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Beyond Risk Factors: The Theoretical Contextualization of Illicit ADHD Medication Use Among High School Students

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Beyond Risk Factors: The Theoretical Contextualization of Illicit ADHD Medication Use
Among High School Students

by

William Christopher Watkins

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
Department of Criminology
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ABSTRACT

Prescription ADHD medication has been shown to be on the rise as a drug of abuse among young people. Unlike other drugs that serve only the purpose of achieving a high, this particular substance can also be perceived as useful and beneficial by those who abuse it. It is these positive attributes given to the illicit use of these drugs that make them so dangerous, especially in the hands of youths. To date extant research has made little effort to contextualize this type of drug use within theories of deviance. This study looks to fill that void as well as bridge the gap between current epidemiological studies on this topic and future etiological studies looking to assess causation within a theoretical context. Examining a national sample of 12th grade students (N=2,384), this study looks at what risk factors and predictors exist for the illicit use of ADHD medication. By testing aspects of social bonding and social learning theories, the goal is to assess which theory can best predict this type of drug use. Due to the low proportion of users, a rare events logistic regression is utilized in the analysis. While social learning items were able to account for the greatest level of variance in use, many of the findings contradict the theory, and therefore no theoretically based conclusions can be made at this time. Overall, more research needed on this topic using better fitting data tailored for theoretical interpretation. Considerations for future studies are also discussed.

Chapter One

Introduction

Drug use continues to be a heavily researched phenomenon with frequently shifting characteristics in addition to new drugs and different users entering into and leaving the drug scene. This is evidenced by the ongoing research of such surveys as Monitoring the Future (Johnston, Bachman, O'Malley, & Schulenberg, 2004) and the National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration, 2005). With overall government spending on drug prevention continually on the rise (The White House, 2003), it appears that ongoing research into drug use trends is a worthwhile venture in order to maintain a current assessment of the problem, as well as gain valuable insight on how to solve the problem. In this regard, it is necessary to conduct research investigating the numerous correlates of drug use as opposed to simply assessing the prevalence of use. In addition, etiological studies that are able to directly address the causes of drug use can also add valuable insight on this subject matter. By these means, researchers gain the ability to get to the root of the problem in the form of examining such things as circumstances surrounding the initiation and cessation of drug use, as opposed to simply studying the characteristics associated with a drug epidemic at a given point in time

Research on juvenile drug use, in particular, appears especially necessary as early onset of drug use has been linked to extensive, and persistent, drug involvement later in

life (Kandel, 1982). High school students, specifically, have received a great deal of interest in this regard as evidenced by this particular population being examined in such national drug surveys as those mentioned above. Bridging the gap between looking at juvenile drug use in a strictly epidemiological manner and moving towards examining this behavior from an etiological standpoint is a necessary first step in not only assessing the current problem, but also investigating the precursors this type of delinquency. While this has been done concerning many types of delinquency, including various forms of drug use, there is a notable gap in the literature concerning the specific type of substance use that is the subject of this study. Overall, this process may not result in a direct assessment of causation, as temporal ordering is not the primary concern at this point, however, researchers will still gain the ability to identify factors that contribute to this behavior and thereby gain the ability to provide at least a partial explanation of the current findings regarding the prevalence of juvenile drug use.

One such area of patterned drug use that has drawn particular attention in recent years is that of prescription drugs. While there have been several descriptive studies conducted on the topic of prescription drugs, there is a notable gap in the literature regarding the application of theoretical constructs. While theories of deviance as a whole, as well as the various principles composing these theories, have commonly been used to examine other specific forms of substance use (Marcos, Bahr, & Johnson, 1986; Akers & Cochran, 1985; Bahr, Maughan, & Marcos, 1998; Akers, Krohn, Kaduce, & Radosevich, 1979; Piquero & Sealock, 2000; Rebellon, 2002; Paternoster & Brame, 1997), little is known about the applicability of criminological theories to the

phenomenon of illicit use of prescription drugs. This study examines, specifically, the illicit use of prescription attention deficit-hyperactivity disorder (ADHD) medication.

This particular type of prescription medication merits attention because of its chemically abusive properties, which are similar in nature to those of cocaine and illegal amphetamines (Babcock & Byrne, 2000). Furthermore, the wide availability of the drugs, both legally and illegally, to younger populations through legitimate prescriptions and illicit sale also poses a public health risk (Robison, Sclar, Skaer, & Galin, 1999). This area of concern has been highlighted by the inclusion in recent years of illicit use measures for ADHD medication on national drug inquiries such as the high school version of the Monitoring the Future survey (Johnston, O'Malley, Bachman, & Schulenberg, 2007). Illicit use of these drugs for their intended effects (e.g. concentration and focus), as well as their side effects (e.g. diminished sense of drunkenness, enhancing the effects of other substances) can be alluring to young people. This may be in part due to perceived performance enhancements in the school realm such as greater efficiency in studying, in addition to other, more common, drug use motivations such as getting high or simple peer pressure.

The overall goal of this study is to add to the risk factor literature concerning drug use. Specifically, this inquiry seeks to be a worthwhile first step in the enhancement of epidemiological literature concerning this type of drug use as well as a solid starting ground by which future research can begin etiological assessments of the illicit use of ADHD medication. While assessing risk factors for drug use is an important step in this line of research, the interpretability and implications of findings is quite limited when the results are simply reported in a non-theoretical manner by which there is no existing

framework in which they may be fully understood. This study seeks to bridge that gap by examining existing risk factors for drug use, determining which fall into the perspective of one of two theoretical constructs, then assessing the predictive power of these risk factors on the illicit use of ADHD medication.

This project has two main components. The first is to identify general risk factors and predictors associated with the illicit use of ADHD medication as well as assess the overall prevalence of this type of drug use among high school students in a particular cross-section of time. This component is derived from an epidemiological point of view and while it will provide general information regarding this type of deviance, it is a basic analysis, not grounding in any sort of theoretical context. The second component seeks to remedy this as the illicit use of ADHD medication will then be examined within the context of two different theories of deviance: social bonding and social learning theory. This derives from an etiological perspective by which we may gain greater insight as to what factors contribute to the use of these substances via various theoretical standpoints. While this may seem contradictory, as using cross-sectional data in the analysis eliminates the opportunity to assess causation, taking the step from simply reporting prevalence and correlations without context to then framing these risk factors through theoretical perspectives works towards bridging the gap between epidemiological and etiological studies of drug use. From here, studies using longitudinal data that seek to directly address the question of causation may be conducted within the guidelines of appropriate theoretical constructs that can properly frame the scope of the investigation.

Examining the illicit use of ADHD medication within the theoretical context of Hirschi's social bonding theory (Hirschi, 1969) will help us to further understand how the

strength of the bond that an individual has to various persons and institutions affect their participation in this type of deviance. According to bonding theory, if an individual possesses weak or non-existent bonds to traditional sources (i.e. parents, school, etc.) that would typically steer an adolescent away from deviant behavior, then delinquency, and subsequently illicit use of these drugs, can result. While there may be a substantial group of youth, conventionally bonded or not, who participate in acts of delinquency, bonding theory states that those with no or weak bonds would be more likely, as a whole, to be delinquent. Gauging the effect of these bonds is not only key in determining which theoretical perspective is most appropriate for examining this type of delinquency, but also for determining which social bonds, in general, are most influential in determining one's behavior for this particular act.

Second, by examining the illicit use of ADHD medication using the principles of social learning theory, we can gain a better understanding of how the processes of learning behavior influence this type of deviance. Primarily, this study examines the influence that peers have on an individual's behavior in regard to this particular type of drug use. Within the confines of this theoretical perspective, it is also possible to measure the extent to which various beliefs and associations regarding this type of illicit drug use are associated with the behavior itself. An investigation using this perspective will also help illustrate exactly which aspects of learning theory appear to have the greatest effect on this type of drug use as well as if the theory as a whole is an appropriate tool for examining the illicit use of ADHD medication.

These two theoretical perspectives are included in this study because their principles have been frequently applied in the past to other forms of drug use (Marcos et

al., 1986; Akers & Cochran, 1985; Bahr et al., 1998; Akers et al, 1979; Piquero & Sealock, 2000; Rebellon, 2002; Paternoster & Brame, 1997). Consequently, it seems fitting to utilize these perspectives in this case as their explanatory power has not yet been tested regarding the illicit use of ADHD medication specifically. In doing this, we can see through comparison how these perspectives are similar or differ in how they are able to assess the likelihood of this particular type of drug use. Furthermore, differences in how well these theories are able predict this type of drug use in compared to others could potentially point to differences in how specifically the illicit use of ADHD medication should be measured. Examples of these differences may include measurement dynamics, characteristics, or context surrounding the illicit use of ADHD medication or the user themselves. It is important to note that although this study will be comparing the predictive power of each of these theories, it is concerned with the theoretical contextualization of this type of deviance and not with making any generalizations about the overall ability of either of these theories to predict deviance as a whole.

Overall, the application of these two theoretical frameworks in this investigation will help illustrate with greater clarity the circumstances surrounding the illicit users of ADHD medication by examining various aspects of a person's life relevant to these theories. Examining specific influential aspects in a person's life (e.g. family, school, peers, etc.) and the dynamics of their association with the user, in accordance with a theoretical perspective to guide the investigation, may provide a better explanation of this type of drug use when compared to an investigation that is not rooted in any form of theoretical contextualization. This is not only because the theoretical perspectives

provide an oft-replicated way in which to frame an investigation into this type of delinquency, but also because these theories identify general risk and protective factors to help guide any such inquiry.

This study begins with a comprehensive overview of the extant research and relevant literature detailing the existing problem of illicit use of ADHD medication. Following this will be an overview of generalized risk factors for drug use. Next, a summary of the theoretical constructs to be used and their relation to the illicit use of ADHD medication will also be provided. This will lay the foundation for the corresponding hypotheses to be tested and expected findings of this study. Next, a description of the sampling technique, measures used, and plan for analysis will be provided. Finally the results will be presented along with a discussion of their substantive and theoretical meaning as well as the implications stemming from this study.

Chapter Two

Literature Review

This chapter describes literature relevant to the research topic of this thesis. It is organized into four sections: (1) an overview of Attention Deficit Hyperactivity Disorder, (2) ADHD medication and illicit use, (3) motivations for and prevalence of student illicit use of ADHD medication, (4) and student ADHD medication use relative to other drug use.

Overview of Attention Deficit Hyperactivity Disorder (ADHD)

ADHD is the most common neurological disorder among children and, as a result, is a frequent topic of research (Rowland, Lesense, & Abramowitz, 2002). This disorder is characterized by inattention, hyperactivity and impulsivity. In addition, low motivation, poor concentration, and distraction are also common symptoms of this disorder. These symptoms prove problematic in school when these youths are disregarded as passive or sluggish by their teachers because they seem unmotivated to excel (National Institute of Mental Health, 1996).

Among school age children, there is little way of knowing the actual prevalence of ADHD because recommendation for diagnosis relies heavily on behavioral reports by parents and teachers to mental health professionals. The long-standing national estimate of ADHD prevalence, however, is set between 3-5% for school aged children, including high school students (LeFever, Arcona, & Antoniccio, 2003). There is still wide

variability in the reported levels of diagnosed ADHD, depending on availability of data and the methodology used in its collection. The National Institute of Mental Health, consistent with the national estimate, reports US diagnosis rates to be between 3-5% among school age children (NIMH, 1996), while the Agency for Health Care Policy and Research shows the rate of diagnosis to be much higher, roughly 7 to 16% (Agency for Health Care Policy and Research, 1999). Still others show rates to be as high as 18% (Rowland et al., 2002) and as low as 1% (Carey, 1999). This disparity in prevalence estimation can be in part due to the methodology used in collecting data on this disorder (e.g. parental/self-report vs. medical documents) or from differences in the scope of various studies estimating ADHD prevalence (e.g. national vs. local estimates).

When looking at gender and age relative to the reported ADHD prevalence, the Centers for Disease Control (2005) reports that males (11%) have a higher rate of diagnosis than females (4%), and that the overall rate of ADHD diagnosis among high school students hovers around 10%. When looking at race and ethnicity, children classified as “multiracial” have the highest prevalence of diagnosis (9.7%) followed by whites (8.6%) and blacks (7.7%); non-Hispanics (8.6%) have a higher rate than Hispanics (3.7%) (CDC, 2005).

ADHD Medication and Illicit Use

There are many different medications on the market used to treat ADHD symptoms. All of these fall under the category of pharmaceutical stimulants and seem to have a “focusing” effect on the individual which can reduce hyperactivity and impulsivity (National Institute on Drug Abuse, 2006; NIMH, 1996). Some of the more popular drugs prescribed are Ritalin (Methylphenidate), Adderall (amphetamine), Dexedrine

(Dextroamphetamine) and Concerta (also Methylphenidate) (NIMH, 1996). Ritalin, arguably the most recognizable name within this classification of drugs, was originally developed in the 1950's. Dexedrine was introduced to the public shortly thereafter and marketed as having similar, yet longer-lasting, effects than Ritalin (Weathers, 1998). Because these drugs are stimulants, they can have properties desirable by those who do not have ADHD or by those to whom they are not prescribed. The "attractive" features of the drugs can include appetite suppression, wakefulness, increased focus/attentiveness, and euphoria. Addiction can occur when repeated use causes a rapid induction of dopamine to the brain by these substances. Cocaine and amphetamine addiction also occurs in this fashion (Babcock & Byrne, 2000).

The CDC estimates that 4.3% of children are legitimately taking some form of ADHD stimulant medication (CDC, 2005). This includes 6.2% of males and 2.4% of females. These numbers are roughly the same when looking at only male and female high school students, 6.7% and 2.4% respectively. When examining racial differences in those taking medication for ADHD, the same data shows that 5% of whites, 3.7% of blacks and 4.8% of multiracial children are on some type of pharmaceutical treatment for their ADHD symptoms. Families with health insurance are almost three times more likely to have a child who is currently on ADHD medication than a family without health insurance (CDC, 2005). Also worth noting is the significant increase in ADHD prescriptions in recent years. In the 5 year period between 1990 and 1995, prescriptions for ADHD medications rose almost 250% (Robison et al., 1999; Safer & Zito, 1996). This is consistent with the rise in those seeking treatment for ADHD symptoms during this period (LeFever et al., 2003).

The most common ways of illicitly using prescription stimulants are orally and intra-nasally (Drug Enforcement Administration, 2005). Illicit use of these drugs, especially by those to whom they were not prescribed, can have negative and potentially fatal side effects. High doses of these drugs can lead to cardiovascular complications, high blood pressure (LeFever, Dawson, & Morrow, 1999), panic attacks, aggressive behavior, destructive tendencies (White, Becker-Blease, & Grace-Bishop, 2003), sleep disturbances, reduced appetite, and suppressed growth (CDC, 2005). In addition to this, potential periods of agitation/irritability and insomnia can also arise from illicitly using these medications. Other symptoms include dry mouth, headaches, nausea, weight loss, ticks, "zombie" demeanor, stomach aches, moodiness and even death (Weathers, 1998).

The Drug Abuse Warning Network (2006) compiled a list of past year emergency room visits involving ADHD drugs (methylphenidate, amphetamine, and dextroamphetamine). These cases totaled 7,873 ER visits, approximately 1% of all drug related ER visits. These results show that 48 percent of these cases were due to reactions associated with illicit use of ADHD medication. They also demonstrate that the rate of ER visits involving ADHD drugs is highest among 12-17 year olds (those typically of high school age), though they are less likely to engage in illicit use of these substances compared to those ages 18-25 (Kroutil, Van Brunt, Stahl, Heller, Bray, & Penne, 2006). This finding helps justify the elevated levels of concern for research on this topic because it suggests that those in the younger age cohort may be at a greater risk for adverse health effects from ADHD medication or may engage in more dangerous use behaviors or riskier methods of use.

Motivations for and Prevalence of Student Illicit Use of ADHD Medication

Due to its effects, there are some seemingly practical reasons why ADHD medication would be seen as an “attractive” drug to high school and college students. The three motives most often provided by students as reasons for their illicit use of these drugs are (1) to help with concentration, (2) increase alertness, and (3) to get high (Teter, McCabe, Boyd, & Guthrie, 2003). For students looking to gain an edge in the classroom, whether it is to excel academically or to keep up with others, the effect that these drugs can have on a person’s concentration and alertness have the potential to facilitate studying and increase work productivity. Furthermore, ADHD medication can be perceived as having recreational use as well. Students have reported that these drugs, when mixed with alcohol consumption, provide a diminished sense of drunkenness when binge drinking (Barrett & Pihl, 2002).

In 2004, SAMHSA examined the prevalence of illicit stimulant use among high school students and reported that 2 percent cited past year illicit use (Substance Abuse and Mental Health Services Administration, 2005) In 2003, the Monitoring the Future survey reported that a greater number (nearly 15 percent) had used prescription amphetamines, including Ritalin, illicitly (Johnston, Bachman, O’Malley, & Schulenberg, 2004a). An Indiana high school study showed that nearly seven percent of students have used ADHD medication illicitly with 2.5 percent using it monthly or more often (Indiana Resource Prevention Center, 1998). In a study including 450 adolescents referred for substance abuse treatment, Williams, Goodale, Shay-Fiddler, Gloster, & Change (2004) found that 23 percent of those surveyed reported non-medical use of ADHD stimulants, with 6 percent qualifying as habitual users of such drugs. Although the estimates of illicit

ADHD stimulant use among high school students vary considerably, they all indicate that the non-medical use of these drugs is a problem that merits further attention.

