January 2017

The Prediction Of Nonmedical Prescription Stimulant Use In College Students

Danielle Lynn Beyer

THE PREDICTION OF NONMEDICAL PRESCRIPTION STIMULANT USE IN COLLEGE STUDENTS

by

Danielle Lynn Beyer
Bachelor of Arts, University of North Dakota, 2012

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Arts

Grand Forks, North Dakota

August
2017

This thesis, submitted by Danielle Lynn Beyer in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Dmitri Poltavski, Ph.D.

Jeffrey Holm, Ph.D.

Adam Derenne, Ph.D.

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.

Grant McGimpsey
Dean of the School of Graduate Studies

Date

PERMISSION

Title	The Prediction of Nonmedical Prescription Stimulant Use in College Students
Department	Psychology
Degree	Master of Arts

In presenting this thesis in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised my thesis work or, in his absence, by the Chairperson of the department or the dean of the School of Graduate Studies. It is understood that any copying or publication or other use of this thesis or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my thesis.

Danielle Lynn Beyer
07/27/2017

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGMENTS

I wish to express my profound gratitude to my committee chairperson, Dr. Dmitri Poltavski. The dedication and guidance he offered throughout the process of statistical analysis and writing of this project were invaluable and have aided my personal growth as a researcher. I would also like to offer my appreciation to all the members of my advisory committee, Dr. Jeffery Holm, Dr. Adam Derenne, and Dr. Alison Looby, whose critiques and suggestions for my project have added to its quality, and challenged me to think more analytically of my own work. Finally, I am appreciative of the financial support provided by the Department of Psychology, which allowed me to provide monetary incentives to participants

ABSTRACT

The use of prescription stimulant medications, such as Ritalin and Adderall, has increased dramatically over the past two decades (Zuvekas & Vitiello, 2014). Particularly concerning to public health officials has been the escalation of college students who report nonmedical prescription stimulant use (NPS). Studies have identified cognitive enhancement (i.e., increased concentration, etc.) as the primary motive for college students to engage in NPS (DeSantis et al, 2011; Smith & Farah, 2011). Additional findings suggest individuals involved with Greek organizations and/or individuals who maintain lower cumulative grade point averages (GPA) report significantly higher rates of NPS than Non-Greek and/or higher GPA peers (McCabe et al., 2005). More recent studies have implicated low academic self-efficacy and high academic procrastination as individual risk factors for NPS (Looby et al., 2015; Sattler et al., 2014). Thus, the current study used a binary logistic regression analysis, with an enter procedure, to test the hypothesis that Greek Involvement, low cumulative GPA, high academic procrastination, and low academic self-efficacy for study would significantly predict NPS for academic purposes in an undergraduate sample. Results indicated a statistically significant overall prediction accuracy of 65.0% ($\chi^2(8, N=140)=17.059$, $p=0.030$). The model accounted from 26% of the variability in the prediction of NPS for academic purposes. Significant individual predictors included GPA (Wald $\chi^2=10.510$, $p=0.001$, OR=0.236), Greek Involvement (Wald $\chi^2=3.797$, $p=0.051$, OR=0.380), and academic procrastination (Wald

χ^2=3.562, p=0.059, OR=1.078). Limitations of the study include combining three motives for NPS use to operationalize ‘academic purposes’ and the small sample size.

CHAPTER I

INTRODUCTION

The number of individuals using prescription stimulant medications has increased dramatically since the mid 1990s (Zuvekas & Vitiello, 2014). This escalation has been observed with the medical use of prescription stimulants, as well as the nonmedical uses of these medications. Although this dramatic increase in both populations is a public health concern, the marked increase in the latter group is particularly alarming because health professionals are unable to actively monitor the adverse effects of nonmedical prescription stimulant use (NPS).

Given the increasing prevalence of NPS, researchers have focused on identifying individuals who are at the greatest risk to engage in this behavior. Several studies have identified adolescents and young adults are the most at-risk populations to engage in NPS (Kaye & Darke, 2012; Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Due to the high prevalence rates within this demographic, especially college students, researchers have focused their efforts to identify predictors associated with NPS (Aldworth, 2009; Kaye & Darke, 2012; Wilens et al., 2008).

Among the identified predictors of NPS, two that have been of the most empirically investigated are: (1) motives for use, and (2) demographic characteristics. Regarding the motives for use, college students primarily cite a desire for enhanced academic performance (i.e., increased concentration and alertness). Thus, the majority of

college students report NPS for academic purposes, as opposed to NPS for recreational purposes (DeSantis, Webb, & Noar, 2008; Garnier-Dakstra, Caldeira, Vincent, O'Grady, & Arria, 2012). Referencing demographic predictors of NPS, individuals involved with Greek organizations or maintain grade point averages (GPA) less than 3.5 are at a heightened risk to engage in NPS relative to same-aged peers (McCabe, Knight, Teter, & Wechsler, 2005). Recently, efforts have been made to identify more malleable individual risk factors for NPS for academic purposes, such as low academic self-efficacy and high academic procrastination (Looby, Beyer, & Zimmerman, 2015; Sattler, Mehlkop, Graeff, & Sauer, 2014). Further research investigating which risk factors are the most predictive of NPS for academic purposes may aid in the development of targeted interventions to reduce the prevalence of NPS among college students.

Prescription Stimulant Medications

Stimulant medications are prescribed as a pharmaceutical treatment for Attention Deficit/Hyperactivity Disorder (ADHD). This disorder presents as a persistent pattern of inattention and/or hyperactivity-impulsivity (American Psychiatric Association, 2013). Hyperactivity manifests as restlessness, fidgeting, and unnecessary body movements, while impulsivity presents as an incapability to suppress inappropriate responses (e.g., premature responding and recklessness; Leonard, McCartan, White, & King, 2004). Prescription stimulant medications have been shown to effectively manage ADHD symptoms in children, adolescents, and adults (Weyandt et al., 2014). As a result, prescription stimulant medications are often among the first-line of treatment for individuals diagnosed with ADHD.

In healthy individuals, prescription stimulants generally promote behavioral alertness, agitation, or excitation and therefore are classified as central nervous system stimulant medications (Campbell & Young, 2015; Leonard et al., 2004). Methylphenidate (MPH; i.e., Ritalin, Concerta) and amphetamine-dextroamphetamine (i.e., Adderall) are two central nervous system stimulants commonly prescribed for the management of ADHD symptoms (Zuvekas & Vitiello, 2014). Despite similar behavioral effects, specific prescription stimulant medications (e.g., MPH and amphetamine-dextroamphetaime) vary in their neurochemical mechanisms of action (Arnold, 2000; Campbell & Young, 2015).

MPH is classified as a pure uptake inhibitor that primarily inhibits dopamine, and to a lesser extent norepinephrine (Leonard et al., 2014). MPH prevents these neurotransmitters from being reabsorbed into the presynaptic cell, thus resulting in an increased extracellular level of dopamine and norepinephrine (Spiller, Hays, & Aleguas, 2013; Wagner & Silber, 2004). Rapidly metabolized, MPH reaches maximum plasma concentration (or the highest absorption the drug will reach) between one and three hours following oral administration (Leonard et al., 2004). This absorption rate of MPH is relatively rapid when compared to other central nervous system stimulants, though individual absorption rates vary from person to person (Modi, Lindemulder, & Gupta, 2000; Shaywitz et al., 1982). Most MPH medications (i.e., Ritalin and Concerta) are available in three forms: short-, intermediate-, and long-release (Chew, Hales, & Yudofsky, 2009).

Another commonly prescribed central nervous system stimulant is amphetamine-dextroamphetamine, sometimes referred to as mixed salts amphetamine (Ilieva, Boland,

& Farah, 2013). This pharmaceutical stimulant is more commonly known by its original marketed name, Adderall. Amphetamine-dextroamphetamine is a combination of amphetamine analogues, which are similar in molecular structure to amphetamines but have slight substitutions on the phenylethylamine backbone (Fitzgerald & Bronstein, 2013). Specifically, amphetamine-dextroamphetamine is comprised of ¾ dextro-amphetamine and ¼ levo-amphetamine and is available in two forms (short- and long-release; Arnold, 2000; Chew et al., 2009).

In the brain, amphetamine-dextroamphetamine acts as a substrate for neurotransmitters in order to gain access into the presynaptic neuron (Arnold, 2000). Unlike MPH that acts by blocking the reuptake of neurotransmitters into the presynaptic cell, amphetamine-dextroamphetamine acts as a releaser of neurotransmitters, specifically dopamine and to a lesser extent norepinephrine and serotonin. This process results in an extracellular increase of these neurotransmitters (Calipari, Ferris, Siciliano, & Jones, 2014). The half-life of amphetamine-dextroamphetamine is estimated to be between four and six hours, which are longer than the approximate three-hour half-life of MPH (Kolar et al., 2008; Hysek et al., 2014).

Although MPH and amphetamine-dextroamphetamine work though different mechanisms of action, behavioral effects for both medications depend upon form is taken (Chew et al., 2009). Specifically, short-release stimulants generally reach optimum effectiveness between two to six hours and require two to three daily doses. Intermediate-release formulas, on the other hand, are taken once or twice daily and reach peak

effectiveness within six to eight hours. Long acting forms are frequently only taken once daily in the morning, and are most effective between six and twelve hours.

Paradoxical Effects of Prescription Stimulants. Reducing attention problems and hyperactive symptoms with a stimulant medication appears inherently contradictory. However, Cools, Aarts, and Mehta (2011) indicate that many medications produce variable, and sometimes paradoxical effects, depending on a variety of factors (e.g., dose, population, baseline levels). Decades of research has indicated that stimulant medications produce a calming behavior and facilitate concentration in many individuals with a diagnosis of ADHD, while these same medications may produce a 'high' or sense of euphoria in healthy individuals. One common explanation for the variable effects is that individuals' with ADHD have problematic dopaminergic functioning in the brain.

In Cools and colleagues' chapter (2011), the authors emphasize the physiological complexities of the brain and stimulant medications. However, they present a few hypotheses regarding proposed mechanisms that give rise to paradoxical drug effects. Specifically, regional specificity in the brain refers to the idea that specific areas in the brain may respond differently than another area. Prescription stimulants alter dopaminergic activity in both the striatum and the prefrontal cortex, however this is accomplished though different mechanisms.

Dopaminergic activity in the ventral striatum is believed to function differently between individuals with and without a diagnosis of ADHD. In particular, individuals with ADHD experience abnormal phasic bursts of dopamine, which increases the availability of a reward to elicit impulsive behavior (Cools et al., 2011). Prescription

stimulants increase extra-cellular dopamine, which though a negative feedback loop causes autoreceptors to inhibit the presynaptic neuron's release of dopamine. Short-term phasic bursts of dopamine are attenuated thus resulting in an individual's ability to suppress immediately rewarding behavior. The striatum has also been indicated in a variety of other behaviors associated with ADHD, such as inhibitory control, working memory, and incentive motivation.

In the prefrontal cortex, levels of functionality are conceptualized in an inverted U-shaped function. Essentially, this function places the optimal level of functionality at the top of the inverted U, while level that fall to the left or right of the peak result in sub-optimal functionality. Cools et al. (2011) summarize literature that indicates individuals with ADHD are functioning with prefrontal cortical dopaminergic levels falling on the left of the inverted U-shape function. Prescription stimulants amplify dopamine transmission, shifting them closer to the peak and to optimal levels of functioning. However in healthy individuals, a stimulant medication pushes them off the peak of optimal functioning and down the right side of the inverted U-shaped function, resulting in sub-optimal levels of functioning. The functions of the prefrontal cortex, working memory, distractor resistance, sustained attention, and response inhibition, have all been implicated as behavioral deficits in individuals with ADHD.

Prevalence Rates of Prescription Stimulant Use

Medical Use of Prescription Stimulants. Prescription stimulant medications are among the most popular treatment for the management of ADHD symptoms in children (Centers for Disease Control and Prevention, 2005). In the United States, three million or

60% of children diagnosed with ADHD are treated with a prescription stimulant medication. Of these children, approximately 50% will continue to experience ADHD symptoms into adulthood (Wilens et al., 2004). An estimated 2.5% of adults in the United States have a diagnosis of ADHD (Simon, Czobor, Bálint, Mészáros, & Bitter, 2009).

