser, and bystander profile on campus.