Student ADHD Medication Use Relative to Other Drug Use

While the presence of the illicit use of ADHD medication among school students has been demonstrated, it is necessary to look at this problem in comparison to illicit use of other substances as a means of measuring the true severity of the problem. When looking at prescription drugs in particular, a nationally representative 2005 survey reported that 19 percent of adolescents admitted to taking some form of prescription painkillers or stimulants in an illicit manner, with the rate of OxyContin use at 5.5% and Vicodin use near 10% (Johnston, Bachman, O'Malley, & Schulenberg, 2005a). Numbers released by the Center for Substance Abuse Research (2007) showed that while marijuana was the most commonly used drug by high school seniors (31.5%), other narcotics, like OxyContin and Vicodin, had a 9% illicit use rate with amphetamines (including Ritalin) being used illicitly at a rate of 8.1% (Center for Substance Abuse Research, 2007). Kaplan (2005) reported illicit use of prescription tranquilizers among high school students to be at 6.6 percent.

These numbers have drastically risen over the past few years. The National Drug Intelligence Center (2002) reported that in the year 2000, 8.4 percent of adolescents ages 12-17 used pain relievers illicitly. This same report also noted that 4 percent of those in the same age group illicitly used prescription stimulants, including amphetamines and Ritalin. Furthermore, the National Clearinghouse for Alcohol and Drug Information (2003) reported that the past fifteen years has seen the number of teens and young adults illicitly using prescription painkillers such as oxycodone and hydrocodone grow

astronomically, roughly 500%, from the mid-eighties to 2000. The same study also showed that the number of those who illicitly used tranquilizers such as diazepam (Valium) or alprazolam (Xanax) went up nearly 50 percent in one year between 1999 and 2000. It is unknown however whether the rise in these prevalence numbers is due to an increase in actual use, a reporting effect, or from a greater amount of these drugs being available on the illicit market.

The goal of this chapter was to provide the reader with a condensed overview of ADHD and the medications used in its treatment as well as the prevalence of and motivations for its illicit use. The next chapter will discuss general risk factors for illicit ADHD medication use as well as for adolescent substance use as a whole. This will help illustrate a clearer image of the personal, environmental, and behavioral characteristics of individuals who would be at risk to use these substances.

Chapter Three

General Risk Factors for Illicit ADHD Medication Use and Other Substance Use

When examining the basic demographics of high school students who illicitly use ADHD stimulants, findings indicate that males are more likely to use these drugs compared to females (Williams, et al., 2004; McCabe, Teter, & Boyd, 2004; Johnston, O'Malley, & Bachman, 1991). This is concordant with ADHD diagnosis trends as a whole. When examining race of the students, whites have the highest rate of illicit use (Hall, Irwin, Bowman, Frankenberger, & Jewett, 2003; McCabe, Teter, & Boyd, 2006; Teter et al., 2003; White et al., 2003). In addition, the mean age of those high school students who report current illicit use of ADHD stimulants is 15.5, which is typically a high school sophomore (Williams et al., 2004).

Furthermore, almost 90 percent of students who use these drugs in an illicit manner have plans to go to college (McCabe et al., 2004). The college experience can bring with it larger social networks that can further facilitate opportunities to participate in illicit activities. Along with seemingly greater academic pressures that may cause a student to turn to illicit use of these drugs to enhance school performance, college also affords a greater atmosphere of freedom that facilitates more recreational or “party” activities that can include illicit substance use. For this reason, school enrollment may play an important factor in the prevalence of illicit use as opposed to simply being a “school aged student,” as studies have shown that only 1 percent of those not enrolled in

college say that have used these ADHD stimulants in an illicit manner (Hall et al., 2003; McCabe et al., 2006; Teter et al., 2003; White et al., 2003). This finding, however, may be the product of those not enrolled having a smaller social network than those in a large college setting and, consequently, fewer sources where they can illegally obtain ADHD medication for illicit use. Regardless of the reasons these individuals may give for use of these drugs in college, it still seems that based on the number illicit users in high school who have college plans that this problem may partially be rooted in the high school setting.

Aside from general demographics, it is necessary to look to various social-behavioral predictors of illicit ADHD stimulant use as a means of identifying at-risk populations. Overall, alcohol use in adolescents has been heavily linked to drug use as a whole (Johnson et al., 1990; Hammersley, Lavelle, & Forsyth, 1992; Hawkins, et al., 1992; Plant & Plant, 1992; Lopes et al., 1996). Regarding this particular drug inquiry, studies have shown that the largest co-morbidity of any drug with ADHD medication is also alcohol (McCabe et al., 2006; Shillington, Reed, James, Lange, Clapp, & Henry, 2006). This poses a problem not only due to the added dangers of using both of these substances at once, but also because students perceive both of these substances as easily obtainable. Furthermore, 86 percent of those who reported past year ADHD medication use also reported past year alcohol use. The same study showed that nearly 70 percent of these illicit users also reported marijuana use.

When focusing on the school realm, studies show that college students who used ADHD stimulants for non-medical purposes had lower grade point averages and that students carrying a B+ average or higher were half as likely to have reported illicit use

(McCabe, Teter, Boyd, & Guthrie, 2001; McCabe, Knight, Teter, & Weschler, 2005).

These findings support the argument that those in the lower GPA cohort use these drugs out of the perceived necessity to enhance their school performance. Conversely, it could simply reflect previous findings that those with poor GPA/low school achievement, at the high school level as well, are more likely to use drugs (Thomas & Hsiu, 1993; Newcomb, Maddahian, & Bentler, 1986; Bry, McKeon, & Pandina, 1982; Andrews, Smolkowski, Hops, Tildesley, Ary, & Harris, 1991; Lang, 1985; Fisher & Harrison, 1990; Johnson, Pentz, Weber, Dwyer, Baer, MacKinnon, Hansen & Flay, 1990; Ellickson & Morton, 1999; Hundleby & Mercer, 1987).

Internal cognitions have also been shown to be related to adolescent substance use. Studies have shown that those with low self-esteem are at a higher risk to be users of drugs, of any kind, compared to those who report a higher general sense of self-satisfaction (Newcomb, et al., 1986, Andrews et al., 1991; Barrett, 1990; Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990; Linden, 1992; Casemore, 1990; Kaplan, 1980; Smith & Fogg, 1978). Furthermore, an individual's pro-drug attitudes have also been shown to affect one's level of actual drug use as well (Hawkins, Graham, Maguin, Abbott, Hill, & Catalano, 1997; Kandel et al., 1978; Krosnick & Judd, 1982; Smith & Fogg, 1978; Ellickson & Morton, 1999). Perhaps factoring into this are elements of influence that would typically deter one from possessing pro-drug attitudes and substance use habits. One such influence that studies have shown to exert an influence on this is a person's religiosity. Individuals who report low levels of religiosity, measured by various factors of devotion to one's religion, have been linked to a higher risk for substance use and abuse (Newcomb et al., 1986; Bry et al., 1982; Newcomb & Felix-Ortiz, 1992).

The importance of studying substance use in younger populations stems not only from the desire to prevent occurrences such as health complications or crime among youths, but also because age of first drug use and persistent drug use in the early years (including illicit prescription medication use) has been shown to be a risk factor for more extensive and persistent drug involvement later in life (Kandel, 1982; Kandel et al., 1986; Newcomb et al., 1992; Hawkins et al., 1992; Hawkins et al., 1995; Robins, 1992; McCabe, West, Morales, Cranford, & Boyd, 2007). Another factor that contributes to one's risk for substance use is an individual's general desire to try new activities. This has been classified in the past as sensation seeking as well as impulsivity and disinhibition. All of these are elements in an individual's personality that could lead them to experiment with illicit substances as well as become a habitual user (Newcomb et al., 1992; Vitaro, Ferland, Jacques, & Ladouceur, 1998; Bates & Labouvie, 1997).

Availability of drugs plays a key role in use patterns as well. Simply put, those who report a higher availability and easier access to illicit substances are at a higher risk for use (Newcomb & Felix-Ortiz, 1992; Gorsuch & Butler, 1976; Ellickson & Morton, 1999). This is especially true regarding the illicit use of ADHD medication as it is more easily accessible through legitimate prescription and diversion/sale of the drugs by those with prescriptions. Unlike other types of prescription drugs such as painkillers and tranquilizers, these types of stimulants are readily prescribed to children and adolescents to treat ADHD and therefore have a greater chance to be in the unsupervised possession of these individuals to distribute or use for non-medical purposes.

Individuals with whom an adolescent associates have also been shown to exert an influence over that person's propensity to participate in substance use. Specifically, drug

and alcohol use among one's peers has been heavily cited as a risk factor for one's own substance use (Newcomb et al, 1986; Hawkins et al., 1997; Agnello-Linden, 1991; Barrett, 1990, Biddle, Bank & Marlin, 1980; Lang, 1985; Newcomb & Bentler, 1989; Oetting & Beau, 1987; Kandel, 1978; Barnes & Welte, 1986; Kandel & Andrews, 1987). Even peers who commit general acts of delinquency, not limited to drug use have been shown to effect one's level of substance use (Dishion, Capaldi, Spracklen, & Li, 1995; Bates & Labouvie, 1997). Another group of important associates, parents, can also have a profound effect on an individual's substance use. While parents and family may not have the greatest influence in this regard, it is possible for them to have the most persistent influence over the course of an individual's formative years. Simply living in the same household as parents who use drugs can lead to such outcomes as an individual adopting their parents' norms regarding drug use as well as justifying their own substance use via their parents' behavior. For these types of reasons, those with substance using parents are at a greater risk to become involved in substance use themselves (Hawkins et al., 1997; Barrett, 1990; Gorsuch et al., 1976; Kandel et al., 1978; Lang, 1985; Johnson et al., 1989; Swadi, 1989).

Different dynamics within the home environment also act as a catalyst for substance use risk. Research has shown that adolescents from broken homes, that is, homes in which there are not two-biological parents present, run a greater risk of substance use (Stern, Northman, & Van Slyck, 1984; Isohanni, Moilanen, & Rantakalillo, 1991; Baumrind, 1983; Penning & Barnes, 1982; Ellickson & Morton, 1999). This is one factor that can lead to parental conflict, which, in and of itself, is considered a risk factor for substance use. Parental conflict not only can be a precursor to rebellious activities but

can also be a result of them as well as lead to poor communication between parent and child. As such, studies show that there is a significant relationship between substance use and a conflict-filled relationship with one's parents (Newcomb & Bentler, 1989; Oetting & Beauvais, 1987; Stern et al., 1984; Loeber & Dishion, 1983; McCord, 1979; Rutter & Giller, 1983, Porter & O'Leary, 1980). Both of these aforementioned risk factors for substance use regarding parent-child relationships, in particular, can result in low levels of parental bonding as a whole. This has been cited as yet another risk factor for general substance use including misuse of ADHD medication (Newcomb et al., 1986; Bry et al., 1982; Brook et al., 1990; Jessor & Jessor, 1977; Kim, 1979; Reily, 1979; Baumrind: 1985; Stoker & Swadi, 1990; Brook, Lukoff, & Whiteman, 1980; Penning & Barnes, 1982). Table 1 provides a summary of these risk factors as well as cites where they have been referenced in past investigations.

Although ADHD medications are not regarded as the most dangerous illicit substance on the drug market, there is sufficient evidence to show that they have become a problem among adolescents and young adults, particularly those in school (Hall et al., 2003; McCabe et al., 2006; Teter et al., 2003; White et al., 2003). School itself can be a risk factor for the illicit use of these substances due to a perceived necessity to use these drugs for academic gains. In terms of recreational use, the school setting can act as a drug market where students can obtain these drugs illicitly with the intention of using them for "partying" purposes, which can result in adverse health effects. This is true to an even a greater extent when used in conjunction with alcohol or other drugs, which may also be easily obtainable. Though there may be a greater prevalence of use among college students, there is ample literature to support the claim that this problem has a

noteworthy presence in the high school setting as well. This justifies a further need for research into this particular student population as a means of determining ways to identify the problem at a younger age. Recognizing personal, environmental and behavioral factors that would put a student at-risk for involvement in the illicit use of these substances is a necessary first step towards curbing this behavior. In doing this, we can potentially add a valuable, and usable, piece of knowledge to the extant research on this type of illicit drug use which can lead to a more effective explanations of this type of deviance. The application of existing theoretical principles can also be a guide in this endeavor as they can provide a framework from which to conduct an investigation into this topic.

Table 1: General risk factors for adolescent drug use

Risk Factor	As cited in	Risk Factor	As cited in	Risk Factor	As cited in
Poor GPA/school achievement	Newcomb et al., 1986; Bry et al., 1982; Andrews et al., 1991; Lang, 1985; Fisher & Harrison, 1990; Johnson et al., 1990; Ellickson & Morton, 1999; Hundleby & Mercer, 1987	Low religiosity	Newcomb et al., 1986; Bry et al., 1982; Newcomb & Feliz-Ortiz, 1992	General peer delinquency/deviance	Dishion et al., 1995; Bates & Labouvie, 1997
Availability of drugs/opportunity to attain drugs	Newcomb & Felix-Ortiz, 1992; Gorsuch & Butler, 1976; Ellickson & Morton, 1999	Broken homes/disrupted families	Stern et al., 1984; Isohanni, 1991; Baumrind, 1983; Penning & Barnes, 1982; Ellickson & Morton, 1999	Pro-drug attitudes	Hawkins et al., 1997; Kandel et al., 1978; Krosnick & Judd, 1982; Smith & Fogg, 1978; Ellickson & Morton, 1999
Peer drug/alcohol use	Newcomb et al., 1986; Hawkins et al., 1997; Agnello-Linden, 1991; Barrett, 1990; Biddle et al., 1980; Lang, 1985; Newcomb & Bentler, 1989; Oetting & Beauvias, 1987; Kandel, 1978; Barnes & Welte, 1986; Kandel & Andrews, 1987	Low self-esteem	Newcomb et al., 1986; Andrews et al., 1991; Barrett, 1990; Botvin et al., 1990; Linden et al., 1992; Casemore, 1990; Kaplan, 1980; Smith & Fogg, 1978	Family dysfunction/parental conflict	Newcomb & Bentler, 1989; Oetting & Beauvais, 1987; Stern et al., 1984; Loeber & Dishion, 1983; McCord, 1979; Rutter & Giller, 1983; Porter & O'Leary, 1980
Poor parental bonding/parental relationship	Newcomb et al., 1986; Bry et al., 1982; Brook et al., 1990; Jessor & Jessor, 1977; Kim, 1979; Reily, 1979; Baumrind, 1985; Stoker & Swadi, 1990; Brook et al., 1980; Penning & Barnes, 1982	Parental substance use	Hawkins et al., 1997; Barrett, 1990; Gorsuch et al., 1976; Kandel et al., 1978; Lang, 1985; Johnson et al., 1989; Sawdi, 1989	Early age of first use	Newcomb et al., 1986; Hawkins et al., 1992; Hawkins et al., 1995; Kandel et al., 1986; Robins, 1992; McCabe et al., 2007; Kandel, 1982
White/male	Johnston et al., 1991; Williams, et al., 2004; McCabe et al., 2004; Hall et al., 2003; McCabe et al., 2006; Teter et al., 2003; White et al., 2003	Alcohol use	Johnson et al., 1990; Hammersley et al., 1992; Hawkins et al., 1992; Plant & Plant, 1992; Lopes et al., 1996; McCabe et al., 2006; Shillington et al., 2006	Impulsivity/sensation seeking/disinhibition	Newcomb et al., 1992; Vitaro et al., 1998; Bates & Labouvie, 1997

Chapter Four

Illicit ADHD Medication Use in a Theoretical Context

As stated earlier, there have been several descriptive studies conducted on the illicit use of ADHD medication in student populations. These studies centered around reporting prevalence numbers in addition to basic correlates of this type of use. However, the explanatory usefulness of these studies is often quite limited. This is especially true when attempting to obtain a full understanding of the type of person most likely to partake in this type of drug use. While this study makes no attempt to directly assess causation, the application of theoretical constructs that measure various concepts pertaining to the user, their attitudes, and their environment can provide greater insight into factors that lead to the use of these substances. This line of questioning can be a stepping-stone for future research on this topic.

In the past, studies utilizing Social Bonding Theory (Hirschi, 1969) have been conducted in order to assess the relationship between bonding elements and adolescent drug use. Marcos et al. (1986) showed that elements contained in bonding theory could be used to explain lifetime use of alcohol, marijuana, cigarettes, and prescription drugs among adolescents. The relationship of these bonding elements to adolescent marijuana use was also shown by Akers & Cochran (1985). Similarly, Bahr et al. (1998) examined various forms of parental bonding as well as levels of religiosity, finding direct and indirect effects between these elements and adolescent drug use. Another example of the

application of these theoretical elements comes from Ross (1994), who found adolescent religious beliefs/bonds to be related to lower levels of delinquent behavior. While elements of bonding theory have been used to explain other types of drug use, they have not yet been directly applied to illicit use of ADHD medications. Although this is the case, Social Bonding Theory appears to be a suitable theoretical context for which to study this particular type of deviance as it has been utilized to study similar populations (adolescents) and types of delinquency (substance use). Specifically, this study looks to examine the relationship that the elements of this theory may have to the illicit use of ADHD medication. In future inquiries, this framework could also be applied to examine other types of prescription drugs as well.