A recent study investigated the medical use of prescription stimulants in an undergraduate sample. McCabe, West, Teter, and Boyd (2014) found that both past-year and lifetime medical use of prescription stimulants has increased significantly since the early 2000s. Specifically, the number of people who reported past-year medical use of prescription stimulants increased from 1.9% in 2003 to 4.7% in 2013. Similar trends were observed regarding the lifetime medical use of prescription stimulants (i.e., 3.4% in 2003 to 7.0% in 2013). This increase in medical use of prescription stimulants may have a direct impact on the nonmedical use of prescription stimulants, as the greater the numbers of prescriptions, the more pills are potentially available to be traded, sold, or stolen.

Nonmedical Use of Prescription Stimulants. The nonmedical use of a medication is defined as using a pharmaceutical drug without a prescription, in a different manner than prescribed, or using the medication to get high (Whiteside et al., 2015). Since the late 1990s, researchers have documented an increasing trend of individuals engaging in NPS. The NPS literature indicates that the initial nonmedical use begins, for some individuals, at an early age. One study reported that 4.5% of 6th-11th graders engaged in NPS (McCabe, Teter, & Boyd, 2004). Further support of this trend was indicated by another study that reported past-year prevalence rates between 5 and 9% among elementary through high school students (Wilens et al., 2008). In 2007, 642,000

individuals over the age of 12 years initiated their first nonmedical use of prescription stimulants (Aldworth, 2009). These statistics are consistent with national epidemiological studies, national surveillance reports, and surveys that show that NPS is a growing problem among both adolescents and young adults (Chen, Crum, Strain, Martins, & Mojtabai, 2015; McCabe et al., 2014).

Regarding young adults, NPS is the second most common illicit substance (behind marijuana) used by college students between the ages of 18 and 22 years (Johnston, O'Malley, Bachman, & Schulenberg, 2004). One study found that among college students with an ADHD diagnosis and a prescription for a stimulant medication, 31% reported taking their medication at a higher dose or more frequently than prescribed (Rabiner et al., 2009). Of students who do not a prescription for a stimulant medication, eighty-five percent reported that obtaining prescription stimulants is "very easy" to "somewhat easy" and that they have access to these medications through a friend or significant other (DeSantis et al., 2008). Of the routes of administration (e.g., orally, internasally, intravenously), the majority of college students who have engaged in NPS (91.9%) report swallowing the capsule whole (Garnier-Dykstra et al., 2012).

Research investigating prevalence rates of NPS on college campuses vary greatly (i.e., 4.1-35.5%) from one college to another (Low & Gendaszek, 2002; McCabe et al., 2005). In a recently published article, McCabe and colleagues (2014) found that past-year NPS increased from 1.9% in 2002 to 4.7% in 2013. Lifetime NPS increased in a similar manner, from 8.1% in 2003 to 12.7% in 2013. The frequency (i.e., number of uses) of past-year and lifetime use of NPS also increased. No significant increases in rate were

observed from one year to the next, suggesting that NPS among college students is increasing gradually over time.

College students report different prevalence rates of NPS depending upon medication (i.e., Ritalin, Adderall) and form (i.e., short-release, extended-release; Kaye & Darke, 2012). Teter, McCabe, LaGrange, Cranford, and Boyd (2006) found that 75.8% of college students who engaged in past-year NPS utilized dextroamphetamine (i.e., Adderall), whereas 24.5% of students reported MPH use. Several studies indicate that the prevalence of immediate-release forms of prescription stimulants is significantly higher than extended-release formulas (Arria et al., 2008; Wilens et al., 2008). The reasons behind the use of immediate-release forms are not well understood. However one empirical study found that immediate-release forms were more "likeable" than extended-release forms. One possible explanation for this finding is that immediate-release forms may lead to faster fluctuations of neurotransmitters (Kollins, Rush, Pazzaglia, & Ali, 1998). Immediate-release stimulants have relatively poor adherence rates when compared to extended-release forms. Given that a greater number of immediate-release medications are forgotten or skipped, more unused pills are available for diversion or nonmedical use. Another possible factor possibly contributing to the high immediate-release NPS rates is that physicians prescribe more of these medications than extended-release forms to individuals over the age of 18 years (Cascade, Kalali, & Weisler, 2008), potentially resulting in a greater number of unused pills. In an attempt to better understand the nonmedical use of these medications, researchers have investigated the abuse potential of prescription stimulants.

Abuse Potential of Prescription Stimulants

When investigating the abuse potential of a substance, several methodologies are established within the substance use literature (Kollins, MacDonald, & Rush, 2001). One of the most basic methods is to compare the chemical structure of a substance to other known drugs of abuse. Another means is to look at the effect of a substance though a behavioral lens. Given that drug use can be viewed as behavioral in nature (i.e., seeking drug and drug administration), variety behavioral methodologies have been developed and adapted to investigate substances' abuse potential. These methods utilize both human and non-human samples and include investigation of: reinforcing effects, discriminative-stimulus effects, and subjective effects. Despite some concerns regarding generalizability to a natural environment, these methodologies have largely been accepted as valid measure of a drug's abuse potential. Thus, the use of these methods is essential in understanding the potential for abuse of MPH and/or dextroamphetamine.

By comparing a substance's chemical structure to that of a known drug of abuse, researchers can somewhat reasonably infer that the substances may share a similar potential for abuse (Kollins et al., 2001). Dextroamphetamine shares a similar chemical structure to that of methamphetamine, a widely recognized drug of abuse (Sevak, Stroops, Hays, & Rush, 2009). On the other hand, the chemical composition of MPH is comparable that of Cocaine, which is, another well-recognized drug of abuse (Calipari et al., 2014; Gatley, Pan, Chen, Chaturvedi, & Ding, 1996). Given the structural similarities between prescribed stimulant medications and known drugs of abuse, they may share a similar potential for abuse.

In addition to chemical structure of a substance, understanding the behavioral effects of drugs is critical for determining abuse potential (Kollins et al., 2001). Reinforcing and discriminative-stimulus effects can be investigated in both human and non-human samples while subjective effects can only be utilized in human samples. Regarding non-human samples, research has demonstrated that substances that reinforce these samples are often abused in human samples and vice-versa (Brady et al., 1987; Fischman & Mello, 1989).

Reinforcing effects can be examined in non-human samples though the use of self-administration procedures (Kollins et al., 2001). These procedures require the organism to perform a specific behavior (e.g., lever press) which is followed by an administration of either the substance(s) under investigation or a placebo. If the organism performs the learned behavior (i.e., self-administers) more frequently following the administration of the test substance than following the administration of a placebo, the substance under investigation is considered reinforcing. A 2001 comprehensive meta-analysis investigated the reinforcing effects of dextroamphetamine, MPH, cocaine (Kollins et al., 2001). Results across seven different non-human studies demonstrated that dextroamphetamine was the most reinforcing substance, followed by MPH, and then cocaine. These results suggest that dextroamphetamine and MPH have the potential to be more reinforcing than a known drug of abuse, cocaine in non-human samples.

Research investigating the reinforcing effects in human samples is less clear (Kollins et al., 2001). In four studies that evaluated reinforcing effects in either children or adults, two studies found that oral MPH was more reinforcing than placebo, while two

others found that MPH was not more reinforcing. In children with a diagnosis of ADHD, MPH was not selected more often than a placebo or no medication (MacDonald & Kollins, 2000). Furthermore, the children more often selected higher doses of MPH (30mg) than lower doses of MPH (10mg), which suggests that children are able to discriminate and show preference for higher doses of MPH than lower doses. Using a progressive ratio procedure, Rush, Essman, Simpson, and Baker (2001) found that 10mg and 20mg of dextroamphetamine and 40mg of MPH increased participants' break point (i.e., the number of responses before participants stop self-administration) among non-sleep deprived and non-drug abusing adults, indicating that dextroamphetamine and MPH may act as reinforcers among healthy adults. Furthermore, research suggests that extended-release forms of dextroamphetamine significantly reduce the rate of relapse, above placebo, among individual's seeking treatment for methamphetamine use disorder (Longo et al., 2010). These results suggest that individuals with a history of methamphetamine use disorder respond more favorably to dextroamphetamine than placebo. Despite these results, two additional studies failed to detect any reinforcing effects of MPH in healthy adult samples (Chait, 1994; Roehrs, Papineau, Rosenthal, & Roth, 1999).

In addition to reinforcing effects, discriminative-stimulus effects are useful when evaluating the abuse potential of a substance (Kollins et al., 2001). Discriminative-stimulus effects are interoceptive cues produced by a substance and can be measured using drug-discrimination procedures. In non-human samples, subjects choose between pressing either a right or left lever. One lever (e.g., the right lever) will lead to the

administration of a training substance while the other lever (e.g., the left lever) will lead to the administration of a placebo. Through many trials of this pairing, the non-human sample is able to discriminate between the substances administered though either the left or right lever press. Once this learning has occurred, a new substance will replace the training substance. If the subject produces a similar response pattern, then the substances are believed to have similar discriminative-stimulus (or interoceptive) effects. This procedure allows for specific investigation regarding different doses of a test substance. In addition, drug-discrimination procedures correlate highly with human's ratings of subjective effects. Investigation of discriminative-stimulus effects can also be conducted with human samples. The procedure is simplified given the communication abilities between participants and researchers.

Regarding the discriminative-stimulus effects of prescription stimulant medications, several non-human studies have investigated subjects' ability to discriminate between dextroamphetamine, MPH, and cocaine (Kollins et al., 2001). Specifically, intraperitoneal and subcutaneous injection studies have found that 1.25-10mg/kg of MPH substituted for 1.25-10mg/kg of cocaine. Other studies reviewed by Kollins and colleagues (2001) indicate that 0.56-2.0mg/kg of dextroamphetamine could be substituted by 2.5-30mg/kg of MPH. These results indicate that depending upon dose, dextroamphetamine, MPH, and cocaine can produce similar behavioral responses across an array of species and routes of administration.

Although fewer human discriminative-stimulus studies exist, information gleaned from these studies is likely to be more generalizable to humans in a natural environment

than animal studies. Two human studies trained participants to discriminate between doses of dextroamphetamine (Heishman & Henningfield, 1991; Rush, Kollins, & Pazzaglia, 1998). Results indicate that 20 to 60mg of MPH fully substitute for 20-30mg of dextroamphetamine. In a sample of cocaine users, 90mg of MPH fully substituted for 200mg of oral cocaine (Rush & Baker, 2001). Another study investigated the discriminative-stimulus effects of methamphetamine, MPH, dextroamphetamine, and triazolam (Sevak et al., 2009). Methamphetamine, MPH, and dextroamphetamine all significantly increased drug appropriate responding, whereas triazolam (i.e., a depressant drug) did not significantly increase drug appropriate responding. Furthermore, the effect of discrimination was not significantly different between methamphetamine, MPH, and dextroamphetamine. Full drug substitution of 10mg of oral methamphetamine was observed for the highest doses of methamphetamine (15mg), MPH (30mg), and dextroamphetamine (15mg). These results indicate that commonly prescribed prescription stimulants may produce similar effects as methamphetamine and cocaine, which are known drugs of abuse.

Examining subjective effects in humans may also provide useful information regarding the abuse potential of particular substances because these effects are frequently dose- and drug-dependent (Kollins et al., 2001). In order to assess subjective effects, participants complete self-report questionnaires and/or rating scales. An analysis of subjective effects (e.g., euphoria, drug-liking, similarity to other addictive substances) may result in a better understanding of the potential for substance abuse. Traditional questionnaires and rating scales associated with abuse potential include the Addiction

Research Center Inventory (ARCI), the Profile of Mood States (POMS), and Visual Analogue Scales (VAS).