Next, the illicit use of ADHD drugs will be looked at from the perspective of Social Learning Theory. This will provide insight as to the degree of influence that one's associates (namely peers) have over this type of behavior. Specifically, this inquiry will examine peer effects as well as the effect of non-peer related beliefs (non-social reinforcers such as perceived effects of the drugs) on the use/non-use of ADHD medication illicitly. Social learning principles have been shown in the past to be associated with deviance, including drug use, in the same type of student-adolescent population that this study draws from (Akers, 1998). The predictive value of these principles has also been compared to those of other theories of deviance. When looking specifically at adolescent drug use, studies have shown that social learning principles possess greater explanatory power regarding this type of delinquency when compared to competing theories, such as social bonding or anomie (Akers & Cochran, 1985; Akers & Lee, 1999).

Many elements of a student's life can be operationalized via the principles of these two theoretical frameworks, albeit to various degrees of effectiveness based on the concept to be measured. For example, academic achievement can be operationalized as an element showing one's commitment (bonding) to their school. Furthermore, the beliefs or behaviors that one's peer group expresses towards their schooling can have a significant influence as to how that particular person chooses to act or the beliefs they personally choose to associate with school. For these reasons, these theories seem to apply well to this particular type of delinquency within the student-adolescent population. As with bonding theory, the decision to use the social learning theoretical framework stems from past research where elements of this theory have been used to explain substance use within adolescent populations. A further justification for including this theory in the current analysis the fact that Social Learning Theory was originally developed and tested looking at younger populations and examining substance use within them (Akers, 1973; Akers et al., 1979).

On the surface it may seem inadequate to examine illicit use of ADHD medication through the scope of only two theories of delinquency, considering the multiple perspectives that exist today. However, the two theories utilized in this study not only possess the ability to explain a wide array of delinquency, but are also in opposition to one another in the ways in which they explain delinquent behavior. In Social Bonding Theory, the principles set forth by Hirschi (1969) directly contrast with the idea of peer influence on delinquent behavior as stated in Social Learning Theory (Akers, 1973). In addition, Social Learning principles, while focusing on significant influences as a whole, are rooted largely in the concept of peer relations whereas Social

Bonding places more emphasis on other institutions such as the family, school, religion, etc. (Hirschi, 1969). While this opposition doesn't inherently make them of greater utility in explaining this type of drug use, it does nonetheless bring to the table two differing perspectives by which to examine the illicit use of ADHD medication. Using these two theories to examine this specific type of deviance may not only show which has the greater explanatory power in this study, but may also provide insight as to which would be the proper framework to use in future studies on this topic. This is in similar fashion to research on other types of substance use where certain theoretical perspectives were of greater use in the investigation compared to others. The next sections will detail the principles of each theory and how they relate to this study in particular.

Hirschi's Social Bonding Theory

Social Bonding Theory provides an appropriate framework for studying deviance within the population used in this study as the four elements that comprise the theory-attachment, commitment, involvement, and beliefs-can be easily applied to various elements in lives of juveniles and adolescents. When the bonds that one has to societal elements/institutions are weak or broken, delinquency can result.

Attachment plays a role in how a person may choose to act due to the emotional bond they have formed with someone else (parents, peers, teachers, etc.) Because of this bond, one will be more likely to care how this other person views them and their behavior (Hirschi, 2003). Consequently, a person would be less likely to commit acts of deviance as their actions may be perceived as shameful by those with whom they have the bond. Conversely, those lacking quality bonds with others are more likely to commit acts of

deviance as they have little or no reason to feel “shamed” or “dishonorable” in the eyes of others with whom they would share a connection.

Hirschi (1969) posited that the attachment that one has with his/her parents can be a vital element in predicting their behavior. Specifically, a strong parent-adolescent bond can decrease the likelihood of participating in acts of delinquency, such as drug use. This bond can also be related to parental monitoring, as Hirschi (1995) states this bonding increases the likelihood that parents will more closely monitor their child’s behavior, thereby decreasing the likelihood of delinquency. Regarding household dynamic, acts of delinquency have been shown to be at their lowest levels in two- (biological) parent homes (Hoffman & Johnson, 1998; Rankin & Kern, 1994; Neher & Short, 1998). This trend could be attributed to the strength of the parental bond present in households with this nuclear set-up. This arrangement stands in contrast to families with various other combinations of household organization (single parents, stepparents, etc.), which may still facilitate parent-child bonding, but perhaps to a lesser degree.

Overall, previous studies have shown parental attachment to be directly related to lower levels of substance use among adolescents (Waitrowski, Griswold, & Roberts, 1981; Hoffman & Johnson, 1998; Bell, Forthun, & Sun, 2000; Gerra, Zaimovic, Moi, Bussandri, Bertacca, Santoro, Gardini, Cassavari, & Nicoli, 2004). In addition to this evidence, parental attachment has been shown to have an indirect effect on substance use via the influence it has on other types of bonding such as educational attachment, religiosity, and bonding to substance using peers (Bahr et al., 1998; Marcos et al., 1986; Urberg, Luo, Pilgrim, & Degirmencioglu, 2004).

Regarding this study, illicit use of ADHD medication would prove less likely when possessing a strong attachment with one's parents. This is contingent, however, on the fact the parents convey and follow conventional norms and values. Certain instances of possessing strong parental bonds can actually lead to delinquency based on the non-conventional beliefs and deviant behavior of the parents themselves (Johnson, Shontz, & Locke, 1984; McDermott, 1984). However, bonding with delinquent parents has a lower likelihood of occurring based on such factors as lower parental monitoring, environmental stress, and negative affect (Chassin, Pillow, Curran, Molina, & Barrera, 1993). Overall, this effect can be somewhat difficult to measure if one is not asked to report one's parents as conventional or delinquent in their actions and beliefs.

Peer attachment, on the other hand, is said to follow a somewhat different path. Attachment to one's peers can actually weaken attachment to one's parents (and to other sources of conventional norms and values) by distancing the individual from a mindset centered around adult responsibilities and by developing goals contrary to those of society at large (Coleman, 1961). This idea, seemingly, runs contrary to Hirschi's Social Bonding Theory at its foundation due to the fact that attachment to peers would involve some sort of investment that the individual does not want to jeopardize. For example, if attached to peers that follow conventional norms and values, delinquent behavior such as illicit drug use, could be seen as negative and therefore the behavior would be avoided to protect the investment and secure the bond. However, if attached to delinquent peers, the bond one has with these individuals actually leads to delinquency and does not deter it. Hirschi (1969) states that both stakes in conformity (to conventional persons, norms and values) and the delinquency of one's peers have an interactive effect, as higher stakes in

conformity lessen the influence that delinquent peers have on an individual. Again, the “stake” reflects an investment that one has made, potentially with non-delinquent peers. Therefore, if highly regarded, this attachment to one’s peers can actually deter one from delinquency. Though this interaction effect cannot and will not be assessed in this study, it is an important feature to note for future inquiries on this topic that would have the ability to measure this aspect. For the purposes of this study, two items measuring one’s feelings towards their peers, importance of strong friendships and satisfaction with one’s peer group, will be examined under the premise that they represent stakes in conformity to conventional norms as well as promote peer bonding.

Many sources of bonding in the life of an adolescent can fit into more than one component of Social Bonding Theory. For instance, the bond one has to their school or religion can consist of attachment, commitment, involvement, and beliefs, each with individual characteristics that fit into different components of the theory. In both of these cases, commitment and involvement can be highly related concepts. In cases such as these, some researchers have elected to measure this overlap as a single construct as it may prove difficult to differentially measure these principles (Krohn & Massey, 1980; Akers & Lee, 1999).

Educational commitment is an investment that a student makes, either for present goals such as good grades, or future endeavors such as college. The stronger the commitment in this case, the less likely one would be to participate in acts of deviance for fear that they would jeopardize the investment they have made (Hirschi, 1969). Consequently, school bonding has been shown to be associated with lower levels of problem behavior, including substance use (Simons-Morton, Crump, Haynie, & Saylor,

1999; Sale, Sambrano, Springer, & Turner, 2003). Conversely, studies have also shown lower levels of bonding and commitment to one's school to be associated to higher levels of substance use (Hawkins, Catalano, & Miller, 1992; Brook, Brook, Gordon, Whiteman, & Cohen, 1990). An argument can be made, however, that if one is trying to excel academically due to a strong investment in their own educational achievement, they might turn to ADHD medication to help in that endeavor. While this claim may have some merit and will be explored in this study, Social Bonding Theory posits that a strong bond to school, being a source of conventional norms and values, would decrease the likelihood that one would turn to delinquent means to accomplish a goal such as this. Furthermore, involvement with a conventional institution, such as school, can lessen the opportunity one has to commit deviant acts. For example, the more time one devotes to school related activities (academic, extra-curricular, etc.) the less time they will have to devote to acts of deviance. It can then be inferred that the more involved one is in school, the less likely they are to be delinquent (Wiatrowski et al., 1981). Overall, the findings in this study may help to shed some light as to which side of this argument possesses more merit and would ultimately warrant future study in that particular line of reasoning for delinquency.

Along these same lines, religious bonding has been shown to be a deterrent from delinquent behavior. Strong religious beliefs can act as an indicator of commitment to conventional activities and also can lead to attachment to others through various conventional mediums within that religion (Akers & Sellers, 2004). When looking specifically into drug use, religious students are less likely to engage in drug use and less likely to have drug-using peers (Bahr, et al., 1998; Hardaway, Elifson, & Petersen, 1984;

Francis, 1997; Lorch & Hughes, 1985). Kendler, Liu, Gardner, McCullough, Larson, and Prescott (2003) found several facets of religiosity, including general and social religiosity as well as involvement with God to be negatively related to substance use disorders.

Overall, the higher level of faith one has in their religion and the more religious activities they are involved in, the less delinquent they are likely to be (Johnson, Spencer, Larson, McCullough, 2000, Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002).

The final element of the social bond, belief, can be facilitated through all of the aforementioned means. The belief component in Social Bonding Theory merely indicates a devotion to conventional values and norms in society and the desire to behave accordingly (Hirschi, 1969). Higher endorsement of these conventional values or laws has been related to lower levels of delinquency (Akers & Lee, 1999; Marcos et al., 1986; Sorenson & Brownfield, 1995; Rebellon, 2002; Paternoster & Brame, 1997; Paternoster & Mazerolle, 1994; Krohn, Massey, & Laner, 1983). The bonds formed with other people and institutions can also help instill these values in the person. The stronger the bond, the more likely one is to adopt the conventional belief structure being conveyed. It has been shown that adolescents who have strong bonds to parents who oppose substance use are more likely to internalize those beliefs (Larzelere & Patterson, 1990). Similarly, those who hold to their religious beliefs, which typically promote conventional values and norms, are less likely to be involved in delinquent acts (Cochran & Akers, 1989; Bahr et al., 1998). Overall, those who possess strong social bonds with persons or institutions that promote the conventional norms and values of mainstream society should be less likely to participate in acts of delinquency, which, for the purposes of this study, would result in a lower likelihood of illicit use of ADHD medication.

Social Learning Theory

The principles of Social Learning Theory are rooted in Edwin Sutherland's Differential Association, which, in and of itself, is one of the components of Social Learning Theory along with definitions, differential reinforcement and imitation (Akers et al., 1979; Akers, 1985; Akers, 1998). While these principles have not yet been directly applied to the illicit use of ADHD medication, they have been used to look at other types of adolescent substance use (Akers et al., 1979; Akers & Cochran, 1985). This investigation proposes to examine the explanatory power of these principles regarding the illicit use of ADHD medication. As a theoretical contextualization of this particular type of deviance is lacking, this study and those like it can shed light on methods by which to conduct future analyses of these types of drugs. Also, the results of this study will allow a comparison of this theory's explanatory power on ADHD medication with that of other substances to gain perspective on how well Social Learning Theory can measure various forms of drug use, including new or rarely-studied substances.

Differential Association

Sutherland's (1947) Differential Association Theory contained nine components that sought to explain criminal behavior. The first two components state that criminal behavior is learned and that it is learned through communication and interaction with others. These both fit well when applied to the sample in this study as high school itself facilitates both interaction and communication between different individuals and groups. These individuals can be both deviant and non-deviant in nature and can convey this behavioral image to others accordingly. Next, Sutherland states that the learning of criminal behavior occurs within intimate personal groups. Those who have close friends

that are illicit users of ADHD medications may be learning this behavior or adopting the beliefs held by their friends simply due to this close relationship. The fourth component states that learning criminal behavior includes obtaining knowledge of the actual criminal techniques to be used as well as motives and rationale for this type of behavior. Again, the school environment can not only provide a source for these substances, but can also act as an environmental facilitator for use by placing these individuals with other students who justify their own use of these drugs and who possess a rationale towards this behavior that the individual may also adopt. The next two components of this theory state that criminal motives and drives are learned from definitions of laws and legal codes as favorable or unfavorable and that criminal behavior results from excess definitions favoring law breaking as opposed to law abiding. In relation to this study, one may not see the harm in illicitly using ADHD medication, even though it violates conventional values as well as legal codes. Additionally, because of one's personal motivations to engage in this type of delinquency, such as enhanced academic performance, as well as their belief that it is acceptable to ignore the law in this case, they may choose to partake in this type of illicit drug use.

The seventh component of Differential Association states that these differential associations can range in frequency, duration, priority and intensity. This component highlights how much exposure one has to the source of this differential association and how highly it is regarded. As stated earlier, criminal behavior is learned within intimate groups. Therefore, it could be a fair assumption that those who have closer, and more intimate, peer associations are more likely to take on these beliefs and behaviors, especially if that person or their actions are held in high regard by the individual. For

example, if an individual has close peer ties with other students who use ADHD medication to enhance their academic performance, this person may begin to use these substances illicitly as well if both the friends and their resulting grades are seen as favorable, even through illegal means. Next, Sutherland states that learning criminal behavior involves the same processes as any other form of learning. The final principle states that while criminal behavior is an expression of one's needs it is not necessarily defined by those needs since an individual can fulfill them through non-criminal actions. In the context of this study, a student may feel the need to attain a certain grade point average and, in turn, may look to illegal methods such as ADHD medication to accomplish this goal. However, attaining a high GPA is not a goal that necessarily requires criminal action to attain as one can use several non-criminal avenues to attain this as well. Examples of ways that one could go about attaining a higher GPA without the use of illegal substances could include getting a tutor, or seeking extra help from an instructor. Even if one were looking for legal substances to aid in their studying or concentration (as ADHD medication would), items such as caffeine pills or over the counter stimulants are legal and available to these individual as well.

Measures associated with the concept of differential association include the perception of parental and peer attitudes regarding delinquency as well as the number of delinquent friends with whom an individual associates (Akers et al., 1979). These measures have all been used as a direct operationalization, or proxy measure of differential association concepts in past research on adolescent substance use (Rebellon, 2002; Marcos et al., 1986; Piquero & Sealock, 2000; Paternoster & Brame, 1997, Kandel, Kessler, & Margulies, 1978; Bailey & Hubbard, 1990).

Definitions

Definitions refer to the meanings that one gives to various behaviors as right and wrong. These can be classified as general or specific definitions. General definitions and beliefs take into account the totality of an individual's belief to be law abiding or law breaking based on their own morals, norms, and values. Specific definitions, the focus of this study, are a set of beliefs that are focused on a single act or set of acts (Akers et al., 1979). An example of a specific definition regarding deviance is a student's belief that it is wrong to cheat on an exam in school as a means of getting a better grade, typically a violation of a commonly held norm. Conversely, however, the same student may see no violation of moral codes if they used ADHD medications illicitly as a means of getting a better grade through enhanced concentration, focus, or study time since good grades are a commonly praised and normatively valued achievement. This paradox of definitions and justifiable delinquency can be used to make a person's actions seem defensible; dubbed by Sykes & Matza (1957) as techniques of neutralization. With these, the individual feels justified and unapologetic about their actions. These have been divided into five different categories that seem to fit well when explaining the type of deviance discussed in this study.

First, there is a denial of responsibility. In regard to illicit use of ADHD medication, for example, one might argue that they didn't know that experimenting with ADHD medication for a positively valued gain was a law or norm violation if the goal of the behavior is a conventional one. This type of justification shields them from feeling personally accountable for acts that are non-conforming to the law. The next two categories, denial of injury and denial of victim, are both related in this case. Students

who use these drugs may see it as a victimless crime since it is a voluntary act that, if done for conventional gains, isn't hurting anyone, including the user. The justification can also be made in this case in regard to no victim and no injury when comparing it to the consequences and effects of the use of more serious drugs such as cocaine or heroin.

The final two techniques of neutralization, condemnation of condemners and appeal to higher loyalties, are also closely related to one another, both involving looking at other persons or institutions as the motives for their deviance. When the individual is confronted about their acts, they may cite pressure from these sources and blame the norm and law violation on them as a means of escaping blame themselves. Also, an individual may state that they are simply looking to accomplish a highly valued conventional goal, such as higher test scores for admission to a better college. The dedication to this goal may cause them to take a "by any means necessary" approach where they believe the end goal will justify any law-violating means they used to attain it. While this study makes no attempt to assess techniques of neutralization and their effect on one's definitions of delinquency, and ultimately their behavior, it is an important component to mention as it relates to social learning principles. In future inquiries on this topic, these techniques may be worthwhile to research in order to gain a greater understanding of justifiable delinquency in this regard.

Lastly, one can possess varying degrees of law-abiding and law-violating definitions (Akers et al., 1979). While an individual may not feel strongly enough that they must violate the law in a given circumstance (such as to attain a high GPA) and illicitly use ADHD medications, they may not hold very strong feelings of following the norm in this case either. For these individuals, they do not make it a point to express

their beliefs through this type of deviance; however, they also do not possess enough strength in their law-abiding beliefs to necessarily stop them from using ADHD drugs illicitly. Simply put, these types of individuals may not actively seek out these substances for their own gain, but when presented with the opportunity to use them, would not turn it down. Therefore, even those who do not strongly favor the use of ADHD medication should be examined in regards to their law-abiding beliefs in order to fully assess the risk of participating in this type of delinquency. Generally speaking, approval or disapproval of certain delinquent behaviors (but not others) as well as levels of endorsement of the laws reflecting various acts are common operationalizations of this concept (Rebellon, 2002; Paternoster & Brame, 1997; Akers & Lee, 1999).

Overall, techniques of neutralization play an important part in how one defines an act as delinquent. In the context of this study, how one rationalizes their use of these drugs, be they for recreational purposes, for or actual progress towards a socially accepted goal, such as school achievement, is a key element in why an individual may choose to participate in this type of drug use despite it being against the normative beliefs, conventional behavior, and a violation of the law.

Differential Reinforcement

Differential reinforcement describes the conditioning that is involved in the learning process. It is a system of weighing the rewards and punishments resulting from committing an act. The consequences, good or bad, resulting from this action serve as the motivating force to act initially (Akers, 1977). These can be divided into social and non-social reinforcers. Social reinforcers can be classified as rewards or punishments for a certain behavior that emanate from persons or institutions that exert an influence on the

individual. Non-social reinforcers, in the context of this study, can be the experienced or anticipated effects of substance use (Akers et al., 1979). For both social and non-social reinforcement, the higher the probability of reward or outward approval for committing an act, it is more likely that this act will be committed. In regards to this study, positive reinforcement for illicitly using ADHD medication can come from higher grades, school based awards, or simply added praise from teachers and school officials that result from ADHD drug use. Conversely, another motivating factor to commit an act is the ability to avoid negative stimuli, such as disapproval or loss of goods. Using this line of reasoning, if the negative consequences stemming from an act, such as risk of punishment or legal recourse, are seen as too high, then that person will be less likely to act (Akers & Sellers, 2004). In this case, a student afraid of being caught using ADHD drugs, or fearful of the health risks or addictive properties may chose not to use them for these reasons. Akers has shown this to be the most influential and important of the four aspects of the theory (Akers et. al, 1979).

Imitation

Imitation is the fourth and final concept illustrated in Social Learning Theory (Akers, 1977). Imitation is used to explain the initiation of deviant behavior. Primary associations (parents, peers, etc.) play an important role in imitation because it is those individuals who are most likely to be role models for imitation. Akers et al. (1979) measured imitation in regard to substance use as “admired” models (primary associations) whom the adolescent observed using a given substance. This concept has been illustrated in other studies as well, measuring the effects of primary associations on an individual’s use of cigarettes, marijuana, alcohol and narcotics (Huba, Wingard, &

Bentler, 1980; Kandel et al., 1978). Imitation can be an attempt at reward or positive reinforcement through these mimicking actions. But once the reward (or lack of punishment) is initially attained, reinforcement becomes the dominant factor in continued behavior. For example, a student may wish to better fit into a certain peer or social group. If these students are those who use ADHD medication illicitly, the student may partake in this act simply to gain favor. Once this favor is gained, it can become less about attempting to fit in and mimic those in the group and more about maintaining the praise and adulation (positive reinforcement) that keeps the student in this pattern of deviance. However, onset of behavior brought on by imitation can be difficult to disentangle from ongoing behavior that is the result of reinforcement. Because of the fact that this study is not specifically concerned with the onset of this drug use and due to the importance of reinforcement (both social and non-social) in the grand scheme of learning behavior, reinforcement will be of greater focus in this study as its principles can be of greater ease to operationalize and have greater impact in the long run over one's behavior.

Overall, the single best social predictor of delinquency in studies that test adolescent drug use with social learning principles is delinquent peers (Marcos et al., 1986; Spooner, 1999; Warr, 2002). Haynie (2002) also showed that the sheer number of delinquent friends remained a strong predictor of one's own delinquency even when controlling for prior delinquency, time spent with peers, and attachment level to peers. This gives merit to the argument that states that the simple proportion of one's delinquent peers have a strong and significant influence over one's behavior despite their existing peer relationship characteristics. While this inherently may not be the product of a social

learning effect, the sheer influence that peers can have on an individual's drug use, combined with the emphasis that social learning theory places on peer groups and their associated aspects, make this an adequate theory in which to examine the illicit use of ADHD medication among high school students. The family, also a primary social group, has a significant influence on an adolescent's behavior as social learning components working through family interactions have been shown to be a predictor of one's law-abiding/law breaking behavior (Patterson, 1975). However, for the purposes of this study, the primary social group examined in the context of this theoretical premise will be one's peers.

Overall, this section has provided a comprehensive overview of the theoretical frameworks to be used in this study. By applying the principles of these theories, the hope is to gain greater understanding of the factors associated with the illicit use of ADHD medication within the context of these two theories. Furthermore, by assessing which theory possesses the greater explanatory power for this type of deviance based on the amount of variance in the delinquency explained by each set of theory-based predictors, further insight can be gained as to the best way to theoretically approach this type of drug use in future inquiries.

Chapter Five

Research Objective and Hypotheses

The objective of this study is to bridge the gap between epidemiological and etiological research regarding the illicit use of ADHD medication. While this study makes no attempt to assess causation, as cross-sectional data will be used in the analysis, a transition from looking at risk factors in a non-theoretical manner to examining them through theories of deviance can be a meaningful first step in properly assessing the scope by which an investigation such as this needs to be conducted. Furthermore, by comparing the predictive power of the two theories at the center of this study, social bonding and social learning, we can attain an understanding as to which of these theories is most appropriate to utilize when studying this particular type of drug use. While a dataset tailored specifically for theoretical interpretation would be ideal for this purpose, the data to be used in this study, nonetheless, provides this investigation with a large sample size and a large number of items from by which we may attempt to answer these questions until a more suitable dataset becomes available. In future studies that utilize longitudinal data when questions of causation can be addressed, a study such as this can be a guideline as to which theory, and the risk factors contained within its principles, would be of the greatest applicability in properly framing an investigation. The hypotheses for this study are as follows:

1. The general risk factors to be analyzed in this study will follow the same trends of direction and magnitude of effect on illicit ADHD drug use as those cited in previous studies on general drug use risk factors. While the general risk factor measures may be able to predict this behavior to a certain degree, it is the more organized and oft-tested theoretical constructs that can better predict this substance use behavior.
2. In accordance with the principles presented in Social Bonding Theory, it is hypothesized that there will be a negative relationship between levels of social bonding and the illicit use of ADHD medication. That is, students reporting weaker social bonds (in the form of attachment, commitment, involvement, and beliefs) to normative persons and conventional beliefs will have a higher likelihood of past year illicit use of ADHD medication than those reporting higher levels of social bonding.
3. Social learning principles (i.e. items measuring one's differential association, definitions, and differential reinforcement) are hypothesized to have a positive relationship with levels of illicit ADHD medication use. In this regard, higher levels of associations with and reinforcement from those who hold definitions favorable to ADHD medication use and general delinquency as well internalized definition favorable to this type of deviance will be associated with as a higher likelihood of reported use.
4. In regards to which theoretical construct may better predict the illicit use of ADHD medications among high school students, it is hypothesized that the social learning items will possess the greater predictive value for this type of

deviance with the pattern of association between these items and past year use following the relationship proposed in hypothesis 3 (the relationship direction posited by Social Learning Theory). This hypothesis is based on previously cited research in which social learning variables were shown to have greater explanatory power when measuring various forms of delinquency, including adolescent substance use, when compared to variables that reflected principles of other theories of deviance (Akers & Cochran, 1985; Akers & Lee, 1999).

Chapter Six

Methodology

Sample

The sample used in this study comes from the 2004 Monitoring the Future: A Continuing Study of American Youth (12th grade survey). The overall size of the sample is 15,222 enrolled high school seniors from around the US. While previous versions of this survey have been used in other studies, the key findings only give concrete insight as to the prevalence of illicit ADHD medication use and correlated risk factors associated with this behavior (Johnston et al., 2004; 2005; 2005a). This study looks to build on this information by applying variables that fit within the principles of social bonding and social learning theories in an attempt to identify which factors are associated with this type of delinquency. The larger goal of this study is to examine theoretical explanations for the illicit use of ADHD medication based on the effects of the variables included in this investigation. The outcome of this study and those like it can potentially lead to greater ease in identifying those who would be at a heightened risk for this type of drug by using theories of deviance to assess the likelihood of this behavior.

Sampling Technique

A three-stage process was used to gather this sample. Stage 1 was the selection of various geographic areas in the US to survey. Stage 2 involved selecting a high school(s)

in the aforementioned areas to distribute the surveys. Stage 3 was the selection of individual seniors in each high school to participate in the study (Johnston et. al, 2004a).

The geographic areas used in stage 1 of the sampling process are the Primary Sampling Units (PSU's) created by the Sampling Section of the Survey Research Center (SRC). These are the areas used in conducting their personal interview studies, meaning that SRC representatives would be able oversee the survey distribution in nearly all schools in these areas helping to ensure an empirically sound data collection process (Johnston et. al, 2004a).

In the stage 2 (school selection) process, the sampling technique was designed such that the probability of drawing a school was proportionate to the size of the senior class. Therefore, schools with larger numbers of students in their senior class had a higher probability of being selected for the study. Due to this, most major metropolitan areas had more than one high school sampled while in non-metropolitan areas, a single high school was selected. In the case that a school was unwilling to participate, a similar high school in the same area was selected as its replacement (Johnston et al., 2004a).

In the final stage of selecting participants, schools with up to 400 seniors had all of its seniors included in the study. In schools with more than 400 seniors, a subset was chosen at random to participate. In all, a combination of 128 public and private high schools was sampled nationwide. The overall response rate for this survey was 82 percent, totaling 15,222 students (Johnston et. al, 2004a). For reasons that will be discussed later, this study will only examine a subset of that group, 2,384 students.

Survey Format

The Monitoring the Future Survey consists of several parts. While the survey is most concerned with the student responses on drug use and related attitudes, it contains questions on 19 other major content areas as well. These other content areas include items inquiring about topics such as religion, victimization, work and leisure as well as many others. While these items can be may be related to one's drug use, the purpose of their inclusion is to offset the feeling that the student is taking a drug survey, or that the primary concern of the study is to look at their responses to questions involving drugs (Johnston et. al, 2004a). The added incentive of including these items in the survey is to be able to gather relevant information on the lives of youth regardless if it is related to substance use.

The content of the questionnaire is separated into six forms. Each of these forms contains the same set of core questions, which inquire about demographics and some drug use. These questions make up roughly one-third of each form. The other two-thirds of the content on each form is comprised of questions regarding all 20 of the major content areas of the study. The combination of these measures is different for each form due to the sheer number of items that are included in the survey inquiring about each of the content areas.

Each student was assigned one of the forms on a random basis and therefore the proportion of students in each form group was roughly equal. Due to this sampling technique, the six sub-samples created by the six-form design can be considered generalizable to the entire sample (Johnston et al., 2004a). One shortcoming of this method is that it is difficult to examine certain variables in the context of the entire

15,222 student sample. This can be the case when the item of concern is unique to only one of the forms and therefore only has responses from one-sixth of the sample in question. Such is the case for this study, limiting these analyses to 2,384 respondents.

There are three other drawbacks of using this data in the analysis that should also be mentioned. The first is that it contains only cross-sectional data. This is useful for reporting things such as prevalence and correlations with various kinds of substance use, but it somewhat limits this study in the sense that it is impossible to establish causal relationships in the use of ADHD medications. While the ability to assess causation may be limited, there is still a great deal that can be learned using survey data as inclusive as Monitoring the Future. The second limitation is that the responses only account for those students who were in school when the surveys were administered. Lastly, the survey items are not derived specifically from theoretical principles. This proves problematic when trying to find suitable measures based in criminological theories to include in the analysis. As such, this limits the number of items that meet the criteria to be included in the study, despite the breadth of this survey.

Measures

Dependent Measure

Two dependent measures are assessed as a single item in this study: Past year Ritalin (Methylphenidate) and Dexedrine (Dextroamphetamine) use. Both of these items (originally dichotomous measures in the survey) are recoded into a single dichotomous measure looking at whether or not the respondent has used either or both of these substances (no use of either coded as 0, use of one or both substances coded as 1).

Because of this, no data are lost in the analysis of those who illicitly used either type of medication inquired about in the original survey. This recode groups together two different, yet highly prescribed ADHD medications to be analyzed in this study. While there are more than two types of medication prescribed for the treatment of ADHD, the two examined in this study were the only ones in which the survey inquired. This recoding strategy is justified due to the fact that this study is looking at those who illicitly use ADHD medications of any kind, not differentiating by one type to the next, therefore providing a more comprehensive explanation than if one particular medication was the focus.

Independent Measures

The independent measures used in this study are divided into four topic groups: (1) demographic information, (2) general risk factor variables, (3) social bonding variables, and (4) social learning variables.

Demographic Information

Race and sex are included as solid demographic correlates. Race is coded in the survey as a two-category dichotomy “white”=0 and “black”=1 for the purposes of categorical simplicity. All other responses for the race variable, 3,470 in all, were recoded as missing data. No further reason is given by the survey administrators for this coding strategy. Sex is measured as female or male (coded 0 and 1 respectively). Age is not included in this list of demographic items because it is coded in the original survey dichotomously as over or under 18 years old. Because of this, a meaningful interpretation of any specific age effects or correlations between age and ADHD medication use would be extremely difficult. Additionally, geographical residence of the

respondent as well as urbanicity are assessed. These have been measured in past drug use studies using Monitoring the Future data (Bachman, Safron, Sy, & Schulenberg, 2003; Safron, Schulenberg, & Bachman, 2001). For geographical residence, the respondents could answer that they resided in either the northeast, north central, western or southern United States. Regarding urbanicity, respondents were asked to describe where they grew up. The response options consisted of ten categories that included answers such as “on a farm”, “in a large city”, and “in a suburb”. Similar to previous studies, high school type as well as mother and father’s education are also measured (Kumar, O’Malley, Johnston, Schulenberg, & Bachman, 2002; Bachman et al., 2003; Safron et al., 2001). The respondent was asked to classify their high school as either college prep, general, vocational, or other. For mother and father’s education, the respondent was asked to indicate the highest level of education completed by each parent. These responses ranged from grade school to graduate school. It should be noted that certain items such as geographical region and urbanicity are subjective measures which provide no scales or references by which the respondent can consult in order to determine their answer to these questions.

General Risk Factor Variables

First, two demographic items will be included in this variable grouping for the multivariate analysis as demographic items will not be examined past the bivariate level. Sex and race will be analyzed as risk factors as being both male and white has been cited as a risk factor for substance use as for illicit ADHD medication use in particular (Johnston et al., 1991; Williams, et al., 2004; McCabe et al., 2004; Hall et al., 2003; McCabe et al, 2006; Teter et al., 2003; White et al., 2003). Next, past year alcohol use

will be measured. This is a dichotomous measure coded as 0=no, 1=yes. This item was included since alcohol use has been associated with drug use and has a high co-morbidity level with illicit ADHD medication use (Johnson et al., 1990; Hammersley et al., 1992; Hawkins et al., 1992; Plant & Plant, 1992; Lopes et al., 1996; McCabe et al., 2006; Shillington et al., 2006). In addition to this, an item inquiring about the availability of ADHD medication will also be included. This item asks respondents to gauge the ease at which they can (illicitly) obtain amphetamines, including ADHD medication. This item is measured on a scale of 1=probably impossible to 5=very easy. Availability of drugs has been shown to be a risk factor for participating in substance use of all kinds (Newcomb & Felix-Ortiz, 1992; Gorsuch & Butler, 1976; Ellickson & Morton, 1999).

Next, two items that gauge one's self esteem will be measured. Both items asked the respondents to indicate how much they agreed with a statement regarding themselves on a scale of 1=disagree 5=agree with both questions treated as separate items. The first item asked respondents how much they agreed with the statement that they take a positive attitude toward themselves. The second item asked them to what degree they agreed with the statement that they felt they could do things as well as others. While these items are similar in their questioning, they are distinctly separate in the sense that those who believe they can do things as well or better than others do not necessarily have a positive attitude of themselves, therefore the items are measured separately. Including these variables in the analysis reflects steps taken in previous inquiries that found low self-esteem to be associated with elevated levels of drug use (Newcomb, et al., 1986, Andrews et al., 1991; Barrett, 1990; Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990; Linden, 1992; Casemore, 1990; Kaplan, 1980; Smith & Fogg, 1978).

The final two items inquired about age of first use of amphetamines (including ADHD medication) and about one's disinhibition. Age of first use is included in the analysis as research has shown that early drug use is associated with drug use later in life (Kandel, 1982; Kandel et al., 1986; Newcomb et al., 1992; Hawkins et al., 1992; Hawkins et al., 1995; Robins, 1992; McCabe, West, Morales, Cranford, & Boyd, 2007). This item asks respondents to indicate when they first tried amphetamines non-medically. The possible age responses for this item ranged from grade 6 to grade 12 (the present) and was coded 1=never used to 8=6th grade. Lastly, disinhibition is measured by asking the respondent how much they agreed with the statement that they liked new and exciting experiences, even if meant they had to break the rules. This item was coded 1=disagree to 5=agree. Overall, disinhibition as well as sensation seeking and impulsivity have been linked to drug use (Newcomb et al., 1992; Vitaro, Ferland, Jacques, & Ladouceur, 1998; Bates & Labouvie, 1997).