Kollins and colleagues (2001) conducted a meta-analysis of 25 studies investigating the subjective effects of prescription stimulants in human samples. Seven of these studies investigated the subjective effects of both MPH and dextroamphetamine and found that participants reported significantly more subjective effects following drug administration (i.e., MPH and dextroamphetamine) than following administration of placebo. Although both substances produced significant effects (e.g., alert-energetic, friendly, good effect, like drug) compared to placebo, in general dextroamphetamine produced higher subjective ratings than MPH. In studies that strictly investigated the subjective effects of MPH, research indicates that participants report significantly higher levels of feeling a "high" and a "rush" than placebo (Kollins et al., 2001; Rush et al., 1998). Furthermore, participants failed to endorse negative effects of prescription stimulants, such as feeling "anxious" or "restless." However, 7 of the 25 studies failed to find significant subjective effects of prescription stimulants. A more recent study investigated the subjective effects of three stimulants (methamphetamine, dextroamphetamine, and MPH) and one benzodiazepine (triazolam; Sevak et al., 2009). For ratings of several subjective effects (i.e., liking drug, stimulated, talkative, friendly, willing to pay for, performance improved, rush, active, alert, energetic, and willing to take again), participants scored significantly higher following administration of all stimulants compared to placebo. Additionally, ratings increased in a linear trend in regard to dose. The scores of methamphetamine, dextroamphetamine, and MPH did not

significantly differ from one another, but all three differed significantly from triazolam. This exact pattern of subjective responses was also observed on the stimulant subscale of the Adjective-Rating Scale and on the stimulant-sensitive and euphoria subscales of the ARCI. Despite high subjective ratings, participants reported some negative effects of MPH (i.e., irregular heartbeats, racing heartbeats, nervous, and anxious) and dextroamphetamine (i.e., shaky and jittery).

Finally, the United States Drug Enforcement Administration (DEA) classifies prescription stimulants as a Schedule II substance, which indicates that these medications (e.g., Ritalin and Adderall) have a high potential for abuse, psychological dependence, and/or physical dependence (Woodworth, 2000). However, since prescription stimulants have a long history of successfully managing symptoms of ADHD, these medications still remain medically necessary (Lakhan & Kirchgessner, 2012). In order to control their potential for abuse, prescription stimulants (with a Schedule II classification) are only available in 30-day non-refillable prescription

Motives for NPS

Given that prescription stimulants have a relatively high prevalence rate and abuse potential, examining the motivation behind NPS is critical for the development of prevention and intervention efforts. Motives for NPS can be interpreted as either academic or non-academic (DeSantis et al, 2008). Academic motives for NPS are numerous and include increased concentration, alertness, energy, attention, memorization, wakefulness, and motivation (DeSantis, Webb, & Noar, 2008; Rabiner et al., 2009; Smith & Farah, 2011; Teter et al., 2006). Non-academic NPS motives include

getting high or partying, experimentation, appetite/weight-related purposes, and enhancing athletic performance (Gallucci & Martin, 2015; Teter et al., 2006).

Although subsets of individuals engage in NPS for non-academic purposes, the primary motives reported by college students are academic in nature (DeSantis et al., 2008). Research shows that students' chief purpose for engaging in NPS is related to their belief that stimulant medications will produce meaningful cognitive enhancement (i.e., increased concentration, alertness, attention, memorization), as well as promote wakefulness and motivation (DeSantis et al., 2008; Sepulveda et al, 2011; Smith & Farah, 2011). These beliefs may help explain why NPS frequently occurs within academic settings (Low & Gendaszek, 2002; Teter et al., 2005). In samples of college students without an ADHD diagnosis, students reported their motive to engage in NPS was to increase concentration (58-65.2%), increase alertness (43-47.5%), and use the medication as a study aid (59.8%; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005; Teter et al., 2006). Overall college students report numerous motives to engage in NPS, though NPS for academic purposes remains consistently the primary motive for use reported by this population.

Lifetime prevalence rates for non-academic motives to engage in NPS vary from study to study. One survey of college students found that among NPS users, 31% of participants engaged in NPS to get high or party while 29.9% of participants engaged in NPS for experimentation (Teter et al., 2006). Another non-academic motive for NPS is linked to the weight loss, as stimulant medications are widely known to suppress appetite (Rabiner et al., 2009; Zachor, Roberts, Hodgens, Isaacs, & Merrick, 2006). Research

indicates that between 9.7 and 11.7% individuals have engaged in lifetime use of NPS for appetite suppressive effects (Jeffers, Benotsch, & Koester, 2013; Teter et al., 2006). However, this number increases to 22.3% when individuals were permitted to report multiple motives (i.e., cognitive enhancement, wakefulness, weight loss/appetite suppressant, etc.; Kilwein, Goodman, Looby, & De Young, 2016). An additional non-academic NPS motive is related to the belief that these medications enhance athletic performance because of their perceived ability to increase focus (Gallucci & Martin, 2015). However, Galluci and Martin's (2015) recent study failed to find significant differences in past-year NPS based on athletic status, with 13.9% of non-athletes and 7.5% of athletes reporting use. These results indicate that athlete students are not more likely to engage in NPS than the average, non-athlete student.

Effects of Prescription Stimulants

Individuals Diagnosed with ADHD. Over the last several decades, empirical evidence has indicated that immediate-release prescription stimulants significantly reduce ADHD symptoms in individuals with this disorder (Hodgkins, Shaw, McCarthy, & Salle, 2012). When given a prescription stimulant, participants showed a 65-75% improvement in ADHD symptom reduction (Greenhill, Pliszka, & Dulcan, 2001). In addition, 5-30% of participants had symptom reduction when given a placebo, indicating that placebo effects can affect symptom reduction in individuals with ADHD. This study, as well as research prior to the 2000s, focused primarily on children and short-term symptom reduction (Hodgkins et al., 2012). Only relatively recently has ADHD been considered a

possibly chronic disorder; therefore, efforts have been made to expand the literature to include extended-release stimulants and adult samples.

Several meta-analyses investigated the effects of both immediate- and extended release stimulants. In a child/adolescent sample (ages 6-18 years), Faraone (2009) found that both immediate- and extended-release stimulants (i.e., dextroamphetamine and MPH) were significantly more efficient at reducing ADHD symptoms (i.e., hyperactivity, inattention, and impulsivity) than non-stimulants (i.e., atomxetine, bupropion, modafinil, and clonidine) or placebo. Additionally, dextroamphetamine was shown to be more effective in both immediate- and extended-release forms than MPH. In a separate meta-analysis that investigated adult ADHD, both immediate- and extended-release stimulants (i.e., dextroamphetamine and MPH) were found to be more effective than placebo (Castells, Ramos-Quiroga, Bosch, Nogueira, & Casas, 2011).

Relatively few studies have operationalized what is meant by the term "cognitive enhancement," which is problematic given that it is the primary motive for NPS among college students (Baroni & Castellanos, 2015; DeSantis et al., 2008). In their comprehensive analysis, Baroni and Castellanos (2015) found prescription stimulants had small to moderate effects in individuals with ADHD on tasks assessing response time, minimally demanding working memory tasks, and response inhibition. Small but significant effects were detected on more complex working memory tasks. Impairments in working memory are generally associated with ADHD, so the small effect size indicates that potentially these medications are not as effective as previously indicated for this facet of ADHD.

Individuals Without a Diagnosis of ADHD. Given the increased prevalence of prescription stimulant use among individuals without a diagnosis of ADHD, researchers are investigating the effects of these medications on non-ADHD individuals. Additionally, much of the current literature has investigated the cognitive impact of NPS given that the primary motives for NPS are academic. Specifically, these studies have investigated the effect of prescription stimulants on learning, memory, executive functioning, working memory, and cognitive control (Ilieva, Hook, & Farah, 2015, Smith & Farah, 2011).

Both Advokat (2010) and Koelega (1993) concluded that prescription stimulants aid adults on simple tasks but hinder their selective attention on complex tasks (e.g., executive functioning tasks). In contrast, Greely and colleagues (2008) found that both dextroamphetamine and MPH may increase an adults' ability to flexibly respond on complex tasks. Another study found that working memory (i.e., momentary holding and processing of information), cognitive control (i.e., tasks in which an individual's automatic/natural response may be incorrect), and some executive functioning tasks were significantly improved following administration of a prescription stimulant (Smith & Farah, 2011). Furthermore, Bagot and Kaminer (2014) concluded that MPH might improve performance on novel tasks, improve attention-based tasks, and decrease planning latency on complex tasks. They also found possible improvements in information consolidation that results in enhanced recall following Adderall use.

Ilieva, Hook, and Farah (2015) integrated several of the above studies, as well as many others in a recent meta-analysis investigating the ability of prescription stimulant

enhance cognition in healthy adults. Overall, they found small significant improvements in inhibitory control, short-term episodic memory, and working memory. Furthermore, a medium effect size was found for delayed episodic memory. Taken together, they concluded a modest overall effect of MPH and amphetamine to enhance cognition in adults without a diagnosis of ADHD.

Despite the aforementioned findings, others speculate expectancy effects may be the more-likely mechanism underlying cognitive improvements (Looby & Earleywine, 2011; Mitchell, Laurent, & de Wit, 1996). To support this theory, one study failed to find any significant cognitive differences between young adults who were given a prescription stimulant (i.e., amphetamine-dextroamphetamine) or placebo (Ilieva et al., 2013). However, participants subjectively rated their performance following stimulant administration higher than their performance following placebo administration. Furthermore, Mitchell and colleagues (1996) found participants who believed they had ingested a prescription stimulant reported significant higher subjective effects (i.e., increased arousal, increased drug effect, increased liking of drug) than controls. A similar but more recent study investigated the subjective and cognitive effects of MPH in prescription stimulant-naïve participants (Looby & Earleywine, 2010). Again, participants reported significant subjective effects (i.e., increased dsyphoria, feeling high, feeling stimulated, intellectual energy, performance efficiency) when they believed that they had ingested 20mg of Ritalin (i.e., MPH). These studies indicate that placebo effects may be responsible, at least in part, for some of the reported cognitive benefits prescription stimulants have on healthy individuals.

Generally, the literature remains mixed regarding the cognitive effects that prescription stimulants produce in healthy individuals (Bagot & Kaminer, 2014; Smith & Farah, 2011). Several researchers suspect that the inclusive findings are the result of publication bias (Ilieva, Hook, & Farah, 2015), arguing that significant results are published more readily than null results. Additionally, Smith and Farah (2011) assert that though significant results have been obtained, the mechanism of action and the generalizability of these results are unknown. Overall, the effectiveness of NPS for cognitive enhancement remains largely unclear despite being cited as the primary motivation for use.

Consequences and Considerations of NPS

Many individuals focus on the perceived benefits of NPS (e.g., cognitive enhancement), while failing to consider the potentially negative consequences and/or ethical and moral considerations of use. Prescription stimulant medications have wide range of adverse behavioral, psychological, and medical effects that range in severity (Berman, Kuczenski, McCracken, & London, 2009). Furthermore, NPS is associated with several problematic drug-related behaviors that may not be readily apparent but may lead to unanticipated medical and legal consequences (McCabe & Teter, 2007; McCabe, West, Schepis, & Teter, 2015). Lastly, the use of prescription stimulant medications for cognitive enhancement, without a bonafide medical diagnosis, presents unique societal and ethical questions (Forlini, Gauthier, & Racine, 2013).

Berman and colleagues (2009) discuss several dose-dependent behavioral changes associated with prescription stimulant medications. These changes include: irritability,

nervousness, jitteriness, increased arousal, decreased appetite, social withdrawal, insomnia, state of pleasurable affect, and feelings of euphoria. A more recent article (Konrad-Bindl, Gresser, & Richartz, 2016) argues that despite the considerable body of research on prescription stimulants, that there remains insufficient data to judge the long-term behavioral effects of these medications. In addition to the aforementioned behavioral changes, Konrad-Bindl and colleagues (2016) conclude that that current data available fails to adequately address the following effects: drowsiness, dizziness, nightmares, psychomotor hyperactivity, aggression, agitation, and accidental injury. Although present data on specific long-term behavioral changes is not definitive, prescription stimulants have been linked to a wide variety of behavioral changes.