Social Bonding Variables

Eight variables are used in the social bonding model for this study. They were grouped into four different institutions of bonding: (1) parent (2) religion, (3) school, and (4) peers.

Parent- Two similar, yet separate, measures are used to assess one's attachment to their parents. The first was an item inquiring if both parents live in the household as opposed to single parents or stepparents. This measure has been used in previous studies to gauge one's attachment to their parents (Hoffman & Johnson, 1998; Rebellon, 2002; Rankin & Kern, 1994). These inquiries concluded that greater parental attachment, as well as less delinquency, results when both natural parents are present in the household,

potentially due to greater levels of parental monitoring through this type of household set-up. The second item asks respondents how satisfied they were with the way they got along with their parents. This item was measured on a scale of 1=completely dissatisfied to 7=completely satisfied. This measure has been used in previous studies under the premise that higher levels of parental satisfaction lead to higher levels of bonding with one's parents (Wiatrowski et al., 1981; Bahr et al, 1998; Akers & Lee, 1999).

Religion-Again, two similar items are used to measure one's religious bonds. The measures in this category apply to all four components of the social bond. The first is a measure of how often the respondent attended religious services. This variable has a response range coded 1=never to 4=once a week or more. The second measure used asked the respondent to indicate how important their religion was in their lives. This measure had a response range of 1=not important to 4=very important. Both of these items have been utilized as representations of Social Bonding Theory in previous studies measuring the effect of religiosity/religious bonds on adolescent substance use (Bahr et al., 1998; Sorenson & Brownfield, 1995; Wallace, Brown, Bachman, Laveist, 2003).

School-Two variables are used to measure a student's school bonds. The first item gauges one's college plans as a means of measuring one's commitment or bond to their educational endeavors. For this, respondents are asked whether or not they had plans to attend a 4-year college. This item was coded 0=no, 1=yes. This item has been shown to be an adequate measure of one's commitment to their education in past studies (Wiatrowski et al., 1981; Bahr et al., 1998; Sorenson & Brownfield, 1995; Bachman et al., 2003; Safron et al., 2001; Akers & Lee, 1999; Marcos et al., 1986). The second item inquired about students' grade point average. The scale for this item ranged from 'A'=9

being the highest reportable GPA to 'D'=1 as the lowest, with +/- included in the grading. While this is a proxy measure for one's bonding level, the validity of this item is supported by previous research indicating higher grade point average to be related to higher levels of bonding (in all four component categories) to one's school (Mazerolle, 1998; Wiatrowski et al., 1981; Bahr et al., 1998; Sorenson & Brownfield, 1995; Bachman et al., 2003; Akers & Lee, 1999; Marcos et al., 1986).

Peers-Two items are included to measure one's bond to their peers. The first item, a measure of one's peer attachment, asked respondents how important it was to have strong friendships. This item had a response range of 1=not important to 4=extremely important. This item has been used in the past by Waitrowski et al. (1981) to examine bonding elements and their effect on adolescent delinquency. The final item, a measure of one's peer satisfaction, asked respondents how satisfied they were with the way they got along with their friends. This item was measured on a scale of 1=completely dissatisfied to 7=completely satisfied. Measures of peer satisfaction were also used by Paternoster & Mazerolle (1994) as an indicator of bonding levels to one's peers.

Social Learning Variables

The eight items included in this model reflected principles contained in social learning theory. They were divided into four different categories: (1) differential association, (2) definitions, (3) social reinforcement, and (4) non-social reinforcement. All of the measures in this variable grouping were either adapted from, or substantively mirror those used in Akers et al. (1979).

Differential Association-Three measures are used in the assessment of one's differential associations towards the illicit use of ADHD medication. The first item asked the respondent to report the number of friends they have who take amphetamines (including ADHD medication) illicitly. This measure was coded with a response range of 1=none to 5=all. This measure has been used to gauge peer influence and association regarding adolescent drug use by other researchers as well (Rebellon, 2002; Piquero & Sealock, 2000; Paternoster & Brame, 1997; Marcos et al., 1986) and has also been tied to the concept of imitation (Akers et al., 1979). The second item, inquiring about the perceived beliefs of those around the respondent, is an attempt to measure the norms of one's significant peers (Akers et al., 1979). This item asked respondents to what degree their friends believe drug use causes a student to be looked up to or down upon. The responses for this item ranged from 1="look down alot" to 5="look up alot". The final item asked respondents if they had ever taken amphetamines (including ADHD medication) illicitly to fit into a group. The responses for this item were coded 0=no, 1=yes.

Definitions-One item is used to measure the direction of an individual's definitions in regards to illicit ADHD medication use. Similar to one of the differential association measures this item asked respondents to what degree they, personally, felt drug use causes a student to be looked up to or down upon. The responses for this item ranged from 1="look down a lot" to 5="look up a lot". The concept behind this measure illustrates not only how one views an act of delinquency and those who commit them, but can also be reflective of their own feelings towards committing the act (Akers, 1977; Akers et al., 1979).

Social Reinforcement-The first item in this category asked respondents to indicate the frequency with which their friends would encourage them to commit any act of which their teacher would not approve. Responses for this item ranged from 1=never to 5=always. Similar to praise for a non-delinquent act, a subtype of social reinforcement used by the Akers et al. (1979), this item measures the opposing concept: praise for acts of delinquency. For the purposes of this study, this item examines praise for a delinquent act as a reinforcer of the behavior. The second item, looking specifically at the school environment as a social reinforcer, asked respondents to indicate whether or not they used prescription amphetamines (including ADHD medication) at school. This item measures the extent to which those who use ADHD drugs in school feel this use may effect school activities in a positive or negative way (Akers, et al., 1979). Including this variable in the analysis can help to gain an understanding as to how large of a role the school environment actually plays in the illicit use of ADHD medication due to the pressures, expectations and other such stressors associated with school that may motivate a student to use these drugs.

Non-Social Reinforcement- Akers et al. (1979) included items in their analysis inquiring about the “usual effects felt when used” as a measure of non-social reinforcement on substance use. Consistent with that study, this investigation includes two items in the non-social reinforcement category that measure substance use based on the perceived effect of the drug in question. These items are to act as measures of motivation for use based on motivators reported in extant literature on the topic (Teter et al., 2003). The first asks respondents who indicated that they had illicitly taken amphetamines (including ADHD medication) in the past year whether or not they did so

to “gain insight.” The second asked the same group whether or not they did so in order to “get energy.” While using a measure such as amphetamine use, which includes the ADHD drugs in question, may seem to be highly entangled with the dependent variable, it is, in fact, independent of the specific dependent variable in question and can properly gauge motivation for the illicit use of ADHD medication. In this case, individuals may have used amphetamines for these purposes, but not ADHD drugs specifically; therefore that case would not be count among the 88 users of ADHD medication identified in this study. Furthermore, those who used ADHD drugs (an amphetamine) but not for these purposes would respond “no” to these items if that were the case; providing a reliable and valid answer to the motivational items in question. Table 2 provides a quick reference to the social bonding and social learning variables used in this study as well as lists what principles of the theory they reflect and where they have been cited as such in past research.

One notable drawback to the social learning measures, as compared to the bonding measures used in this study, is that they have not been highly replicated in past studies. The measures used here are mainly based on the social learning principles and general guidelines for the theoretical measurement therein set by Akers (1977). Furthermore, as previously mentioned, the measures in both theoretical groupings come from a national survey that is designed and administered with the purpose of gathering data on prevalence and correlates of drug use, not specifically for theoretical analysis. Though suitable measures that are reflective of theoretical principles can be found within these data, it may be practical for those conducting future studies on this topic to analyze data containing measures that are specifically designed to be direct representations of

theoretical concepts. Though the potential to find a dataset as comprehensive as Monitoring the Future for these purposes may be limited, a comparison between the two types of data on this topic is no less warranted.

Analytic Plan

The plan of analysis in this study consists of two steps. The first step will use SPSS 16.0 to provide frequencies and a descriptive analyses of all independent measures examined in this study. Bivariate crosstablulations will be used to examine the relationship between these independent measures and the dependent variable, past year illicit use of ADHD medication. In this step, chi-square statistics will be the main source of interpretation with the Phi and Cramer's V utilized where appropriate to gauge the strength of any expected relationships. Inter-item correlations will also be provided with Phi, Cramer's V and Tau-b statistics used where appropriate as the correlation coefficient since the analysis will consist of dichotomous and ordinal data (Garson, n.d.).

The final, and main, step of this study will be the comparison of the general risk factors and theory-based measures in their power to predict the likelihood of illicit use of ADHD medication. This will be accomplished by a multi-block stepwise analysis using rare events logistic regression (King & Zeng, 2001). This was the preferred method of analysis for this study due to the low number of past year illicit users (N=88) in such a large sample. Even in a large sample such Monitoring the Future, binary logistic regression can lead to problems in the estimation of an event making past year illicit use of ADHD medication difficult to explain and predict due to the high proportion of "no" responses compared to the small amount of "yes" answers regarding past year use. Therefore, using a subroutine available in STATA that specifically takes into account

rare events data would be the most appropriate course of action for this analysis (Tomz, King, & Zeng, 1999). Piquero, MacDonald, Dorbin, Daigle, & Cullen (2005) successfully demonstrated the usefulness of this technique when examining the rare event of homicide deaths.

In this analysis, a set of measures corresponding to the general risk factors as well as risk factors relating to the principles of each theory will be grouped into separate blocks for analysis. Four model blocks will be assessed in all. First, general risk factors alone will be analyzed. Next, the social bonding items will be added to the model. The third model will consist of general risk factors and the social learning items while the final model will contain all general risk factors, social bonding and social learning items. Model chi-square statistics will be used to test the overall significance of each model block while odds ratios will be calculated to assess the effect of the individual predictors on the past year illicit use of ADHD medication.

Table 2: Theory-based risk measures for illicit ADHD medication use

Social Bonding Variables			Social Learning Variables		
Variable	Concept(s) Measured	Previously Cited	Variable	Concept(s) Measured	Previously Cited
Mother & father in household	Attachment	Hoffman & Johnson, 1998 Rebellion, 2002 Rankin & Kern, 1994	No. of friends who take amphetamines illicitly	Diff. Association Imitation	Rebellion, 2002 Piquero & Sealock, 2000 Paternoster & Brame, 1997 Marcos et al., 1986 Akers et al., 1979
Parental satisfaction	Attachment Commitment	Wiatrowski et al., 1981 Bahr et al, 1998 Akers & Lee, 1999	Friends look up to/down on drug use	Diff. Association	Akers et al., 1979
Attendance at religious services	Commitment Involvement	Bahr et al., 1998 Sorenson & Brownfield, 1995 Wallace et al, 2003	Self looks up to/down on drug use	Definitions	Akers et al., 1979
Importance of religion	Attachment Commitment Belief	Bahr et al., 1998 Sorenson & Brownfield, 1995 Wallace et al, 2003	Take amphetamines to fit into group	Diff. Association Imitation	Akers, 1977 Akers et al., 1979
Plan to go to a 4-year college	Commitment	Wiatrowski et al., 1981 Bahr et al., 1998 Sorenson & Brownfield, 1995 Bachman et al., 2003 Safron et al., 2001 Akers & Lee, 1999 Marcos et al., 1986	Friends encourage activities teachers would not approve of	Social Reinforcement	Akers et al., 1979
Grade point average	Attachment Commitment Involvement Belief	Mazerolle, 1998 Wiatrowski et al., 1981 Bahr et al., 1998 Sorenson & Brownfield, 1995 Bachman et al., 2003 Akers & Lee, 1999 Marcos et al., 1986	Use of amphetamines in school	Social Reinforcement	Akers et al., 1979
Importance of strong friendships	Attachment	Wiatrowski et al., 1981	Taken amphetamines to gain energy	Non-social reinforcement	Akers et al., 1979
Peer satisfaction	Attachment Commitment	Paternoster & Mazerolle, 1994	Taken amphetamines to gain insight	Non-social reinforcement	Akers et al., 1979

Chapter Seven

Results

Frequencies and Descriptive Analysis

When examining the response distribution among the demographic variables in this study, we see first that the greatest proportion of respondents (31.2%) come from the southern US with 24.8 percent from the north-central U.S., 23.6 percent from the west and finally 20.4 percent living in the northeastern United States. Overall, the greatest number of these students, 24.2 percent reported living in small towns, with the next highest proportion (12.7%) living in medium cities and the smallest bunch (3.6%) living on a farm. Regarding sex and race, this sample contains slightly more women (51.7%) than men, while “whites” make up the overwhelming majority of the sample with 85.4 percent. When looking at the highest level of education completed by the respondent’s father, the analyses show the highest proportion of respondents (25.9%) listed this as high school. A slightly higher proportion, 28.2 percent, also listed high school as their mother’s highest education level completed. For high school type, the majority of respondents (56.6 %) listed “college prep” as the type of high school they currently attend while 30.6 percent of respondents reported that they attend a “general” high school.

For the general risk factors examined, we see that the just over seventy percent of all respondents report past year alcohol use. When looking at the perceived ease of

obtaining amphetamines, over half of the sample reports these drugs as easy to obtain with 28.1 percent citing them as fairly easy and 26.6 percent listing them as very easy to obtain illicitly. Only 12.4% of respondents found it impossible to obtain these drugs. For the self-esteem measures, the majority of the sample, on both items, listed responses indicative of higher levels of self esteem, with the vast majority in agreement that they had a positive attitude of themselves and that they could do things as well as others. While 93.1 percent of users report never using amphetamines of any kind, the majority of those who did report use said that they first did so in grade 10. Finally, for the disinhibition measure, nearly half of the sample (48.4%) indicated that they liked trying new things even if it meant breaking the rules while roughly twenty-five percent indicated some form of disagreement with this statement.

When examining the social bonding variables we first see that nearly seventy percent of the sample (68.4%) lives at home with both of their biological parents. Maintaining the focus on parental bonding, we also see that 69.6 percent of respondents cite some level of parental satisfaction with 27.1 percent indicating that they are completely satisfied with the relationship they have with their parents and only 4.4 percent stating that they are completely dissatisfied. Regarding one's religiosity, 34.8 percent of respondents indicate that they rarely attend religious services. However, roughly the same amount, 33.3 percent, indicates that they attend at least on a weekly basis. Those who never attend church comprise 16.5 percent of the sample while 15.4 percent attend only once or twice per month. As far as importance of religion in one's life, nearly one-third (32.7%) of all respondents cite religion as being extremely important in their life with 17.1 percent stating that is it not important at all. When

switching to the school realm, we see that 68.6 percent of respondents possess a grade point average of a “B” or better with the largest proportion of students (18.4%) holding a “B” average. Furthermore, in regards to future college plans, 78.3 percent of the sample indicated that they plan to attend a four-year college. For peer satisfaction, eighty-six percent of respondents indicated some level of satisfaction with their friends with 41.5 percent saying that they are completely satisfied with their relationship with their peers. Conversely, less than one percent said they were either dissatisfied or completely dissatisfied with their friends. Finally, 65.8 percent of the sample believed that strong friendships were extremely important to them while a meager 1.4 percent cited friendships as not important at all.

For the social learning items, we first see that 40.4 percent of the sample indicates that their friends never encourage them to do things of which their teachers would not approve while 31.7 percent report that their friends only seldom encourage this behavior and two percent stating that their friends encourage this all the time. Next, we see that sixty-nine percent of respondents say that none of their friends use amphetamines, including ADHD medication, illicitly with less than one percent reporting that all their friends take these drugs. Of those surveyed, thirty six percent indicate that they believe their friends look down a lot on drug use with 39.8 percent believing their friends look neither up nor down on use and just 1.7 percent of respondents indicating that their friends look up a lot to drug use. For one’s own thoughts on drug use, we see that nearly half the sample (49.5%) looks down a lot on drug use with 29.6 percent neither looking up to nor down on use and 1.6 percent looking up a lot to drug use. Regarding the use of amphetamines (including ADHD medication) for the purposes of fitting into a group, we

see that nearly the entire sample, 99.7 percent, reported never using these drugs for this purpose. Furthermore, we also see that 3.9 percent of respondents report amphetamine use for the purposes of gaining energy with only one percent reporting use for the purpose of gaining insight. The same proportion of respondents who reported gaining energy as a reason for use (3.9%) also reported amphetamine use while in school. Finally, as previously stated, only 88 total respondents (3.7%) reported any instances of past year illicit use of ADHD medication. Table 3 displays the frequencies and descriptive analysis for the sample used in this study.