In addition to behavioral changes, prescription stimulants have several reported psychological effects. Anxiety, depression, and tics may be associated with these medications, but some degree of uncertainty remains given the limited available long-term research (Konrad-Bindl et al., 2016). However the literature has substantiated other psychological changes such as emotional liability, mood disturbances, negative affect, and stimulant-induced psychosis (Berman et al., 2009). Psychosis is a schizophrenia-like state, in which individuals may experience hallucinations, delusions, and flattened affect (Lakhan & Kirchgessher, 2012). Stimulant-induced psychosis is rare, and is likely to occur only if the medication is taken in a higher dose than prescribed or in a different manner than prescribed (e.g., intranasally). Overall prescriptions stimulants use has the potential to produce psychological effects, however these effects vary between individuals, doses, and routes of administration.

Over the last several decades, numerous adverse medical events have been reported in association with prescription stimulants. Early studies investigating prescription amphetamines reported delays in height and weight growth in a subset of children (Berman et al., 2009). More commonly reported adverse reactions to these medications include effects on the cardiovascular, central nervous, gastrointestinal, and dermatological systems (Lakhan & Kirchgessher, 2012). Specifically, the cardiovascular system may be impacted by hypertension (i.e., high blood pressure) or tachycardia (i.e., rapid heart rate). While headaches, dyskinesia (i.e., abnormal/impaired voluntary movement), nausea, and abdominal pain have been reported as central nervous and gastrointestinal system side effects. Regarding the dermatological system, rash and urticarial (i.e., hives) have been caused by the use of prescription stimulant medications.

Extending beyond the behavioral, psychological, and medical consequences, other considerations should be taken into account by individuals who engage in NPS. One particular consideration is that individuals who endorse NPS are significantly more likely to experience problematic drug-related behavior (McCabe & Teter, 2007). Individuals with a history of NPS have reported the following problematic drug-related behaviors: simultaneous polydrug use, illegal activities to obtain drug, withdrawal symptoms, and 'family conflict' (McCabe & Teter, 2007). A recent study of high school seniors found that 64% of individuals who engaged in NPS, co-ingested the prescription stimulant with another drug (McCabe et al., 2015). Although the exact effects of co-ingesting prescription stimulants with other drugs (e.g., alcohol, marijuana) is unknown, it is likely this behavior lead to unintended consequences.

Lastly, the use of prescriptions stimulants by healthy individuals presents unique ethical and societal questions (Bossaer et al., 2013; Forlini et al., 2013). Are healthy individuals who use prescription stimulants for perceived cognitive enhancement engaging in fair practice by embracing their right to improve cognition? Or rather, is it unethical practice (e.g., academic dishonesty) to use pharmaceuticals to enhance individual performance? Racine and Forlini (2010) developed three paradigms though which to view this ethical and societal dilemma. Common in empirical journals, The Prescription Drug Abuse Paradigm focuses on health risk and the potential for abuse associated with prescription stimulant medications. Looking primarily at the perceived cognitive benefits rather than long-term health outcomes, The Cognitive Enhancement Paradigm is somewhat controversial in the scientific community. Lastly, The Lifestyle Use of Pharmaceuticals Paradigm is endorsed mostly by mainstream culture and promotes prescription stimulants as a lifestyle choice and that their aid individuals in 'being all they can be.' At this time, there is no clear consensus as to whether the use of prescription stimulants for perceived cognitive enhancement as ethical or unethical.

Risk Factors for NPS

In the United States, young adults enrolled in college are at the greater risk to engage in NPS (Johnston et al., 2004). Given the high prevalence rates of NPS on college campuses, researchers have been able to identify risk factors unique to this population (DeSantis et al., 2008; McCabe et al., 2005; Teter et al., 2006). Students at risk to engage in NPS vary on several demographic and individual characteristics (Looby et al., 2015; McCabe et al., 2014; Sattler et al., 2014).

One frequently reported finding is that males are significantly more likely than females to engage in both past-year and past-month NPS (McCabe et al., 2005). However, more recent research contradicts this finding by suggesting that NPS rates are similar between males and females (McCabe et al., 2014). In addition to gender, other demographic characteristics, such as ethnicity, have also been investigated. In a recent longitudinal study, of individuals who reported past-month NPS, Whites engaged in NPS significantly more (68.2%) than Asians (13.7%), African-Americans (4.1%), Hispanics (4.0%), others who failed to report their ethnicity (10.0%; McCabe et al., 2014). The role of age correlates with prevalence rates of NPS in college students. Specifically, students under the age of 24 report significantly higher rates of past-month NPS use when compared to older students enrolled in the same college or university (McCabe et al., 2005).

Several studies have demonstrated that individuals who engaged in recreational drug use and/or binge drinking are at an increased risk of NPS (Arria et al., 2008; McCabe et al., 2005; Sweeney, Sembower, Ertischek, Shiftman, & Schnoll, 2013). Sweeney and colleagues (2013) found that 83.2% of individuals who have engaged in NPS, report lifetime use of another stimulant (e.g., diet pills and methamphetamine). In addition, individuals who have reported lifetime NPS are more likely than peers to engage in frequent recreational use of marijuana (Arria et al., 2008; DeSantis, Noar, & Webb, 2009; McCabe et al., 2005). Finally, individuals who report a history of NPS have significantly more binge drinking episodes than people who report never engaging in

NPS (McCabe et al, 2005). Overall for more than a decade, polydrug use has been associated with individuals at risk of NPS.

One early study investigating personality factors and NPS found that individuals who endorse NPS also scored high on measures of perfectionism and sensation seeking (Low & Gendaszek, 2002). Since that early study, additional research has supported and expanded upon those findings. Specifically, individuals who engaged in NPS scored significantly higher on the UPPS Impulsive Behavior subscales of Impulsivity and Sensation Seeking and on the Brief Symptoms Inventory subscales of Paranoid Ideation and Psychoticism (Lookatch, Dunne, & Katz, 2012; Weyandt et al., 2009). Using the Big Five Personality Traits, Benotsch and colleagues (2013) found that individuals who engage in NPS score significantly higher on Neuroticism and Openness to Experience. Overall certain personality traits, such as sensation seeking, appear to be associated with prescription stimulant misuse.

Among the frequently identified demographic risk factors, Greek affiliation and GPA have remained among the most robust predictors across several studies (DeSantis et al., 2008; McCabe et al., 2005; Wilens et al., 2008). Specifically, students who live in a fraternity or a sorority house report significantly higher past-month (8.0%) and past-year (13.4%) NPS when compared to same-aged peers (1.8-2.5% and 3.5-4.5%, respectively; McCabe et al., 2005). This finding is further supported by another study that reported 61% of students who engage in NPS were also members of a Greek organization (DeSantis et al., 2008). Students who are involved in Greek affiliations may be more willing to engage in NPS because they may have more non-academic time commitments,

spend more time socializing, or have easier access to a prescription stimulant. Another risk factor that has also been repeatedly supported by the literature is low GPA (Arria et al., 2013; Bavarian, Flay, Ketcham, & Smith, 2013; McCabe, Teter, Boyd, Knight, Wechsler, 2005b; Wilens et al., 2008). In particular, students who retain a GPA of B or lower twice as likely to report engaging in NPS than students who uphold a B+ or higher GPA (McCabe et al., 2005b). Students who report low GPA may be more willing to engage in NPS because they may have lower self-efficacy for studying or more likely to procrastinate.

Although knowledge regarding demographics can aid in the identification of students who engage in NPS, generally these risk factors do not allow for effective prevention or intervention efforts. As a result, recent studies have identified other, possibly more malleable, risk factors such as expectancy effects, academic self-efficacy, and academic procrastination. Studies have found that positive cognitive enhancement expectancies regarding the effects of these medications increase likelihood to engage in NPS (Labbe & Maisto, 2010; Looby & Earleywine, 2010). Specifically, if individuals believed that NPS would meaningfully enhance his/her cognitive performance (e.g., concentration or alertness) on a task, then that individual was more likely to engage in NPS. Looby and colleagues (2015) found that college students who have low academic self-efficacy (i.e., they do not believe they possesses the ability to do well on academic tasks) were more likely to intend to engage in NPS. Students who report low academic self-efficacy may be more willing to engage in NPS because they do not perceive that they have the ability within themselves to perform well on academic tasks, and therefore

may seek an external solution (e.g., prescription stimulant) to aid performance. Another potential risk factor, academic procrastination, has recently been empirically supported to predict NPS. Specifically, students who reported higher levels of procrastination were significantly more willing to engage in NPS than students with low levels of procrastination (Sattler et al., 2014). Students who report academic procrastination may be more willing to engage in NPS because of the medication's perceived cognitive enhancement.

Procrastination and Self-Efficacy in College Students

Academic Procrastination. The literature on procrastination has failed to come to a consensus on a universal definition; however, a 2007 meta-analysis established the following unified definition: "Intentionally deferring or delaying work that must be completed" (Schraw, Wadkins & Olafson). Research in the collegiate setting has established that academic procrastination has been present among the student population for decades (Rothblum, Solomon, & Murakami, 1986; Patrzek, Sattler, van Veen, Grunschel, & Fries, 2015). One study suggests that as many as 70% of students procrastinate regularly (Schouwenburg, 2004). College students report watching television, sleeping, socializing, online surfing, and online communications as the activities they are most likely to engage in while procrastinating on academic tasks (Patrzek et al., 2015).

Overall, students who procrastinate begin studying closer to their examination date and preparing assignments/papers closer to deadlines than their non-procrastinating counterparts (Schouwenburg & Groenewoud, 2001). These behaviors lead to less time

available learn the material and/or prepare necessary materials. Researchers suggest that the reduced availability of time maybe responsible for academic misconduct (Patrzek et al., 2015). High procrastinating students are significantly more likely to cheat on examinations and plagiarize material than individuals who score low on measures of procrastination.

Self-Efficacy. In 1977, Albert Bandura investigated individuals' expectations of personal efficacy, or as he coined the concept 'self-efficacy', to create behavioral change. In this seminal article, Bandura proposed that an individuals' self-efficacy is formed based upon four sources of information: performance accomplishments, vicarious experience, verbal persuasion, and psychological state. He investigated the inactive, vicarious, exhortative, and emotive factors and their relation to the cognitive processing of expectations of personal efficacy. Though this research, Bandura demonstrated that an individual's level and strength of self-efficacy was related to behavioral change.

Since the publication of Bandura's article, the notion of self-efficacy has continued to influence psychologists in research and clinical practice. The application of self-efficacy to academic functioning is one of the domains in which it has been utilized. In this setting, self-efficacy refers to an individual's perception that he/she possesses the skills and abilities to perform well (Zimmerman & Kitsantas, 2007). Some research in this area has found a negative correlation between academic self-efficacy and academic procrastination (Komarraju & Nadler, 2013; Wolters, 2003).

Present Study

Over the past couple of decades, the number of college students who take prescription stimulant medications (e.g., Ritalin, Adderall) without a prescription has continued to rise (McCabe et al., 2014). Public health officials have expressed concern regarding the abuse potential and negative consequences associated with NPS (Zuvekas & Vitiello, 2014). Early research on misuse focused on demographic characteristics, thus finding low GPA and Greek involvement were among the most predictive factors (McCabe et al., 2005a). More recent research has attempted to identify more malleable predictors, in efforts to develop targeted interventions to reduce NPS for academic purposes on college campuses (Looby et al., 2015; Sattler et al., 2014).

To date, no study has investigated the combine robust demographic factors (i.e., GPA and Greek Involvement) and adaptive factors (Academic Procrastination and Academic Self-Efficacy) and their role in the prediction of NPS for academic purposes. The aim of the proposed study is to determine if the aforementioned demographic and adaptive factors predict NPS for academic purposes in a college sample. And if so, which factor is most predictive of misuse. Results from the proposed study can aid in the development of targeted interventions to reduce the number of college students who engage in NPS.

CHAPTER II

METHOD

Participants[1]

A total of 273 participants were recruited from a large Midwestern University, online though SONA Systems. SONA Systems is a subject pool software program in which university undergraduate Psychology students were eligible for participation. Given the highest rates of NPS are reported in the undergraduate population, eligible participants for this study were between 18 and 25 years of age.

Measures

Demographic questionnaire. A brief demographic questionnaire assessed participants' age and gender. Participants indicated their current involvement in the Greek system (i.e., yes or no) as well as cumulative undergraduate GPA on a 4-point scale ranging from 0.0 to 4.0. Participants in their first semester of undergraduate study were eliminated from the analysis given their cumulative high school GPA is not a valid substitute for a cumulative GPA at the university level.

---

[1] Data collection occurred in collaboration with another study investigating eating disorders and suicidality. Participants completed additional measures: The Purgative Behavior Subscale of the Multifactorial Assessment of Eating Disorders Symptoms (MEADS-PUR), Interpersonal Needs Questionnaire (INQ), The Hopelessness Subscale of The Helplessness-Hopelessness-Haplessness Scale (HS), The Suicidality Subscale of The Depressive Symptom Inventory (DSI-SS), The Eating Disorders Examination-Questionnaire (EDE-Q), Patient Health Questionnaire (PHQ), and The Negative Urgency Subscale of The Urgency Premeditation Perseverance-Sensation Seeking-Positive Impulsive Behavior Scale (UPPS-P).

Nonmedical Prescription Stimulant Use. Participants indicated if they have ever used a prescription stimulant medication (e.g., Ritalin, Adderall) without a prescription and/or in a higher dose than prescribed by a physician. If the participant endorses past nonmedical use of a prescription stimulant medication, then participants were asked to indicate frequency of lifetime, past 12 month and past 30 day use (i.e., 1 time, 2 times, 3 times, 4 times, 5 + times). Additionally, participants who endorse NPS were asked how they gained access to the medication and their motives for use. The list of motives for use included: It give you a high; It counteracts the effects of other drugs or alcohol; For experimentation; It's safer than street drugs; You're addicted to it; It helps you concentrate; It helps increase your alertness; It helps you study; It helps you lose weigh; It decreases or curbs appetite. For the purposes of this study, NPS for academic purposes were operationally defined by endorsement of any of the following three motives for use: It helps you concentrate; It helps increase your alertness; and/or It helps you study.

Academic Self-Efficacy. Participants completed the studying scale from the Self-Efficacy for Learning Form (SELF; Zimmerman & Kitsantas, 2005). Overall, the SELF is a 57-item measure of student perception of ability to manage stress on academic-related tasks. Specifically, the SELF measures self-efficacy as it relates to reading, studying, test preparation, note taking, and writing. The scale for each item ranges from 0% (definitely cannot do it) to 100% (definitely can do it). To remain consistent with previous research, the proposed study will utilize only the 14 items related to self-efficacy for studying subscale (Looby et al., 2015). The SELF has demonstrated good predictive validity and a single factor structure that is highly reliable (α=.99). Thus the

shorter version, including the studying subscale, is likely equally effective as the full SELF scale (Zimmerman & Kitsantas, 2005).

Academic Procrastination. Participants' level of academic procrastination was assessed using the Questionnaire for Academic Procrastination (QAP; Patrzek et al., 2014). The QAP is an eight-item measure designed to evaluate the degree to which individuals fail to turn intentions into actions on academic tasks. The scale for each item ranges 1 (very seldom) to 6 (very often). The QAP has been shown to be internally consistent (a study 1 = 0.93 and a study 2 = 0.94) and correlates highly with another procrastination scale (i.e. Tuckman Procrastination Scale; r = 0.77). Factor analytic research indicates this measure has a uni-dimensional structure.

Procedure

This study was completed entirely online. Participants were able to view a brief description of the study though SONA Systems. At that time, if the participants were interested in participating in the study, a link posted on SONA Systems re-directed them to a Qualtrics webpage, which provided the participant with informed consent. If the participants provided their informed consent, they began the study immediately. Participants completed the demographic questionnaire, information on history of NPS, the SELF (Self-Efficacy for Studying sub-scale), and the QAP. This portion of the survey took participants approximately 30 minutes, however, this study was part of a larger investigation that required a total of 60 minutes. Participants were prompted to select between two forms of compensation: (1) receive one credit hour on SONA Systems, or (2) be entered into a raffle drawing one of eight $10 Amazon gift cards.

Analytic Strategy

A Binary Logistic Regression, with an enter procedure, was utilized to analyze the data obtained from the 273 undergraduate participants. The four hypothesized predictors (i.e., Low GPA, Greek Involvement, Academic Self-Efficacy, Academic Procrastination) were analyzed to determine if they significantly predict the dependent variable (i.e., NPS use for Academic Purposes). This procedure allowed each of the four predictors to be added one at a time, forcing the predictor with the highest correlation to be entered into the equation first (Field, 2013).

In order to ensure that only predictors of NPS use for academic purposes were assessed, individuals who report NPS for recreational motives were eliminated from the analysis. If participants report having been prescribed a stimulant medication, they were eliminated from the logistic regression. To maximize classification efficacy of the model, true heterogeneity was assumed (Menard, 1995, 2002). According to this assumption, with no predictors in the equation, the proportion or number of cases observed in each category (the base rate) should be the same as the proportion or number of cases predicted to be in each category (i.e. 50% chance of being in the NPS vs. non-NPS user group). Since it is expected that a lot more students will report not using NPS than those who will report using NPSs for academic purposes, an equal number of individuals denying a history of NPS for academic purposes will be randomly selected from the sample of all non-users to maintain the proportion of students in each category at 50%.

For the purpose of power analysis, a small-to-medium effect size (w=.20; Cohen, 1992) is anticipated based upon the literature (DeSantis et al., 2008; Looby et al., 2015;

McCabe et al., 2005; Sattler et al., 2014). G*Power 3.1 was used to calculate the necessary sample size for a Binary Logistic Regression with four predictors. Using the goodness of fit model, with a minimum acceptable power of .80, 3 degrees of freedom, and a small-to-medium anticipated effect size (w = .2), a total of 273 participants are required.

CHAPTER III

RESULTS

Total Sample

A total of 728 participants completed this study online. Of these participants, 57 were excluded from further analysis as a result of missing data and/or failure to meet study parameters (e.g., older than 26 years). One hundred and thirteen (16.8%) reported lifetime NPS, 34 (5.1%) reported past 12-month NPS, and 31 (4.6%) reported past 30-day NPS. Broad ranges of motives were reported, as participants were permitted to select multiple motives for use (See Table 1).

Table 1
Self-Reported Motives for NPS

Motive	% Endorsed by Individuals Engaging in NPS
It helps you concentrate	19.8%
It helps you study	19.2%
It increases you alertness	11.9%
For experimentation	7.9%
It give you a 'high'	7.7%
It decreases or curbs appetite	4.5%
It helps you lose weight	4.1%
It counteracts the effects of other drugs	2.1%
It's safer than 'street drugs'	1.6%
You're addicted to it	1.0%

For the purposes of this study, an additional 43 participants were eliminated from the remainder of the analyses because 1) The participants denied NPS for academic purposes (i.e., It helps you concentration, It helps you study, It increases your alertness),

or 2) The participants reported a history of being prescribed a stimulant medication. Given these exclusions, lifetime NPS for academic purposes will be utilized as the dependent variable, rather than the initial proposal of past 12-month NPS for academic purposes. The overall lifetime NPS sample consists of 70 participants. A random sample of 70 participants, who denied lifetime NPS, was generated using SPSS's Random Sampling of Cases.

Demographic Information

Group-wise differences between participants who reported NPS for academic purposes and participants who denied a history of NPS were assess. No differences were observed with respect to gender, χ^2 (3, N = 140) = 7.466, p = .058; ethnicity/race, χ^2 (5, N = 140) = 10.191, p = .070; age, χ^2 (7, N = 140) = 2.873, p = .897; or years of education χ^2 (3, N = 140) = 3.421, p = .331. See Table 2 for summary of demographic information.

Table 2
Demographic Information

Gender	NPS for Academic Purposes (*n*)	No History of NPS (*n*)
Male	23	12
Female	46	57
Transgender	1	1
Race/Ethnicity		
White	60	66
African American or Black	2	0
Asian	1	1
Hispanic or Latino	2	3
American Indian/Alaska Native	3	0
Other	2	0
Age		
18 Years	15	20
19 Years	16	15

20 Years	13	15
21 Years	11	9
22 Years	4	3
23 Years	1	1
24 Years	1	0
Not Specific	9	7
Years of Education		
12 (Freshman)	29	32
13 (Sophomore)	18	24
14 (Junior)	15	8
15 (Senior)	8	6

Binary Logistic Regression

The hypothesized model, which included Greek Involvement, cumulative undergraduate GPA, QAP, and SELF-studying subscale, was significantly better at predicting NPS for academic purposes than the null model ($\chi^2(8, N=140)=17.059$, $p=0.030$). Overall, the hypothesized model accounted for 26% of variability in the dependent measure (see Table 3; Nagelkerke $R^2=0.260$). Furthermore, the hypothesized model accurately predicted NPS for academic purposes 65.0% of the time, which is greater than a 25% improvement in accuracy over the null model (Classification Accuracy = 65%; Proportional by Chance Accuracy = 62.5%). Sensitivity of the hypothesized model indicated 61.4% accurate detection of individuals who have engaged in NPS for academic purposes. Specificity of the hypothesized model indicated 68.6% accurate detection of individuals who denied a history of NPS for academic purposes.

Table 3

Logistic regression analyses summary predicting lifetime NPS for academic purposes

Criterion	Predictors	B	S.E.	Wald	df	Sig.	Exp(B)
Had reported lifetime NPS	Greek Membership	-0.968	0.497	3.797	1	0.051	0.380
	GPA	-1.446	0.446	10.510	1	0.001*	0.236
	QAP	0.075	0.040	3.562	1	0.059	1.078
	SELF-Studying Subscale	-0.008	0.011	0.464	1	0.496	0.992

*$p<0.05$; Nagelkerke $R^2 = 0.260$

Cumulative undergraduate GPA was the strongest predictor, with a higher GPA corresponding to a lower likelihood of NPS for academic purposes. For every unit increase in GPA reduces the likelihood of NPS for academic purposes by 76% (Wald χ^2=10.510, p=0.001, OR=0.236). Greek Involvement was observed to be the second strongest predictor in this model because Greek membership was associated with a lower likelihood of NPS for academic purposes by 62% (Wald χ^2=3.797, p=0.051, OR=0.380). Total score on the QAP moderately predicted NPS for academic purposes. Specifically, Academic Procrastination was associated with a higher likelihood of NPS for academic purposes by 8% (Wald χ^2=3.562, p=0.059, OR=1.078). Total score on the SELF-studying subscale failed to significantly predict NPS for academic purposes (Wald χ^2=0.464, p=0.496, OR=0.992). For mean differences on significant predictors between individuals engaging in NPS for academic purposes and individuals who denied a history of NPS refer to Table 4.

Table 4

Means, standard deviations, and p values for mean differences on measures of Greek Involvement, GPA, QAP Scale, and SELF-Studying Subscale between individuals who have engaged in lifetime NPS for academic purposes and individuals with no history of NPS

Measures	NPS	No NPS	p Value
GPA	3.147 (0.494)	3.489 (0.424)	$p<0.001$*
QAP	18.586 (6.011)	15.229 (5.550)	$p=0.001$*
SELF-Studying Subscale	102.029 (21.110)	114.586 (20.519)	$p<0.001$*

*Significant at $p<0.05$.

CHAPTER IV

DISCUSSION

Previous research indicates the prevalence of lifetime NPS has been gradually increasing for more than a decade (McCabe et al., 2014). Although a broad range of motives have been reported, the desire to improve academic performance (e.g., increased concentration, alertness, attention, memorization) is often cited as the primary reason individuals engage in NPS (DeSantis et al., 2008; Smith & Farah, 2011). Not surprisingly, college students are among the most at-risk populations with prevalence rates ranging from 4.1-35.5% (Low & Gendaszek, 2002; McCabe et al., 2005). The present study produced similar prevalence rates, with 16.8% of the overall sample, reporting lifetime NPS. Furthermore, a total of 70 participants indicated at least one academic motive.