Table 3: Frequencies and descriptive analysis of independent measures (N=2,384)

Demographic Information	Distribution (%)	General Risk Factors	Distribution (%)
<u>Geographic Region</u>		<u>Past year alcohol use</u>	
-Northeast	486 (20.4)	-No	568 (29.3)
-N. Central	591 (24.8)	-Yes	1686 (70.7)
-South	744 (31.2)		
-West	563 (23.6)		
<u>Sex</u>		<u>Easy to get amphetamines</u>	
-Male	1152 (48.3)	-Impossible	295 (12.4)
-Female	1232 (51.7)	-Very difficult	284 (11.9)
		-Fairly difficult	501 (21.0)
		-Fairly easy	670 (28.1)
		-Very easy	634 (26.6)
<u>Race</u>		<u>Positive attitude of oneself</u>	
-White	2036 (85.4)	-Agree	861 (36.1)
-Non-white	348 (14.6)	-Mostly agree	889 (37.3)
		-Neither	369 (15.5)
		-Most. disagree	166 (7.0)
		Disagree	100 (4.2)
<u>Urbanicity</u>		<u>Can do as well as others</u>	
-Farm	85 (3.6)	-Agree	1058 (44.4)
-Country	198 (8.3)	-Mostly agree	935 (39.2)
-Sm. Town	577 (24.2)	-Neither	269 (11.3)
-Med. City	302 (12.7)	-Most. disagree	72 (3.0)
-Med. Suburb	271 (11.4)	-Disagree	50 (2.1)
-Lg. City	245 (10.3)		
-Lg. Suburb	226 (9.5)		
-Vrylg. City	116 (4.9)		
-Vrylg. Suburb	114 (4.8)		
<u>Dad Ed. Level</u>		<u>First use</u>	
-Grade school	85 (3.6)	-Never	2219 (93.1)
-Some H.S.	252 (10.6)	-Grade 12	19 (0.8)
-H.S. grad	617 (25.9)	-Grade 11	36 (1.5)
-Some college	398 (16.7)	-Grade 10	45 (1.9)
-College grad.	519 (21.8)	-Grade 9	36 (1.5)
-Grad school	152 (6.4)	-Grade 8	9 (0.7)
		-Grade 7	16 (0.4)
		-Grade 6	5 (0.2)
<u>Mom Ed. Level</u>		<u>Likes to try new things even if breaking rules</u>	
Grade school	85 (3.6)	-Agree	515 (21.6)
-Some H.S.	171 (7.2)	-Mostly agree	638 (26.8)
-H.S. grad	672 (28.2)	-Neither	596 (25.0)
-Some college	450 (18.9)	-Most. disagree	352 (14.8)
-College grad.	624 (26.2)	-Disagree	283 (11.9)
-Grad school	293 (12.3)		
<u>H.S. type</u>			
-College prep	1349 (56.6)		
-General	730 (30.6)		
-Vocation/tech	122 (5.1)		
-Other	183 (7.7)		

Table 3 continued.

Social Bonding Variables	Distribution (%)	Social Learning Variables	Distribution (%)
<u>Mother & Father at home</u>		<u>Friends' bad encouragement</u>	
-No	784 (31.6)	-Never	963 (40.4)
-Yes	1630 (68.4)	-Seldom	756 (31.7)
		-Sometimes	458 (19.2)
		-Often	160 (6.7)
		-Always	47 (2.0)
<u>Attend religious services</u>		<u>Amt of friends who take amp</u>	
-Never	393 (16.5)	-None	1645 (69.0)
-Rarely	830 (34.8)	-A Few	468 (19.6)
-1-2X/month	367 (15.4)	-Some	198 (8.3)
-1X/week +	794 (33.3)	-Most	51 (2.1)
		-All	22 (0.9)
<u>Importance of religion</u>		<u>Friends look up/down on drug use</u>	
-Not imp.	408 (17.1)	-Down alot	858 (36.0)
-Little imp.	555 (23.3)	-Down some	410 (17.2)
-Pretty imp.	641 (26.9)	-Neither	948 (39.8)
-Extremely imp.	786 (32.7)	-Up some	128 (5.4)
		-Up alot	40 (1.7)
<u>GPA</u>		<u>Self looks up/down on drug use</u>	
-D	40 (1.7)	Down alot	1180 (49.5)
-C-	64 (2.7)	-Down some	408 (17.1)
-C	129 (5.4)	-Neither	706 (29.6)
-C+	229 (9.6)	-Up some	51 (2.1)
-B-	286 (12.0)	-Up alot	39 (1.6)
-B	439 (18.4)		
-B+	396 (16.6)		
-A-	424 (17.8)		
-A	377 (15.8)		
<u>Want to go to a 4 year college</u>		<u>Take amp to fit into group</u>	
-No	517 (21.7)	-No	2377 (99.7)
-Yes	1867 (78.3)	-Yes	7 (0.3)
<u>Satisfied with friends</u>		<u>Use amp at school</u>	
-Comp dissat.	17 (0.7)	-No	2291 (96.1)
-Dissatisfied	21 (0.9)	-Yes	93 (3.9)
-Somewhat Dis.	74 (3.1)		
-Neutral	222 (9.3)		
-Somewhat sat.	302 (12.7)		
-Satisfied	758 (31.8)		
-Comp. sat	990 (41.5)		
<u>Satisfied with parents</u>		<u>Use amp for insight</u>	
-Comp dissat.	105 (4.4)	-No	2560 (99.0)
-Dissatisfied	91 (3.8)	-Yes	24 (1.0)
-Somewhat dis.	169 (7.1)		
-Neutral	350 (15.1)		
-Somewhat sat.	393 (16.5)		
-Satisfied	620 (26.0)		
-Comp. sat.	646 (27.1)		
<u>Imp. of strong friendships</u>		<u>Use amp for energy</u>	
-Not imp	33 (1.4)	-No	2292 (96.1)
-Somewhat imp	176 (7.4)	-Yes	92 (3.9)
-Quite imp	607 (25.5)		
-Extremely imp	1568 (65.8)		

Bivariate Analysis

Bivariate crosstabulations were used to gauge the association between the illicit use of ADHD medication and the items in the four variable groupings. Chi-square statistics were used to measure significance at the $p < .05$ level with Phi and Cramer's V utilized, where applicable, to assess the strength of the relationship. The final number of illicit users in the analyses totaled 88 high school seniors. Because of the extremely low number of users (more importantly the low proportion of users to non-users), a rare events logistic regression will be employed later in the multivariate analysis to further build on any findings yielded from the bivariate analysis.

Demographic Information and General Risk Factors

Of the demographic items analyzed (Table 4), only sex and race showed a significant relationship with the illicit use of ADHD medication. Regarding sex ($X^2=4.492$, $\Phi=-.043$), 4.2 percent of female respondents were illicit users of ADHD medication, while 2.6 percent of males reported past year use. This runs contrary to previous literature on the illicit use of ADHD medication as well as drug use as a whole that shows males to be at a greater risk for use than females. For race ($X^2=3.246$, $\Phi=-.041$), 3.5 percent of white respondents reported past year use, while users only comprised 1.4 percent of non-white respondents. Among the general risk factors variables (Table 5), the only item showing a significant relationship with the illicit use of ADHD medication was the disinhibition measure inquiring if the student liked to try new things even if it meant breaking the rules ($X^2=18.471$, Cramer's $V=.025$).

Table 4: Bivariate crosstabulation of demographic information with past year illicit ADHD medication use (N=2,384)

Variable	N (% of users in variable)	χ^2 *	Phi/Cramer's V
Geo. Region		.452	.032
-Northeast	15 (2.9)		
-N. Central	25 (3.9)		
-South	23 (2.9)		
-West	25 (3.4)		
Sex		4.492	-.043
-Male	31 (2.6)		
-Female	53 (4.2)		
Race		3.246	.041
-White	57 (3.5)		
-Non-white	4 (1.4)		
Urbanicity		5.907	.048
-Farm	2(2.2)		
-Country	3 (1.4)		
-Sm. Town	25(4.0)		
-Med. City	12 (3.7)		
-Med. Suburb	9 (3.1)		
-Lg. City	8 (3.0)		
-Lg. Suburb	7 (2.9)		
-Vrylg. City	4 (3.2)		
-Vrylg. Suburb	6 (4.9)		
Dad Ed. Level		8.675	.059
-Grade school	7 (7.8)		
-Some H.S.	8 (3.1)		
-H.S. grad	22 (3.4)		
-Some college	15 (3.6)		
-College grad.	15 (2.8)		
-Grad school	15 (4.1)		
Mom Ed. Level		10.800	.066
Grade school	8 (9.0)		
-Some H.S.	6 (3.4)		
-H.S. grad	21 (3.0)		
-Some college	14 (3.0)		
-College grad.	20 (3.1)		
-Grad school	14 (4.6)		
H.S. type		2.586	.033
-College prep	41 (3.0)		
-General	32 (4.3)		
-Vocation/tech	4 (3.3)		
-Other	6 (3.2)		

*p<.05 denoted in **Bold**

Table 5: Bivariate crosstabulation of general risk factor variables with past year illicit ADHD medication use (N=2,384)

Variable	N (% of users in variable)	X ² *	Phi/Cramer's V
Past year alcohol use		.470	.014
-No	21 (3.0)		
-Yes	60 (3.5)		
Easy to get amp		1.268	.013
-Impossible	8 (2.7)		
-Very difficult	11 (3.8)		
-Fairly difficult	16 (3.1)		
-Fairly easy	22 (3.2)		
-Very easy	25 (3.9)		
Positive attitude		1.825	.025
-Agree	23 (2.8)		
-Mostly agree	31 (3.6)		
-Neither	13 (3.6)		
-Most. disagree	7 (4.4)		
Disagree	4 (4.2)		
Can do as well as others		6.393	.009
-Agree	31 (3.0)		
-Mostly agree	35 (3.9)		
-Neither	6 (2.3)		
-Most. disagree	1 (1.4)		
Disagree	4 (3.4)		
First Use		11.369	.028
-Never	59 (3.3)		
-Grade 12	1 (6.7)		
-Grade 11	0 (0.0)		
-Grade 10	2 (5.4)		
-Grade 9	2 (6.9)		
-Grade 8	0 (0.0)		
-Grade 7	1 (12.5)		
-Grade 6	1 (25.0)		
Likes to try new things even if breaking rules		18.471	.025
-Agree	11 (4.1)		
-Mostly agree	7 (2.1)		
-Neither	8 (1.4)		
-Most. disagree	34 (5.7)		
Disagree	15 (3.1)		

*p<.05 denoted in **Bold**

Social Bonding and Social Learning Variables

Next, the social bonding variable group was examined in relation to the illicit use of ADHD medication (Table 6). Among these variables, only one item, satisfaction with friends, was significantly related to past year illicit use of ADHD medication at the bivariate level ($X^2=13.435$, Cramer's $V=.003$). Here, past year use is reported in higher proportions among respondents who indicate some level of dissatisfaction with their friends with 11.1 percent of those who are completely dissatisfied with their friends indicating illicit use within the past year.

Of the eight social learning variables examined (Table 7) five were shown to be significantly related to the illicit use of ADHD medication at the bivariate level. First, the item inquiring if one's friends encouraged them to do things their teacher would not approve was significant ($X^2=20.079$, Cramer's $V=.066$). Here we see that 13.6 percent of those who have friends that always encourage bad behavior also report past year use. This is in contrast to just 2.4 percent of respondents who indicate that their friends never encourage bad behavior reporting past year use.

Finally, all four items related to motivation for illicit use were shown to be significant at the bivariate level as well. First, the illicit use of amphetamines to get energy was significantly related to past year use ($X^2=75.203$, $\Phi=.582$). Here, fifty-six percent of those who report amphetamine use for the purposes of gaining energy were past year users of ADHD medication. Next, there was a significant relationship between past year use of ADHD medication and illicit use for the purposes of gaining insight ($X^2=7.115$, $\Phi=.323$). For this item 61.5 percent of those who reported amphetamine use for the purposes of gaining insight reported past year ADHD medication use.

Furthermore, amphetamine use at school was significant as well ($X^2=60.777$, $\Phi=.552$). Here, 53.5 percent of those who had ever used amphetamines at school indicated past year use of ADHD medication. Finally, taking amphetamines for the purpose of fitting into a group was also shown to be related to the illicit use of ADHD medication at the bivariate level ($X^2=11.258$, $\Phi=.066$). In this item, ADHD medication users comprised 25 percent of respondents who indicated using amphetamines for this purpose. Of the four specific motivational variables for amphetamine use, this item, by far, had the least amount and proportion of illicit users of ADHD medication indicating this as a reason for use.

Inter-item Correlations

Similar to the bivariate crosstabulations, when examining the inter-item correlations of the measures used in this study, you are able to see both expected as well as contradictory trends. First, the dependent variable was significantly correlated with sex, parental satisfaction, friends' bad encouragement, and all four specific amphetamine use motivations. As expected from the crosstab findings, this relationship was strongest between the dependent variable and amphetamine use at school, for insight, and for energy. However, there are also several statistically strange findings that arise when looking at these relationships. The most notable is the lack of a significant association between the dependent variable and past year alcohol use. Alcohol use has been reported to have the highest co-morbidity of any substance with the illicit use of ADHD medication (McCabe et al., 2006; Shillington et al., 2006), yet here it has a low and non-significant correlation ($\Phi=.014$) with past year use in this study with the both items dichotomously coded as yes or no for use within the past year. Further confounding is

the fact that past year alcohol use seems to affirm past theoretical findings (Marcos et al., 1986) linking higher levels of bonds to a lower likelihood of use as five of the eight social bonding variables have significant, negative correlations with past year alcohol use. Therefore the bonding items used in this study (at least the five that were significantly related to past year alcohol use) seem to be valid reflections of the theoretical principles they are purported to represent. This gives merit to the idea that bonding theory/bonding principles may not be able to accurately explain and predict illicit use of ADHD medication.

Next, the aspect of social influence comes into question based on these findings as the amount of amphetamine using friends as well as the view that one's friends have of drugs had virtually no correlation with past year use of ADHD medication. This contradicts previous research suggesting that, in fact, peer delinquency and the number of delinquent peers is the greatest predictor of one's own delinquency (Marcos et al., 1986; Spooner, 1999; Warr, 2002; Haynie, 2002). Also confusing is the finding that one's own view of drug use is not significantly correlated with past year use of ADHD medication. These odd findings, and potential reasons for them, will be addressed later in the discussion section. Table 8 displays the inter-item correlations for all of the variables used in the study. While the results at the bivariate level may be somewhat surprising, when grouped together into models, these items fall below thresholds for concerns of multicollinearity and therefore we are able to proceed with the multivariate analysis in the hope of yielding significant results and meaningful interpretations which seemed elusive at the bivariate level.

Table 6: Bivariate crosstabulation of social bonding variables with past year illicit ADHD medication use (N=2,384)

Variable	N (% of users in variable)	X ²	Phi/Cramer's V
<u>Mother & Father at home</u>		.122	-.007
-No	28 (3.6)		
-Yes	56 (3.3)		
<u>Attend religious services</u>		1.943	-.018
-Never	14 (4.5)		
-Rarely	19 (2.9)		
-1-2X/month	9 (3.1)		
-1X/week +	19 (3.0)		
<u>Importance of religion</u>		.363	-.006
-Not imp.	12 (3.8)		
-Little imp.	14 (3.2)		
-Pretty imp.	15 (3.0)		
-Very imp.	20 (3.3)		
<u>GPA</u>		4.385	.004
-D	1 (2.4)		
-C-	0 (0.0)		
-C	4 (3.1)		
-C+	9 (3.9)		
-B-	9 (3.1)		
-B	20 (4.5)		
-B+	13 (3.2)		
-A-	14 (3.2)		
-A	13 (3.4)		
<u>Want to go to a 4 year college</u>		1.051	.021
-No	14 (2.7)		
-Yes	68 (3.4)		
<u>Satisfied with friends</u>		13.435	-.003
-Comp dissat.	2 (11.1)		
-Dissatisfied	1 (4.3)		
-Somewhat Dis.	4 (5.0)		
-Neutral	5 (2.1)		
-Somewhat sat.	18 (5.6)		
-Satisfied	18 (2.2)		
-Comp. sat	40 (3.8)		
<u>Satisfied with parents</u>		9.685	-.039
-Comp dissat.	5 (4.4)		
-Dissatisfied	6 (6.1)		
-Somewhat dis.	5 (2.8)		
-Neutral	21 (5.5)		
-Somewhat sat.	13 (3.1)		
-Satisfied	21 (3.2)		
-Comp. sat.	17 (2.5)		
<u>Imp. of strong friendships</u>		4.057	.037
-Not imp	1 (2.9)		
-Somewhat imp	3 (1.6)		
-Quite imp	18 (2.8)		
-Extremely imp	66 (4.0)		

*p<.05 denoted in **Bold**

Table 7: Bivariate crosstabulation of social learning variables with past year illicit ADHD medication use (N=2,384)

Variable	N (% of users in variable)	χ^2 *	Phi/Cramer's V
<u>Friends' bad encouragement</u>		20.079	.066
-Never	21 (2.4)		
-Seldom	22 (3.2)		
-Sometimes	21 (5.1)		
-Often	7 (4.8)		
-Always	6 (13.6)		
<u>Amt of friends who take amp</u>		2.606	.000
-None	54 (3.4)		
-A Few	12 (2.7)		
-Some	9 (4.8)		
-Most	2 (4.2)		
-All	0 (0.0)		
<u>Friends look up/down on drug use</u>		.887	-.001
-Down alot	25 (3.2)		
-Down some	13 (3.5)		
-Neither	27 (3.1)		
-Up some	3 (2.6)		
-Up alot	2 (5.6)		
<u>Self looks up/down on drug use</u>		4.762	.026
-Down alot	30 (2.8)		
-Down some	12 (3.3)		
-Neither	27 (4.3)		
-Up some	0 (0.0)		
-Up alot	2 (5.7)		
<u>Take amp to fit into group</u>		11.258	.066
-No	86 (3.4)		
-Yes	2 (25.0)		
<u>Use amp at school</u>		60.777	.552
-No	35 (1.4)		
-Yes	53 (53.5)		
<u>Use amp for insight</u>		7.155	.323
-No	72 (2.8)		
-Yes	16 (61.5)		
<u>Use amp for energy</u>		75.203	.582
-No	32 (1.3)		
-Yes	56 (56.0)		