Over the past several years, efforts have been made to identify factors associated with NPS. By identifying these factors, prevention and intervention strategies may be developed to target the misuse of prescription stimulants and their associated negative consequences. Two of the most robust demographic characteristics associated with NPS are cumulative undergraduate GPA and Greek Involvement (McCabe et al., 2005a). Recently adaptive features, such as academic procrastination and self-efficacy for studying, have been identified as potentially malleable risk factors associated with NPS (Looby et al, 2015; Sattler et al., 2014). However, the potential for these specific

demographic and adaptive factors to jointly predict NPS for academic purposes has not been empirically investigated.

The present study proposed low cumulative GPA, Greek Involvement, high academic procrastination, and low self-efficacy for study would significantly predict NPS for academic purposes in a college sample. Overall, the results partially supported the original hypotheses that lower cumulative GPA and higher academic procrastination would significantly predict NPS for academic purposes. Contrary to the proposed hypothesis, membership in a Greek organization (i.e., Fraternity or Sorority) actually reduced this likelihood to engage in NPS for academic purposes. Although self-efficacy for studying showed promise in a previous study (Looby et al., 2015), the current model indicates that low GPA, non-Greek Involvement, and high academic procrastination were stronger predictors of NPS for academic purposes. No differences were observed between gender, ethnicity/race, age, or years of education on NPS for academic purposes.

In the present model, cumulative undergraduate GPA was the most significant predictor of NPS for academic purposes. Specifically, higher GPA was associated with a lower likelihood to engage in NPS for academic purposes. This relationship between GPA and NPS is consistent with other published findings (Arria et al., 2013; Bavarian et al., 2013; McCabe et al, 2005b). Possible explanations for the relationship may include individuals with lower GPAs have less developed time management skills, an external locus of control, or lower intellectual/achievement abilities; and therefore, these individuals may seek out stimulant medications in an attempt to augment academic performance (Curtis & Trice, 2013; Richardson, Abraham, & Bond, 2012; Schunk &

Zimmerman, 2008). Future studies need to investigate which of these factors, if any, contribute to the relationship between GPA and NPS for academic purposes.

The second strongest predictor in the model, Greek Involvement, was found to be marginally significant. Participants who associated themselves with a Fraternity or Sorority were less likely to engage in NPS for academic purposes. This finding contradicts the large body of literature that indicates that Greek Involvement increases likelihood to engage in NPS (McCabe et al., 2005a; DeSantis et al., 2008). In fact, a recent meta-analysis reported that seven of ten studies reported Greek Involvement significantly increased likelihood to engage in NPS (Benson, Flory, Humphreys, & Lee, 2015). The discrepancy between previous research and current findings may be the result of a couple factors. First, the present study restricted prediction of Greek Involvement to NPS for academic purposes only. Many of the previous studies assessed Greek membership but failed to separate motives for use (i.e. academic purposes, recreational). Therefore, individuals involved in Greek organizations may be more likely to engage in NPS, but potentially for recreational motives such as 'to get high' or 'counteract the effects of other drugs'. Secondly, many of the studies suggesting that Greek Involvement increases likelihood to engage in NPS were conducted prior to 2012, which can be seen in Benson and colleges' meta-analysis (Benson et al., 2015). The dispersion of NPS may have increased to the level where a 'tight-knit' relationship (e.g., Fraternity brother or Sorority sister) is no longer a necessary in order to illegally obtain a prescription stimulant. Future studies need to evaluate motives for NPS, as well as routes of

dispersion, to better understand these discrepant findings between the likelihood of Greek members to engage in NPS for academic purposes.

Academic procrastination, as assed by the QAP, was a marginally significant predictor in the current model. Participants who scored higher on a measure of academic procrastination were more likely to engage in NPS for academic purposes. Given this predictor was only moderately significant (p=0.059), an independent sample t-test was conducted to directly compare QAP scores between individuals who endorsed NPS for academic purposes and individuals who denied a history of NPS. Significant mean differences between groups were found (t (138)=11.784, p=0.001), indicating individuals who reported NPS for academic purposes scored significantly higher (M=18.586, SD=6.011) on a measure of academic procrastination than individuals who denied a history of NPS (M=15.229, SD=5.550). These findings are consistent, but weaker than results reported by Sattler and colleagues (2014). The discrepancy between Sattler et al.'s (2014) and the present study's results may be explained by the assessment of NPS. Specifically, the aforementioned study had participants estimate their likelihood to engage in NPS, where the present study utilized individuals' who endorse lifetime NPS for academic purposes. Thus, individuals who score high on measures of academic procrastination report a higher likelihood to engage in NPS, but were only 8% more likely to actually engage in NPS for academic purposes.

Self-efficacy for study, as assessed by the SELF-studying subscale, was not significant and therefore did not contribute to the overall prediction of NPS for academic purposes. Participants who scored lower on a measure of self-efficacy for study were no

more likely to engage in NPS for academic purposes than participants who scored higher on the SELF-studying subscale. An independent sample *t*-test was conducted to directly compare self-efficacy for study scores between individuals who endorsed NPS for academic purposes and individuals who denied a history of NPS. Significant mean differences between groups were found (t (138)=12.736, p<0.001), indicating individuals who reported NPS for academic purposes scored significantly lower (M=102.029, SD=21.110) on a measure of self-efficacy for studying than individuals who denied a history of NPS (M=114.586, SD=20.519). These findings are consistent with results reported by Looby and colleagues (2015). The different findings between the model prediction and mean differences indicate self-efficacy for studying is lower for individuals engaging in NPS for academic purposes; however GPA, Greek Involvement, and Academic Procrastination are better overall predictors.

Strengths, Limitations, & Future Directions

The present study has much notable strength, which contributes to overall NPS literature. Specifically, this study investigated the most commonly reported motive for NPS (i.e., academic purposes). By limiting the scope of motives for use, the present study is able to more accurately develop a prediction model. Most studies have failed investigate risk factors for NPS based upon motives. Individuals who indicate recreational NPS may have significantly different demographic and adaptive factors than individuals who report NPS for academic purposes. Additionally, this study benefits from the ambiguity of online research. In particular, participants may have felt more

comfortable disclosing their NPS history though an online survey, than disclosing that information to a research assistant in a laboratory setting.

Despite the strengths of this study, a few limitations are necessary to note. First, the dependent variable (i.e., NPS for academic purposes) was operationally defined by combining three separate motives for use: It helps you concentration, It helps you study, It increases your alertness. Although unlikely in a college student sample, the possibility remains participants may have endorsed "It helps you concentrate" or "It increases your alertness" for reasons that are unrelated to academic performance. Therefore, future research should present more discrete categories when assessing NPS for academic purposes.

An additional limitation was the small sample size of 140 participants. Initial power analysis recommended a minimum sample of 273 participants, which is significantly more than the obtained sample. The data collection process to obtain the desired sample size is ongoing. Future research should pull from multiple sampling pools (e.g., multiple university) to ensure an adequate sample of individuals who endorse NPS for academic purposes.

Future studies investigating NPS for academic purposes should be longitudinal in design. To date, no research on NPS has examined individual trends of use over time. As a result, although the primary motive for NPS is academic, no studies have addressed whether NPS objectively improves academic performance across time. A few preliminary studies have found small-to-medium improvements in cognition; however, these findings

were based on laboratory tasks at only one time point (Bagot & Kaminer, 2014; Smith & Farah, 2011).

Implications

The knowledge gained from the present study can be applied in a variety of settings. First, researchers can utilize these findings to empirically investigate prevention and treatment models to reduce the number of college students engaging in NPS. Specifically, future studies can focus on the recruitment to students with low GPA, since this characteristic is highly associated with NPS for academic purposes. Following the recruitment process, various interventions focusing on the reduction behaviors associated with academic procrastination, another predictor of NPS, may provide empirical support for prevention and interventions strategies to reduce NPS on college campuses.

Secondly, the medical community benefits by receiving confirmatory statistics that NPS on college campus remains a prevalent problem. In the present study, approximately 17% of undergraduate students reported a history of NPS (i.e., lifetime), with roughly 5% of the total sample reporting recent use (i.e., past 12-month). Equipped with this information, medical and mental health providers may conduct more comprehensive assessments of stimulant-related use disorders, as well as continued awareness for possible malingering of ADHD for stimulant medications. This information may be particularly useful for professionals working at student health centers and/or university counseling centers.

Lastly, results for this study can aid university administrators and faculty by raising awareness and developing preventions/interventions to reduce the prevalence of

NPS. At the level of administration, policies requiring students with a low cumulative GPA to enroll in a course that teaches skills for academic success or attend weekly meetings with academic advisors may aid in the mitigation of low GPA individuals engaging in NPS for academic purposes. Additionally, administrators (and students) serving on the Interfraternity and Panhellenic Council Judicial Boards can enforce stricter sanctions on students involved in Greek organizations who are caught distributing and or engaging in NPS. Although the current study did not find Greek Involvement to be a significant predictor of NPS for academic purposes, previous research has suggested Greek Involvement does predict NPS. Thus, the inclusion of the Interfraternity and Panhellenic Councils will target individuals who are involved in Greek organizations. At the faculty level, lecturing professors may intervene by structuring courses in a manner that limits students' ability to procrastinate, aiming to reduce NPS among high procrastinators. For example, a course with more frequent assessments (e.g., quizzes, examinations, writing assignments) requires students to remain current with course material, rather than a course with only two assessments (e.g., mid-term examination, final examination)

CHAPTER V

CONCLUSION

Results from the present study suggest NPS remains prevalent on college campuses. By continuing to investigate this growing problem, researchers may begin to untangle the complex factors associated with NPS for academic purposes. Furthermore, targeted prevention and intervention programming can be developed to reduce the number of college students engaging in illegal use of stimulant medications. The present study contributes to the literature by combining demographic and adaptive factors to predict individuals who engage in NPS for academic purposes.

Appendix A
Consent Form

THE UNIVERSITY OF NORTH DAKOTA
CONSENT TO PARTICIPATE IN RESEARCH

TITLE:	*Suicidality, Eating Behaviors, and Drug Use Among College Students*
PROJECT DIRECTOR:	Danielle Beyer and Alexandra Thiel
PHONE #	(612) 470-7792
DEPARTMENT:	Psychology

STATEMENT OF RESEARCH

In order to participate in a research study, a person must give his or her informed consent first. This consent requires that the person considering participation understands the nature and risks of the research study before agreeing to participate. This document will present information about the research study so that you can make an informed decision about whether you want to participate. Please read the document carefully and take your time in making your decision. If you have any questions, please contact the researchers by email: psychresearch.und@gmail.com.

WHAT IS THE PURPOSE OF THIS STUDY?

You are invited participate in this research study because you are currently enrolled in a four-year U.S. college or university, and are between the ages of 18 and 24.

The purpose of this research study is to understand what puts college students at risk of misusing prescription stimulants, and to better understand the relationship between disordered eating and thoughts about suicide. The information gathered from this study will help to inform prevention efforts and will provide knowledge for future research projects.

HOW MANY PEOPLE WILL PARTICIPATE?

Approximately 555 people locally, as well as nationwide, will take part in this study.

HOW LONG WILL I BE IN THIS STUDY?

You will be asked to complete surveys a total of three (3) times during this study. The first survey will take about one (1) hour, and the two follow-up surveys will take less than 30 minutes each. These surveys will be completed over the course of ten weeks.

WHAT WILL HAPPEN DURING THIS STUDY?

If you decide to participate in this study, you will immediately begin the first survey. This survey contains questionnaires about prescription stimulant use, eating behaviors, and past and current thoughts about suicide. We will also ask you to provide some demographic information (e.g., age, gender, and ethnicity). Approximately 5 and 10 weeks after you complete the baseline survey, we will email and text message you links for the two follow-up surveys. To help ensure prompt data collection, we will send reminders to you via email, text message, and phone. For example, if you have not completed the follow-up within 2 days, we will contact you again via email and text message. If, after 2 more days, the survey has not been completed, we will remind you again by emailing, text messaging, and calling you. Please expect text messages and phone calls from (612) 470-7792. When you have completed all the surveys, you will be debriefed.