*p<.05 denoted in **Bold**

Table 8: Inter-item correlations (Phi/Cramer's V/T_b)

Var.	DV	RF1	RF2	RF3	RF4	RF5	RF6	RF7	RF8	SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SL1	SL2	SL3	SL4	SL5	SL6	SL7	SL8
DV	1	-.043	.041	.013	.014	.025	.009	.028	.025	-.007	-.018	-.006	.004	.021	-.003	-.039	.037	.066	.000	-.001	.026	.066	.552	.323	.582
RF1		1	.036	.035	.002	-.043	-.029	.011	.010	.018	-.066	-.116	-.122	-.107	.000	.026	.004	.021	.027	.018	.004	-.027	-.031	.003	-.044
RF2			1	.142	.140	.151	.076	-.007	.007	.280	-.087	-.206	.157	.013	.042	.017	.038	-.011	.118	.009	.013	-.008	.021	.025	.034
RF3				1	.167	.040	-.018	.043	.005	-.007	-.095	-.095	-.053	-.026	.024	-.017	.010	.000	.315	.035	.050	.009	.016	.005	.036
RF4					1	.068	.030	-.001	-.007	-.036	-.144	-.172	-.117	-.017	.038	-.015	.011	.039	.151	.000	.007	.018	-.008	-.018	-.002
RF5						1	.510	-.035	-.019	.020	-.084	-.160	-.063	-.107	-.023	-.015	-.012	-.008	.072	.019	.018	.018	-.032	.029	.007
RF6							1	-.034	.016	.015	-.041	-.089	-.094	-.137	-.022	.026	.029	.009	.021	.002	.000	.000	-.028	.015	.003
RF7								1	-.012	.015	-.013	-.004	-.011	-.022	-.010	-.035	-.005	.023	.025	.198	.241	-.014	.050	.065	.051
RF8									1	.005	.004	.001	.012	-.007	.029	-.007	.006	-.008	.000	.005	-.004	.013	-.013	-.008	-.007
SB1										1	.129	.025	.141	.097	.013	.028	-.003	-.011	-.002	.043	-.011	-.023	-.018	-.018	-.018
SB2											1	.586	.124	.111	.036	.037	.022	.008	-.074	-.008	-.010	-.024	-.027	.025	-.032
SB3												1	.078	.073	.020	.029	.036	-.014	-.073	-.023	-.023	.013	-.007	.005	-.001
SB4													1	.178	.017	.031	-.045	-.012	-.077	-.013	-.034	-.002	-.008	.003	-.004
SB5														1	.042	.026	.003	.014	-.056	-.045	-.044	-.005	.008	.031	.037
SB6															1	.235	.220	-.073	.016	-.035	-.040	-.016	.010	.049	.025
SB7																1	.053	-.074	-.030	-.021	.002	-.040	-.046	-.017	-.039
SB8																	1	-.056	-.003	-.002	-.014	.010	.049	.017	.043
SL1																		1	.000	-.016	-.014	.012	.061	.028	.058
SL2																			1	.009	.037	.046	-.002	-.026	.016
SL3																				1	.619	-.002	.013	.004	.011
SL4																					1	-.013	.014	.022	.020
SL5																						1	.061	.134	.169
SL6																							1	.242	.587
SL7																								1	.241
SL8																									1

p<.05 denoted in **bold****Independent Item Key:**

RF1=sex

RF2=race

RF3=easy to get amphetamines

RF4=past year alcohol use

RF5=positive attitude of oneself

RF6=can do things as well as others

RF7=age of first use

RF8=like to try new things even if breaking rules

SB1=mother and father at home

SB2=attendance at religious services

SB3=importance of religion

SB4=GPA

SB5=want to go to a 4 year college

SB6=friend satisfaction

SB7=parental satisfaction

SB8=importance of strong friendships

SL1=friends encourage bad behavior

SL2=amount of friends who take amphetamines

SL3=friends' view of drug use

SL4=own view of drug use

SL5=take amphetamines to fit into a group

SL6=take amphetamines at school

SL7=take amphetamines for insight

SL8=take amphetamines for energy

Multivariate Analysis

In this step of the analysis, four variable sets are analyzed using rare events logistic regression (Table 9). Model 1 contains only the general risk factor measures (8 in total). Model 2, containing 16 variables, consists of the general risk factors and social bonding items. Model 3 contains the general risk factors and the social learning variables, again 16 in total. The final model contains all general risk factors social bonding, and social learning variables, summing to 24 items. Each model consists of 2,384 cases. This figure represents the number of cases out of the 15,222 students sampled that had valid responses for all of the items used in these models. As stated in the sampling section, this is a drawback of using this data since many of the items were not made available in each of the six surveys and therefore only those respondents in the analysis who had the opportunity to answer all of the items in question are eligible for inclusion. However, because of the random distribution of these surveys, any findings among these subgroups are considered to be generalizable to the entire sample. Of the three models, model 2 was shown to be significant ($X^2=30.32$, $p<.05$), as was model 3 ($X^2=225.89$, $p<.05$). Model 4 displayed the largest chi-square value ($X^2=243.81$, $p<.05$) with the largest chi-square change occurring between models 1 and 4 (232.06).

Model 1 produced no items significantly related to the past year use of ADHD medication. In model 2 only one item, parental satisfaction ($b=-.107$, $p<.05$), showed a significant relationship with the dependent variable. This is consistent with the bivariate findings as well which show a significant correlation between parental satisfaction and past year use of ADHD medication. In terms of odds ratio, each increase in level of satisfaction with one's parents results in the odds of past year use decreasing by a factor

of .898, or roughly eleven percent. This supports previous literature claiming higher parental attachment/bonding to be associated with a lower likelihood of substance use (Waitrowski et al., 1981; Hoffman & Johnson, 1998; Bell et al., 2000; Gerra et al., 2004). The X^2 change between models 1 and 2 was 18.57.

Model 3 contains seven items that are significantly related to the past year illicit use of ADHD medication. The first significant item is the esteem measure from the general risk factor grouping inquiring as to one's positive attitude of themselves. This item was not significant in model 1 or 2. However, when adding the social learning this item becomes significant in model 3 ($b=.221$, $p<.05$). This finding, however, seems to run contrary to previous assertions regarding the link between self-esteem and substance use. These findings indicate that each increase in the level of positive attitude one has for themselves results in roughly a twenty-five percent increase in the odds of them illicitly using ADHD medication in the past year.

The final six significant items in model 3 all come from the social learning variable grouping. Consistent with bivariate findings, friends' encouragement of bad behavior has a positive and significant relationship to past year use ($b=.084$, $p<.05$). The next two significant items, regarding views of drug use, have opposing results. First, the view one's friends have of drug use ($b=-.220$, $p<.05$) runs opposite to previous literature concerning differential association and reinforcement through peers as each increase in support for drug use by ones friends results in decrease in the odds of past year use by about twenty percent. Conversely, the odds of past year use increases by nearly twenty-nine percent for each increase in the level one's own support for drug use ($b=.254$,

$p < .05$). This, however, is the type of finding one would expect from a person holding positive attitudes towards drug use.

The final three significant items in model 3 all come in the form of motivations for use. Here amphetamine use in school (presumably for school related purposes) results in an increase in the odds of past year use by a factor of 2.768. Similarly, amphetamine use for insight ($b = 2.733$, $p < .05$) and amphetamine use for energy ($b = 2.705$, $p < .05$) both result in robust increases in the odds of past year use of ADHD medication. Overall model 3 was significant with a chi-square of 225.69. This indicates a sizeable change in chi-square value between model 1 and 3 (213.94).

Model 4 contains eight items that were significantly related to past year illicit use of ADHD medication. As with model 3, the first was the item inquiring about one's positive attitude of themselves. This item possessed the same coefficient value and odds ratio as it did in model 3, which did not contain the social bonding items. Again, this item was not significant in models 1 or 2, but when including the social learning variables in model 3 and now here, this item becomes significant. Next, satisfaction with one's friends was also significant when controlling for all other measures ($b = -.143$, $p < .05$). Crosstabulations indicated that variable item was significant at the bivariate level as well. As with the previous item, this was not significant in the other model that did not contain social learning items. These results show that for each unit increase in level of satisfaction with one's peers there is a decrease in the odds of past year illicit use of ADHD medication by a factor of .868, or 13.2 percent.

Again, the final six significant items in model 4 come from the social learning variable set. First, the amount of friends that one has who uses amphetamines was

significantly related to past year illicit use of ADHD medication at the multivariate level ($b=-.129, p<.05$). This item was not significant in model 3 but becomes significant once the social bonding items are added here in model 4. In terms of odds ratio, having higher numbers of amphetamine using friends results in a decrease in the odds of past year use of ADHD medication by a factor of .879, or 12.1 percent. As with the bivariate findings, this goes contrary to literature that suggests a link between peer delinquency and one's own delinquency. Again, the item inquiring if one's friends look up to or down on drug use was significantly related to past year use ($b=-.202, p<.05$) as was the item inquiring if the respondent themselves looked up to or down on this behavior ($b=.232, p<.05$). In model 4 the pattern is the same as in model 3. Each increase in the level of friends' admiration of (looking up to) this behavior results in a decrease in the odds of past year use by roughly eighteen percent. As for the respondent's view, each increase in the level of admiration for drug using behavior results in an increase in the odds of past year use by about twenty-six percent.

The final three significant variables are the same motivational items as in model 3. Amphetamine use at school was also significantly related to past year illicit use of ADHD medication at the multivariate level ($b=2.645, p<.05$). In terms of odds ratio, amphetamine use at school results in an increase in the odds of past year use by a factor of 14.083. Similarly, amphetamine use for the purposes of gaining insight was also significant in model 3 ($b=2.813, p<.05$). Here, amphetamine use for the purposes of gaining insight results in an increase in the odds of past year ADHD medication use by a factor of 16.659. Lastly, amphetamine use for the purposes of gaining energy was significantly related to past year use as well ($b=2.725, p<.05$). This translates into an

increase in the odds of past year use by a factor of 15.256. All of these numbers quite similar to those findings on the motivational items in model 3. Overall, model 4 was significant with a large chi square value ($X^2=243.81$, $p<.05$). The chi square change between models 1 and 4 was the largest of all model differences at 232.06.

According to these results, it appears that models containing the social learning variables we able to yield the greatest significance and predictive power. Even more noticeable are some of the odd findings that exist among the relationships (or lack thereof) between the variables. There are several factors that may exert a notable influence on these multivariate findings such as high robust standard errors in some of the measures and variables that act as suppressors within the analysis. These will be discussed further in the following chapter.

Table 9: Rare events logistic regression analysis (N=2,384)

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>b</i>	S.E.	O.R.	<i>b</i>	S.E.	O.R.	<i>b</i>	S.E.	O.R.	<i>b</i>	S.E.	O.R.
Sex	-.071	.051	.931	-.059	.069	.942	-.091	.056	.913	-.088	.064	.916
Race	-.024	.026	.976	-.016	.029	.984	-.020	.038	.818	-.018	.041	.982
PY alc use	.161	.252	1.174	.149	.253	1.160	.598	.437	1.818	.665	.455	1.944
Easy to get	-.009	.058	.991	-.012	.058	.988	.017	.060	1.017	.016	.058	1.016
Attitude	.109	.065	1.115	.111	.070	1.117	.221*	.071*	1.247*	.221*	.076*	1.247*
Can do well	-.123	.065	.884	-.132	.069	.876	-.111	.078	.894	-.125	.080	.882
First use	.019	.029	1.019	.018	.029	1.018	-.031	.042	.969	-.030	.040	.970
Try new things	-.019	.027	.981	-.018	.028	.982	.005	.038	1.005	.007	.038	1.007
Mom+Dad				.006	.008	1.006				.004	.007	1.004
Attend svc.				-.009	.093	.991				.003	.159	1.003
Imp. of Rel.				-.012	.091	.988				-.015	.155	.985
GPA				.023	.038	1.023				.056	.053	1.057
Coll. plans				.012	.089	1.012				-.008	.116	.992
Sat. friends				.008	.063	1.008				-.141*	.065*	.868*
Sat. parents				-.107*	.043*	.898*				-.022	.084	.978
Friend imp.				.333	.191	1.395				.083	.184	1.0686
Encouragement							.084*	.042*	1.087*	.081	.043	1.084
Friend use							-.119*	.064*	.887*	-.129*	.064*	.879*
Frnds. view use							-.220*	.087*	.802*	-.202*	.092*	.817*
Self view of use							.254*	.092*	1.289*	.232*	.097*	1.261*
Use to fit in							.547	.597	1.728	.574	.773	.932
Use at school							2.768*	.554*	15.926*	2.645*	.545*	14.083*
Insight							2.733*	.839*	15.378*	2.813*	.849*	16.659*
Energy							2.705*	.531*	14.954*	2.725*	.521*	15.256*
Model X ²	Model 1			Model 2			Model 3			Model 4		
X ² Change	11.75			30.32*			225.69*			243.81*		
				18.57			213.94			232.06		

*p<.05 denoted in **Bold**

Chapter Eight

Discussion & Conclusion

Reflecting back on the purpose for this investigation, the reason for this study was to add to the extant drug use literature by filling the void between epidemiological research and etiological studies concerning the illicit use of ADHD medication among high school students. While assessing the predictive power of general risk factors for drug use on this particular substance use behavior we also considered theoretical implications and examined aspects of social bonding and social learning theories and their ability to predict ADHD medication use among students. The necessity for this type of study was derived from the significant absence of theoretical frameworks in most of the present studies on the illicit use of ADHD medication, which looks predominantly at general risk factors for this behavior in a cross-section of time. The overall goal of this tactic was to find the most fitting theoretical framework through which researchers may best direct their future studies on this topic. Currently, there are no studies which seek to directly utilize theoretical principles to predict the likelihood ADHD medication use the way they have in the past for other types of substances such as alcohol or marijuana. Due to the nature and growing epidemic of this type of drug use as well as the success of theoretical application in the past to explain various forms of substance use, this study possesses a worthwhile purpose and can yield insightful results. Furthermore, this study was to be a stepping stone for future etiological inquiries into this type of drug use that

can examine longitudinal data within theoretical frameworks that are shown to be of significant explanatory power in studies utilizing cross-sectional data such as this.

Based on previously cited research (Akers & Cochran, 1985; Akers & Lee, 1999, Hirschi, 1969) it was hypothesized that aspects of both social bonding and social learning theories would be better able to explain the illicit use of ADHD medication among high school students compared to general drug use risk factors. Furthermore it was also hypothesized that higher levels of bonding would be negatively related to this type of drug use and that higher levels of association, reinforcement, and definitions favorable with the use of ADHD medication would be positively related to the use of ADHD medication. Overall, consistent with past research, items reflecting social learning principles were predicted to have the greatest explanatory power for this type of drug use among students compared to social bonding items and general risk factors. A sample of 2,384 high school seniors from the 2004 high school version of Monitoring the Future was utilized to test these hypotheses.

Discussion of Key Findings

Hypotheses

The results from the multivariate analyses indicate partial support for the first hypothesis as the variable group containing just the general risk factors was the only non-significant model due to the model chi-square not meeting the .05 criterion for significance. Therefore, as hypothesized, model 1 possessed the least amount of predictive power for the illicit use of ADHD medication. It is only partially supported due to the fact that there were no significant relationships found at the multivariate level between any of the general risk factors and past year use therefore failing to affirm past

findings on the topic as was hypothesized. Hypothesis 2 is rejected since not all of the social bonding items were negatively related to ADHD medication use. We can also reject hypothesis 3 as not all of the social learning items show a positive relationship with ADHD medication use. Finally, hypothesis 4 can also be rejected. While the models which contained the social learning items were significant and possessed the highest chi-square values, the relationship that many of these items had with past year use ran contrary to the suppositions of social learning theory and therefore violated the conditions of the hypothesis which was partially contingent on the support of hypothesis 3.

Multivariate Analysis

While model 1 containing just general risk factors yielded no significant results, model 2, which combined these items with social bonding measures, produced one measure significantly related to past year ADHD medication use in parental satisfaction. Not only was this measure significant, but it followed the hypothesized trend of greater levels of bonding being negatively related to past year use. This reflects previous literature that shows parent-child bonding to be directly associated with lower levels of substance use (Waitrowski et al., 1981; Hoffman & Johnson, 1998; Bell et al., 2000; Gerra et al., 2004).

Model 3 had seven significant measures. One of these measures was used in both of the previous models and was not significant until introducing the social learning items in model 3. The item, inquiring whether one has a positive attitude of themselves, is positively related to past year ADHD medication use. As mentioned before, this runs contrary to previously cited literature regarding the link between lower self-esteem and substance use (Newcomb, et al., 1986, Andrews et al., 1991; Barrett, 1990; Botvin et al.,

1990; Linden, 1992; Casemore, 1990; Kaplan, 1980; Smith & Fogg, 1978). A potential reason for this could involve these answers being related to the seemingly positive effects resulting from the illicit use of ADHD medication. For example, a student may have raised their GPA or school performance due to the illicit use of these substances which may lead to a boost in the positive outlook they have of themselves. Another explanation is that their use has somehow resulted in heightened popularity among their fellow students who are aware of their drug use for these purposes, or added praise from teacher or parents who are unaware of their drug use and their reasons behind it. Next, the results show bad encouragement from friends to be positively related to past year use. Here, we can see the effects of social reinforcement and its effect on this type of substance use as shown in past studies concerning other types of drugs.

Furthermore, one's own view of drug use follows the hypothesized trend of being positively related to past year use. This finding seems to substantively make sense based on previous research concerning one's approval or disapproval of certain delinquent behaviors (Rebellon, 2002; Paternoster & Brame, 1997; Akers & Lee, 1999). Also, those who use these substances would be less likely to look down on drug use, and ADHD medication in particular, due to the perceived performance enhancements that illicit use can bring. This type of reinforcement has also been supported in past literature regarding adolescent substance use (Akers, 1977, Akers et al., 1979).

However, the finding on one's own view of use runs contrary to the finding on friend's view of drug use, which displays a negative relationship between use and positive views. One possible explanation for this is that the majority of one's friends may in fact be non-users, and have negative views of drug use. This fact however may carry

little influence over the individual's behavior since, particularly for this type of substance, it would be hard to surround themselves with users of these specific types of drugs since use is so sporadic among students. On the other hand, a student may choose to surround themselves with those of a higher academic caliber (ex. honors students), who are non-users, and may use these drugs in order to gain elevated levels of performance in the school realm similar to their peers, though their own is by illicit means. The final three significant items, use in school, use for energy, and use for insight, all follow the hypothesized relationship trend. In all these findings give insight as to the reasoning behind and setting for this type of drug use. Again, these results seem to run parallel to what we already know about common motivations for the illicit use of ADHD medication (Teter et al., 2003) in that they are used for their actual medicinal effects (energy, insight) as well as positively perceived side effects (heightened performance in school).

In model 4, all of the measures significant in model 3 were also significant at the $p < .05$ level (as well as possessed the same relationship direction) with the exception of friend's bad encouragement, which moved to non-significance when adding the social bonding variables into the model. Strangely enough, the amount of friends who use amphetamines becomes a significant item in model 4, but has a relationship with past year ADHD medication use in the opposite direction of what social learning principles would predict. One reason for this could be that the strength of influence coming from certain peers has a greater effect over one's personal use compared to the sheer number of peers that use, a notion that has been supported in past research looking at adolescents and substance use (Norton, Lindrooth, & Ennett, 1998). Simply put, while one may

associate with a greater number of users, they may not possess the ability to pressure the individual into use when compared to strength of influence from non-using peers. Lastly, satisfaction with parents, the only significant bonding measure in the model 2 also was non-significant in model 4 when the social learning variables were added to the general risk factors and the social bonding items.

Upon first glance, many of these results may appear perplexing considering some of the items do not follow predicted relationship directions and some strangely enough are not significant at all. Taking a further glance, specifically, at items yielding null findings, a supplemental analysis indicates that the distribution for many of these items seems to follow the same trend for users and non-users alike. This brings up an interesting point to consider: Ultimately, there may indeed be no significant difference in beliefs and behavior (excluding actual use) between the general population of non-substance using adolescents, and those who qualify as users of these drugs. A real world example of this concept would be non-deviant sub-cultures of cocaine use in Amsterdam (Cohen, 1989). Contrasting this blending into mainstream society would be subgroups such as those involved in the club and rave culture, which may be characterized by their differential beliefs and behaviors in addition to their use of ecstasy, MDMA and other similar substances (Inciardi, 2008).

Implications

What does this all mean? This study, using cross-sectional data, attempted to find a proper scope by which to investigate this type of drug use, taking into consideration both non-theoretical and theoretical perspectives. Partial support for the first hypothesis suggests that it might be prudent to frame investigations such as these in the scope of

theories of behavior, as opposed to grouping together general risk factors typically associated with substance use, when conducting this type of inquiry. Furthermore, if we can see that it is better to look at cross-sectional data on ADHD medication use using certain theoretical perspectives, it helps guide future investigations into this type of deviance at the etiological level, using longitudinal data.

Theoretically speaking, the findings of this study have produced conflicting results. While the models containing the theory-based variables did possess the greatest predictive power, some of the individual measures representing various aspects of the theory had relationships that run contrary to the theoretical principles they represent. While items such as parental and friend satisfaction followed the hypothesized relationship to the illicit use of ADHD medication as dictated by social bonding theory, there were other significant items such as amount of drug using friends and peer view of substance use that ran contrary to what social learning theory states. Even amongst the non-significant variables, there are still items that stand out not only because they are not significant, but because their relationship direction does not correspond to their theory.

This brings into question the quality of the data. Due to this, a second set of analyses was run substituting past year use of marijuana for past year ADHD medication use. The results from these analyses not only show that all of the models, including the model containing general risk factors was significant at the $p < .05$ level, but that other covariates, not significantly related to the past year use of ADHD medication, become significant now as well. In this analysis availability of drugs, the impulsivity measure inquiring on one's desire to try new things, the amount of friends who use marijuana, use of marijuana to fit into a group, as well as age of first use were significantly related to

past year marijuana use, in the proper direction as well. These, along with the same theory-based measures also found significant in the ADHD model (ex. motivations) make a credible case that the covariates used are indeed valid and accurate reflections of the theoretical principles they are proposed to represent. In addition to this, those items that were not significant still had directions in relationship, albeit not significant, that corresponded with the principles of the theory it was representing. Therefore, while many of these items, some of which are proxy measures, seem to produce strange and confounding results in regards to illicit use of ADHD medication, they still, albeit not wholly, can be used to explain marijuana use based on the principles of the theories that these items represent.

This shifts the focus to the dependent variable. While it is a recode that includes two of the most popular prescription drugs used to treat ADHD, it still is unable to account for those who illicitly use ADHD medication other than the two included in this study (ex. Adderall, or Concerta). Consequently, this study is unable to capture the full spectrum of use illicit use among these students. However, it would be a fair to assume that students who illicitly use ADHD medications other than the ones examined in this study do so for the same reasons as those who use the drugs included here, as they have similar, if not identical, effects. A rare events logistic regression was utilized in this study to account for the low (and disproportionate) number of users which may have been a product of the dependent variable. Therefore, taking on the assumption that there is no difference in use patterns from one type of ADHD medication to the next, the findings on this topic would have been no different even with a more inclusive dependent variable.

Regardless of the data concerns present in this study, more theory testing is necessary if we wish to gain the ability to properly discern which theoretical premise can best be used to explain and predict this type of drug use. While this study did show that social learning items had the greatest effect on the analyses, many of the findings contradicted core theory principles, therefore positing that social learning theory may not be the best scope by which to study this particular type of drug use. These findings, nonetheless, do bring up an interesting question that should be explored in future investigations on ADHD medication: Perhaps this particular type of drug use lacks a more traditional, peer based, social component that would normally contribute to a higher probability of use. This notion is derived from examining findings of the social and non-socially based items included in the social learning variable group regarding past year use. Here, the items regarding one's own definitions as well as the non-social reinforcement (motivational) items were significant and had the hypothesized relationship direction. However, aside from friend's encouragement of bad behavior, significant only in Model 3, the other socially oriented items (amount of friends who use and friend's view of use) had directional relationships that ran opposite of what social learning principles state.

With affirmed findings on the non-social and personal definition aspects of this type of drug use and significant but contradicting findings on the social aspects, future studies may want to carefully reconsider the potential reasons for use as well as the type of drug in question when attempting to theoretically contextualize the illicit use of ADHD medication. Unlike common motivations for other substances such as alcohol (intoxication), marijuana (to get high), LSD (psychedelic experience), or ecstasy (sensory

enhancement), previous literature has suggested that the primary motivation behind the use of these drugs seems to be utilitarian as opposed to recreational. Because of this, use may be for the purpose of attaining personal goals or enhancing one's performance in, for instance, the school realm and therefore would be more personal in nature than social. So while social learning items were able to best predict use in this study, albeit in contradictory ways, the aforementioned lack of a social component or socially based motivation for use should be explored further before proper theoretical contextualization can occur.

Methodologically speaking, even with the large sample such as the one used in this study, the use of these types of drugs are an extremely rare event. Bivariate analyses can only give us relationships between individual covariates and use of these drugs, which possess very little explanatory power on a grand scale. Furthermore, this method proves futile if we wish to test the effect of multiple variables as a whole, such as a set of theory-based measures.

Due to the low number of users, a standard regression analysis is not the most prudent method to utilize in this case. However, using a rare events regression will allow researchers to gain some viable interpretability when faced with a low number of "yes" responses, as it did in this one. The majority of the studies currently published on this topic have not taken it to this level of analysis thus far. These studies focus primarily on bivariate analyses and/or the reporting of prevalence of and individual correlations to the illicit use of ADHD medication (Babcock & Byrne, 2000; Barrett & Pihl, 2002; Hall et al., 2006; McCabe et al., 2004; Robison et al., 1999; Teter et al, 2003; White et al., 2003). Therefore, when attempting to build on the existing literature on this topic in the form of

theoretical contextualization, the methodology employed in this study represents a novel and effective means by which to achieve such a goal.

The methodology employed in this study moves beyond basic prevalence, correlations and bivariate relationships and allows researchers to study the effect of multiple variables as a set as well as facilitates more in depth interpretation concerning relationship direction and magnitude. This will help to bridge the aforementioned gap between epidemiological studies, which frequently employ simple bivariate analyses, and etiological investigations, which can use studies such as these as a base for research on this topic at the longitudinal level.

Limitations

As previously alluded to, this investigation is not without its own set of limitations. First off, by using Monitoring the Future, the measures for this study are not specifically tailored for theoretical interpretations. Fortunately, many of the measures were direct reflections of theoretical concepts (ex. one's view of drug use as a definition) or had been used in the previous studies testing theoretical aspects against various forms delinquency (ex. plans to go to a 4-year college as educational commitment). However, despite the extensiveness of the Monitoring the Future survey, the actual breadth of the theoretical measures that could be selected from the data to be utilized in this study was quite limited. Consequently, a more in-depth investigation employing numerous items to measure each aspect of the theories examined (see Akers et al., 1979) was not possible with this data. Furthermore, some of these should be treated as proxy measures and in the future, better fitting replacements should be used in lieu of those utilized in this study

(ex. friends encouragement of behavior the teacher would not approve as social reinforcement towards substance use).

Next, there are notably higher robust standard errors in three of the significant measures in model 3 of the multivariate analysis: amphetamine use at school, for insight, and for energy. These items could potentially affect the predictive power of models 3 and 4. A potential, and obvious, reason for this could be that these three measures are highly correlated with the dependent variable as well as each other (see table 8).

Normally, this would prove problematic when attempting to accurately interpret the effects of the variables in the model. However, further analysis shows that these items fall below the thresholds for concerns of multicollinearity. Despite this, there is still a noticeable change in several items when these motivational measures are added to the analysis in models 3 and 4. The two most notable cases of this occurring would be with the items regarding parental satisfaction as well as having a positive attitude of oneself. In model 2, parental satisfaction has a significant, negative relationship with past year alcohol use. However, when including these questionable items along with the rest of the social learning measures in model 4, this item is now no longer significant. Furthermore, the attitude measure, not significant in models 1 and 2, is significantly related to past year ADHD medication use in models 3 and 4 when these items are included in the analysis. Lastly, though it is not a significant measure in any of the models, past year alcohol use also shows a peculiar trend when in the same model as these items as well. In models 1 and 2, past year alcohol use has coefficients of .161 and .149, respectively, with standard errors just above .250 in both. However, models 3 and 4 show coefficients values for this item three and four times greater than in the previous models in addition to nearly

doubling the value of the standard error. These trends may point to problems with the social learning measures, and in particular those with the unusually high error terms.

To test the potentially adverse effect that these items may have on predictive power on the model as a whole, a separate analysis was run removing these three items from the model in addition to the fourth, non-significant, motivator of “use to fit into a group”. Here, model 4 was re-run with these four items removed. This process still yielded a significant model, albeit with a much smaller chi-square ($X^2=39.60$, $p<.05$). These results also show no other items gained or lost significance when these 4 items of motivation were removed, signifying that these items do not affect model significance via their inclusion. Regardless, the high error terms of the motivational items combined with the changes in other measures seen when in the same model with these questionable measures raises concerns about the data quality. If this issue does indeed derive from a problem with the data, it seems prudent for future studies on this topic to utilize and replicate measures from other studies attempting to assess these theoretical aspects in order to avoid this very predicament.

Continuing to speak on the limitations present in the multivariate analysis, it appears that there are some suppression effects that arise between the bivariate and multivariate analyses. Further examination shows that nine of the individual covariates, five risk factors and four bonding measures, displayed changes in the direction of their relationship with past year ADHD medication use from the bivariate analysis to the multivariate regression.

Regarding the general risk factors, race and the item inquiring if one can do things as well as others showed a positive relationship with the dependent variable in the

bivariate analysis yet had a negative relationship in all four models in the regression analysis. Next, the availability and impulsivity/sensation seeking/disinhibition measures both displayed positive relationships at the bivariate level, but showed a negative relationship in models 1 and 2 of the multivariate analysis. Finally, age of first use showed a positive relationship with past year use in the bivariate analysis, but the relationship direction became negative when adding the social learning items in models 3 and 4.

For the social bonding items, results show that the item measuring household composition had a negative relationship at the bivariate level, but was positively associated with past year use in the regression analysis. Attendance at religious services was negatively associated with the dependent variable in the bivariate analysis, but this relationship became positive with the addition of the social learning items in model 4. The item measuring one's college plans also changed in relationship direction (negative to positive) in the full model as well. Finally, friend satisfaction, was negatively associated with past year use at the bivariate level. However, this relationship became positive when including the rest of the bonding items as well as the general risk factors in model 2. It should be noted that the relationship again became negative as well as significant in model 4 with the addition of the social learning items. Overall, none of these aforementioned items were significant at the bivariate level, with only one, friend satisfaction, significant in any model of the multivariate analysis. Due to this, the suppressive effects present in the multivariate model may not exert a strong influence on the individual effects that each of these measures has on the dependent variable, yet it is still an issue that merits attention.

A final note on the limitations of this study concerns the data. While 15,222 cases comprise the Monitoring the Future respondents, only 2,384, or 15.7 percent, could be used in the analyses. While funneling down these cases may seem problematic and lead to data loss or problems with generalization, further investigation shows that this is not the case in this study. An analysis of the frequency distribution of the demographic items as well as past year alcohol use, which were made available to all participants in MTF, were compared to the frequency distributions of the same items answered by those in the sample used in this study. The results show that the responses by the study sample follow the same distribution trend as all participants on each item with no more than a one percent difference in each answer category between the groups. Furthermore, when comparing the frequency distribution of responses to questions unique to those who received one MTF sub-file to those of the study sample, similar results are reported, again, with no more than a one-percent difference in each answer category on each item between the two groups. While it would be have been ideal to include all 15,222 cases, the sampling method used in the original distribution of this survey and as well as the one used in this study takes steps to ensure generalization and reliability of any results derived from the data.

Future Considerations

These findings make it clear that more research is necessary on this topic before meaningful interpretations can be made about the theoretical contextualization of ADHD medication. While this study did produce significant results, many of them were contradictory and require further investigation. In addition to replicating this study with different data that is better tailored for theoretical interpretation, the exploration of other

theories and their ability to predict this type of drug use is also necessary. While further examining the effects of social bonding and social learning theories may build on the finding in this investigation, considering the a more personal (non-social) nature of this type of drug use and attempting to examine it in the context of strain theory or a rational choice perspective may provide insight into aspects that were overlooked in this study. Overall, the focus at this time still remains on the proper theoretical contextualization of this type of drug use before moving on to more in-depth investigations involving the assessment of causation within a theoretical context.

In this regard, however, it may be worthwhile to consider a two-step approach when conducting a study such as this in the future. Using cross-sectional data, researchers can gather information from a sample of adolescents to determine what risk factors, belonging to a theoretical perspective, are most commonly associated with the use of ADHD medication. It is in this step that they can assess the applicability of various theories to the illicit use of ADHD medication. From there, using the same sample, a longitudinal approach will be employed gathering information at one or more times in a given period in order to build on the cross-sectional findings and to potentially assess causation. A combination approach similar to this has been used in the past to look at adolescent drug use (Newcomb et al., 1986; Newcomb & Feliz-Ortiz, 1992). A qualitative approach may also be a meaningful venture since this population of users still appears to be relatively small in comparison to users of other substances, such as marijuana or cocaine. Along these lines, case studies of habitual users, or even semi-structured interviews with casual users, may provide more insight as to the various

factors surrounding this particular type of drug use than a more rigid and objective survey method.

To conclude, this study has examined the illicit use of ADHD medication among high school students in the hope of not only adding to the literature regarding this relatively new, but dangerous, drug use trend, but also to help develop new ways by which researchers can study this particular type of drug use. This study set out with the specific goal of contextualizing the illicit use of ADHD medication into a theory of deviance in order to provide a scope by which future researchers on this topic may use in their investigations. However, much work is still ahead on refining this method in a manner that can produce consistent and reliable results with meaningful interpretations. Specifically, further investigation as to which theory or theories can most adequately predict the use of ADHD medication is necessary as well as developing methods by which researchers can maximize the interpretation of their findings on this topic given such a small user population. While much is still to be learned about this specific type of prescription drug use, this study is nonetheless a step forward in fully understanding the factors behind the illicit use of ADHD medication. If this study conveys any lasting message, it should be that while it is important to keep a watchful eye on prevalence numbers and factors associated with the illicit use of ADHD medication, a proper examination and assessment of this type of drug use must be conducted through the proper theoretical scope in order to gain a full understanding of the problem and the most effective ways by which policymakers may go about curbing this behavior among this country's youth.

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