In order to contact you for the two follow-up surveys, we will need you to provide your preferred name, email address, and phone number. This information will be used for the purpose of this study only: to contact you for the follow-up surveys, and to provide contact information for mental health resources if you so request. If during the course of the study, you withdraw your consent to participate, and notify the research team by email or phone, we will not continue to contact you. The personal information you provide to us will be kept in password-protected files and only individuals involved in the research project will be able to access the document. To maintain confidentiality, your personal information and your responses to the surveys will only be linked in a separate secure file and only kept as long as you are enrolled in the study. Following your completion of the study, all contact information will be destroyed.

WHAT ARE THE RISKS OF THE STUDY?

There may be some risk from being in this study. Some of the survey questions deal with sensitive topics, and you may become upset as a result. However, these risks are not considered greater than “minimal risk”.

If you do become upset by some of the questions, you will be able to decline to answer the questions or stop the survey. If you are in crisis, we urge you to call 9-1-1 for immediate medical and/or psychological aid. If you would like to talk to someone about

your feelings or intentions, you are encouraged to contact any of the following helplines and organizations:

University of North Dakota Counseling Center: (701) 777-2127

University of North Dakota Psychological Services Center: (701) 777-3691

National Suicide Prevention Lifeline: 1-800-272-8255
http://www.suicidepreventionlifeline.org/

Suicide.org helpline: 1-800-784-2433 or text 1-800-799-4889
http://www.suicide.org/suicide-hotlines.html

National Alliance on Mental Illness: 1-800-950-6264, M-F 10am-6pm EST
http://www.nami.org/

National Eating Disorders Association: 1-800-931-2237, M-Th 9am-9pm, Fri 9am-5pm EST or email at info@nationaleatingdisorders.org
https://www.nationaleatingdisorders.org/

WHAT ARE THE BENEFITS OF THIS STUDY?

You may not benefit personally from being in this study. However, we hope that, in the future, other people might benefit from this study. The knowledge we gain from the results will help our understanding of why college students are at risk for prescription stimulant misuse and how disordered eating is related to suicidal thoughts and actions. By bettering our understanding of these psychological phenomena, prevention programs aimed at reducing mental illness can be improved.

ALTERNATIVES TO PARTICIPATING IN THIS STUDY

For University of North Dakota students enrolled in a Psychology course, you can earn extra credit for your course in other ways. Please contact your instructor for more information on alternatives. For all other students, declining participation for this study will not affect your current or future relationship with the University of North Dakota and/or their researchers.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

There are no costs for being in this research study.

WILL I BE PAID FOR PARTICIPATING?

For University of North Dakota Psychology students seeking course credit:

For your participation, you will receive one (1) credit for the first survey and a half credit (.5) for each of the two follow-up surveys. Thus, you can receive a maximum of 2 SONA credits. *Each time you complete a survey, you can choose whether you would like SONA credit or be entered into the raffle. For example, if your Psychology course ends before your study participation, you can be entered into the raffle instead of receiving SONA credit.*

For all other college students:

For each survey you complete, you will receive one entry into a raffle to receive an Amazon gift card. In the first raffle, eight (8) participants will receive an Amazon gift card worth $10. In the second raffle, seven (7) participants will receive an Amazon gift card worth $15. Finally, in the third raffle, 11 participants will receive an Amazon gift card worth $20. Raffle winners will be emailed a code to retrieve their gift card online through the Amazon website. It is possible to win more than one raffle drawing.

Please note that if you answer less than 80% of the questions for any one survey, you will not be eligible to receive SONA credit or be entered into the raffle.

WHO IS FUNDING THE STUDY?

The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

CONFIDENTIALITY

The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by Government agencies, the UND Research Development and Compliance office, and the University of North Dakota Institutional Review Board.

Any information that is obtained in this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Your confidentiality will be maintained by means of password-protected data files and online data-collection accounts. Access to these accounts and documents will be restricted to only the researchers and their assistants. The personal information you provide (e.g., name, email, etc.) will be kept in a separate file from the responses you give to survey questions.

If we write a report or article about this study, we will describe the study results in a summarized manner so that you cannot be identified.

Additionally, we encourage participants to complete the surveys on a personal computer or cell phone, in a private space. However, if you choose to complete surveys on a public computer or non-personal cell phone, please be sure to close all browsers when you have finished to ensure confidentiality.

IS THIS STUDY VOLUNTARY?

Your participation is voluntary. You may choose to decline answering questions that you find too uncomfortable. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the University of North Dakota.

If you decide to leave the study early, we ask that you notify the researchers via email (psychresearch.und@gmail.com). By notifying us of your choice to discontinue, we will stop contacting you for the follow-up surveys.

CONTACTS AND QUESTIONS?

The researchers conducting this study are Danielle Beyer and Alexandra Thiel. If you have questions, concerns, or complaints about the research, now or later, please contact us via email at psychresearch.und@gmail.com, or contact Danielle at danielle.beyer@my.und.edu, or contact Alexandra at alexandra.thiel@my.und.edu. You may also contact our advisors, Kyle De Young, Ph.D. at (701) 777-5671, or Alison Looby, Ph.D. at (701) 777-3803.

If you have questions regarding your rights as a research subject, you may contact The University of North Dakota Institutional Review Board at **(701) 777-4279** or Michelle Bowles at michelle.bowles@research.und.edu.

- You may also call this number about any problems, complaints, or concerns you have about this research study.
- You may also call this number if you cannot reach research staff, or you wish to talk with someone who is independent of the research team.
- General information about being a research subject can be found by clicking "Information for Research Participants" on the web site: http://und.edu/research/resources/human-subjects/research-participants.cfm

By selecting the, “I consent to participate” box, you indicate that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study.

If you select the, “I decline to consent” box, you indicate that you will not participate in the study. If this is the case, be assured that your current or future relationship with the University of North Dakota will not be affected.

You are encouraged to print or save a copy of this consent form for your personal records.

Appendix B
Demographic Questionnaire

1. Please enter your age.
   - Ø (enter)

2. Which gender to you identify with?
   - Ø Male
   - Ø Female
   - Ø Transgender
   - Ø Other (please enter)

3. What is your ethnicity?
   - Ø White
   - Ø African American or Black
   - Ø Asian
   - Ø Other Pacific Islander
   - Ø Hispanic or Latino
   - Ø American Indian or Alaska Native
   - Ø Other (please enter)

4. Where in the United States are you currently living?
   - Ø West (WA, ID, OR, CA, NV, UT, WY, CO, MT, AK, HI)
   - Ø Southwest (AZ, NM, TX, OK)
   - Ø Midwest (ND, SD, NE, KS, MN, IA, MO, WI, IL, IN, MI, OH)
   - Ø Southeast (AR, LA, MS, AL, GA, FL, TN, KY, WV, VA, SC, NC)
   - Ø Northeast (MD, DE, NJ, CT, RI, MA, NH, ME, VT, NY, PA)

5. What is your current year in school?
   - Ø Freshman
   - Ø Sophomore
   - Ø Junior
   - Ø Senior

6. Are you a member of a Greek organization (e.g., Fraternity or Sorority)?
   - Ø Yes
   - Ø No

7. Please select your current living arrangement.
   - Ø Single-sex residence hall
   - Ø Co-ed residence hall
   - Ø Greek housing
   - Ø Other university housing

- Ø Off-campus house/apartment
- Ø Off-campus house/apartment with relatives

8. Please enter your cumulative undergraduate GPA.
   - Ø (enter)

9. Please enter your cumulative high school GPA.
   - Ø (enter)

11. Please estimate your primary parent/caregiver's annual income.
   - Ø < $25,000
   - Ø $25,001–$50,000
   - Ø $50,001–$75,000
   - Ø $75,001–$100,000
   - Ø $100,001 +

Appendix C
Prescription Stimulant Questionnaire

1. Have you ever been diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD) by a medical provider or psychologist?
   - Ø Yes
   - Ø No

2. Do you currently have a diagnosis of ADHD by a medical provider or psychologist?
   - Ø Yes
   - Ø No

3. Have you ever been prescribed a stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse) by a physician?
   - Ø Yes
   - Ø No

4. Do you currently have a prescription for a stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse)?
   - Ø Yes
   - Ø No

5. If you have a prescription for a stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse), have you ever given sold, or traded your medication?
   - Ø I do not have a prescription for any of these medications
   - Ø Yes
   - Ø No

6. Have you ever used a prescription stimulant medication without a prescription and/or in a higher dose than prescribed by a physician?
   - Ø Yes
   - Ø No

**If the participant selected 'Yes' to question #6, the participant was asked the following questions. If the participant selected 'No' to question #6, the participant was re-directed to the next questionnaire.

7. How many times in your lifetime have you used a prescription stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse) without a prescription and/or in a higher dose than prescribed by a physician?
   - Ø 1 Time
   - Ø 2-3 Times
   - Ø 4-5 Times

- Ø 6-10 Times
- Ø 11-20 Times
- Ø 21-30 Times
- Ø 31-40 Times
- Ø 41-50 Times
- Ø 50+ Times

8. How many times in the past 12 months have you used a prescription stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse) without a prescription and/or in a higher dose than prescribed by a physician?

- Ø 1 Time
- Ø 2-3 Times
- Ø 4-5 Times
- Ø 6-10 Times
- Ø 11-20 Times
- Ø 21-30 Times
- Ø 31-40 Times
- Ø 41-50 Times
- Ø 50+ Times

9. How many times in the past 30 days have you used a prescription stimulant medication (e.g., Ritalin, Adderall, Concerta, Vyvanse) without a prescription and/or in a higher dose than prescribed by a physician?

- Ø 1 Time
- Ø 2-3 Times
- Ø 4-5 Times
- Ø 6-10 Times
- Ø 11-20 Times
- Ø 21-30 Times
- Ø 31+ Times

10. How did you gain access to the prescription stimulant medication that you took without a prescription or in a higher dose than prescribed by a physician?

- Ø Personal prescription (in your name)
- Ø Friend
- Ø Family member
- Ø You took it from a family member or friend without his/her knowledge
- Ø Other (Please specify)

11. Please read the following reasons for nonmedical prescription stimulant sue. Select all that apply to explain why you have used a prescription stimulant for recreational/nonmedical purposes?

- Ø It gives you a high

- Ø It counteracts the effects of other drugs or alcohol
- Ø For experimentation
- Ø It's safer than street drugs
- Ø You're addicted to it
- Ø It helps you concentrate
- Ø It helps increase your alertness
- Ø It helps you study
- Ø It helps you lose weight
- Ø It decreases or curbs appetite

12. In the next 6 months, what is the likelihood that you will use a prescription stimulant medication without a prescription or in higher doses than prescribed by a physician for academic purposes (e.g., to enhance concentration or studying)?

- Ø 0-Not at All Likely
- Ø 1
- Ø 2
- Ø 3
- Ø 4
- Ø 5-Somewhat Likely
- Ø 6
- Ø 7
- Ø 8
- Ø 9
- Ø 10-Extremely Likely

Appendix D
Self-Efficacy for Learning Form (SELF)—Studying Subscale

Please choose a percentage to indicate your answer.

Definitely Cannot Do it	Probably Cannot Do It	Maybe	Probably Can Do It	Definitely Can Do It
0%	30%	50%	70%	100%

1. When you have trouble remembering complex definitions from a textbook can you redefine them so that you will recall them?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. When you have tried unsuccessfully to study for an hour can you set and attain an important study goal during your remaining time?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. When you find your homework assignments vary greatly in length each day can you adjust your time schedule to complete them
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. When you notice that your are getting behind in your homework during the week can you catch up during the next weekend?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. When another student asks you to study together for a course in which you are experiencing difficulty can you be an effective study partner?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. When you have missed several classes can you make up the work within a week?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. When problems with friends and peers conflict with schoolwork can you keep up with your assignment?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. When a homework assignment such as learning vocabulary words is repetitive and uninteresting can you make it into an exciting challenge?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. When you feel moody or restless during studying can you focus your attention well enough to finish your assigned work?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10. When you are trying to understand a new topic can you associate new concepts with old ones sufficiently well to remember them?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. When you have time available between classes can you motivate yourself to use it for studying?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12. When you find yourself getting increasingly behind in a new course can you increase your studying time sufficiently to catch up?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

13. When you are angry about a course because of a teacher's demanding requirements can you find a way to channel your anger to help you succeed?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

14. When you discover that your homework assignments for the semester are much longer than expected can you change your other priorities to have enough time for studying?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix E
Questionnaire for Academic Procrastination

Using the scale below, please rate the following items. Please answer as truthfully as possible.

1. Although I plan to work on a university assignment, I don't do it.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

2. If I intend to continue working on a university assignment, I do it.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

3. Even if I intend to finish a university assignment, I don't do it.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

4. When I plan to start working on a university assignment, I stick to the plan.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

5. I don't continue working on a university assignment, although I intend to.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

6. When I intend to work on a university assignment, I do it.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

7. I don't start working on a university assignment, although I intend to.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

8. If I intend to finish a university assignment, I do it.

Very Seldom	Seldom	Somewhat Seldom	Somewhat Often	Often	Very Often
(1)	(2)	(3)	(4)	(5)	(6)

Appendix F
Debriefing Form

Dear Student,

Thank you again for your participation and time. We appreciate that you took time over the past 12 weeks to participate in this research! Again, all of your survey responses are anonymous and will only be used for research purposes.

There are two purposes to this study. The first is to understand how eating behaviors, especially purging, are related to thoughts and feelings about suicide (e.g., loneliness, feeling like a burden, hopelessness). Previous research has suggested that individuals who engage in purgative behaviors are at higher risk for experiencing suicidal ideation, so the purpose of this study is to understand why this relationship exists.

The second purpose of this study is to better understand non-medical prescription stimulant use. Past research has identified GPA, Greek involvement, and academic self-efficacy as risk factors for non-medical prescription stimulant use. This study is trying to test whether these risk factor influence non-medical prescription stimulant use through academic procrastination.

If you have any questions about this study, please don't hesitate to email us. You can reach Alexandra at alexandra.thiel@my.und.edu and Danielle at danielle.beyer@my.und.edu

If your participation in this study has caused a great deal of stress or discomfort, we urge you to contact any of the following psychological resources. If you are in crisis, please seek emergency medical help by calling 9-1-1.

National Suicide Prevention Lifeline: 1-800-272-8255
http://www.suicidepreventionlifeline.org/
Suicide.org helpline: 1-800-784-2433 or text 1-800-799-4889
http://www.suicide.org/suicide-hotlines.html
National Alliance on Mental Illness: 1-800-950-6264, M-F 10am-6pm EST
http://www.nami.org/
National Eating Disorders Association: 1-800-931-2237, M-Th 9am-9pm, Fri 9am-5pm EST or email at info@nationaleatingdisorders.org

Again, your participation in our study has helped us tremendously in our programs of research. Thank you for your time!

Sincerely, Alexandra Thiel & Danielle Beyer

REFERENCES

Advokat, C. (2010). What are the cognitive effects of stimulant medications? Emphasis on adults with attention-deficit/hyperactivity disorder (ADHD). Neuroscience & Biobehavioral Reviews, 34(8), 1256-1266.

Aldworth, J. (2009). *Results from the 2007 national survey on drug use and health: National findings*. DIANE Publishing.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Arnold, L. E. (2000). Methyiphenidate vs. amphetamine: Comparative review. *Journal of Attention Disorders*, *3*(4), 200-211.

Arria, A. M., Caldeira, K. M., O'Grady, K. E., Vincent, K. B., Fitzelle, D. B., Johnson, E. P., & Wish, E. D. (2008). Drug exposure opportunities and use patterns among college students: Results of a longitudinal prospective cohort study. Substance abuse, 29(4), 19-38.

Arria, A. M., Wilcox, H. C., Caldeira, K. M., Vincent, K. B., Garnier-Dykstra, L. M., & O'Grady, K. E. (2013). Dispelling the myth of "smart drugs": Cannabis and alcohol use problems predict nonmedical use of prescription stimulants for studying. *Addictive behaviors*, *38*(3), 1643-1650.

Baroni, A., & Castellanos, F. X. (2015). Stimulants, cognition and ADHD. Current Opinion in Behavioral Sciences, 4, 109-114.

Bavarian, N., Flay, B. R., Ketcham, P. L., & Smit, E. (2013). Illicit use of prescription stimulants in a college student sample: A theory-guided analysis. *Drug And Alcohol Dependence*, *132*(3), 665-673. doi:10.1016/j.drugalcdep.2013.04.024

Benotsch, E. G., Jeffers, A. J., Snipes, D. J., Martin, A. M., & Koester, S. (2013). The five factor model of personality and the non-medical use of prescription drugs: Associations in a young adult sample. *Personality and Individual Differences*, *55*(7), 852-855.

Benson, K., Flory, K., Humphreys, K. L., & Lee, S. S. (2015). Misuse of stimulant medication among college students: a comprehensive review and meta-analysis. *Clinical child and family psychology review*, *18*(1), 50.

Berman, S. M., Kuczenski, R., McCracken, J. T., & London, E. D. (2009). Potential adverse effects of amphetamine treatment on brain and behavior: A review. *Molecular Psychiatry*, *14*(2), 123-142. doi:10.1038/mp.2008.90

Bossaer, J. B., Gray, J. A., Miller, S. E., Enck, G., Gaddipati, V. C., & Enck, R. E. (2013). The use and misuse of prescription stimulants as "cognitive enhancers" by students at one academic health sciences center. *Academic medicine*, *88*(7), 967-971.

Brady, J. V., Griffiths, R. R., Hienz, R. D., Ator, N. A., Lukas, S. E., & Lamb, R. J. (1987). Assessing drugs for abuse liability and dependence potential in laboratory primates. In Methods of assessing the reinforcing properties of abused drugs (pp. 45-85). Springer New York.

Calipari, E. S., Ferris, M. J., Siciliano, C. A., & Jones, S. R. (2014). Differential Influence of Dopamine Transport Rate on the Potencies of Cocaine, Amphetamine, and Methylphenidate. *ACS chemical neuroscience*, *6*(1), 155-162.

Campbell, R., & Young, S. P. (2015). Central nervous system stimulants: basic pharmacology and relevance to anaesthesia and critical care. *Anaesthesia & Intensive Care Medicine*, *16*(1), 21-25.

Cascade, E., Kalali, A. H., & Weisler, R. H. (2008). Short-acting versus long-acting medications for the treatment of ADHD. *Psychiatry (Edgmont)*, *5*(8), 24-27.

Castells, X., Ramos‐Quiroga, J. A., Bosch, R., Nogueira, M., & Casas, M. (2011). Amphetamines for attention deficit hyperactivity disorder (ADHD) in adults. *The Cochrane Library*.

Center for Disease Control and Prevention. (2005). Mental health in the United States. Prevalence of diagnosis and medication treatment for attention-deficit/hyperactivity disorder – United States, 2003. *MMWR Morbidity and mortality weekly report, 54*(34), 842–847.

Chait, L. D. (1994). Reinforcing and subjective effects of methylphenidate in humans. *Behavioural pharmacology*, Vol 5(3), Jun 1994, 281-288.

Chen, L. Y., Crum, R. M., Strain, E. C., Martins, S. S., & Mojtabai, R. (2015). Patterns of concurrent substance use among adolescent nonmedical ADHD stimulant users. *Addictive behaviors*, *49*, 1-6.

Chew, R.H., Hales, R.E., Yudofsky, S.C. (2009). Stimulants and non stimulants for ADHD. In *What your patients need to know about psychiatric medications* (2nd Ed.), Washington D.C.: American Psychiatric Publishing.

Cohen, J. (1992). Statistical power analysis. Current directions in psychological science, 1(3), 98-101.

Cools, R., Aarts, E., & Mehta, M. A. (2011). Paradoxical effects of drugs on cognitive function: The neuropsychopharmacology of the dopamine and other neurotransmitter systems. The paradoxical brain, 397-417.

Curtis, N. A., & Trice, A. D. (2013). A revision of the academic locus of control scale for college students. *Perceptual and motor skills*, *116*(3), 817-829.

DeSantis, A. D., Webb, E. M., & Noar, S. M. (2008). Illicit use of prescription ADHD medications on a college campus: a multimethodological approach. *Journal of American college health*, *57*(3), 315-324.

DeSantis, A., Noar, S. M., & Webb, E. M. (2009). Nonmedical ADHD stimulant use in fraternities. *Journal of Studies on Alcohol and Drugs*, *70*(6), 952-954.

Faraone, S. V. (2009). Using meta-analysis to compare the efficacy of medications for attention-deficit/hyperactivity disorder in youths. *Pharmacy and Therapeutics*, *34*(12), 678.

Fischman, M. W., & Mello, N. K. (Eds.). (1989). Testing for abuse liability of drugs in humans. US Department of Health and Human Services.

Fitzgerald, K. T., & Bronstein, A. C. (2013). Adderall®(amphetamine-dextroamphetamine) toxicity. *Topics in companion animal medicine*, *28*(1), 2-7.

Forlini, C., Gauthier, S., & Racine, E. (2013). Should physicians prescribe cognitive enhancers to healthy individuals?. *Canadian Medical Association Journal*, *185*(12), 1047-1050.

Gallucci, A. R., & Martin, R. J. (2015). Misuse of prescription stimulant medication in a sample of college students: Examining differences between varsity athletes and non-athletes. *Addictive behaviors*, *51*, 44-50.

Garnier-Dykstra, L. M., Caldeira, K. M., Vincent, K. B., O'Grady, K. E., & Arria, A. (2012). Nonmedical use of prescription stimulants during college: Four-year trends in exposure opportunity, use, motives, and sources. *Journal Of American College Health*, *60*(3), 226-234. doi:10.1080/07448481.2011.589876

Gatley, S. J., Pan, D., Chen, R., Chaturvedi, G., & Ding, Y. S. (1996). Affinities of methylphenidate derivatives for dopamine, norepinephrine and serotonin transporters. *Life sciences*, *58*(12), PL231-PL239.

Greely, H., Sahakian, B., Harris, J., Kessler, R. C., Gazzaniga, M., Campbell, P., & Farah, M. J. (2008). Towards responsible use of cognitive-enhancing drugs by the healthy. *Nature*, *456*(7223), 702-705.

Greenhill, L. L., Pliszka, S., & Dulcan, M. K. (2001). Summary of the practice parameter for the use of stimulant medications in the treatment of children, adolescents, and adults. *Journal Of The American Academy Of Child & Adolescent Psychiatry*, *40*(11), 1352-1355. doi:10.1097/00004583-200111000-00020

Heishman, S. J., & Henningfield, J. E. (1991). Discriminative stimulus effects of amphetamine, methylphenidate, and diazepam in humans. *Psychopharmacology*, *103*(4), 436-442.

Hodgkins, P., Shaw, M., McCarthy, S., & Sallee, F. R. (2012). The pharmacology and clinical outcomes of amphetamines to treat ADHD. *CNS drugs*, *26*(3), 245-268.

Hysek, C. M., Simmler, L. D., Schillinger, N., Meyer, N., Schmid, Y., Donzelli, M., ... & Liechti, M. E. (2014). Pharmacokinetic and pharmacodynamic effects of methylphenidate and MDMA administered alone or in combination. *International Journal of Neuropsychopharmacology*, *17*(3), 371-381.

Ilieva, I. P., Hook, C. J., & Farah, M. J. (2015). Prescription stimulants' effects on healthy inhibitory control, working memory, and episodic memory: a meta-analysis. Journal of cognitive neuroscience, 27(6), 1069-1089.

Ilieva, I., Boland, J., & Farah, M. J. (2013). Objective and subjective cognitive enhancing effects of mixed amphetamine salts in healthy people. *Neuropharmacology*, *64*, 496-505.

Jeffers, A., Benotsch, E. G., & Koester, S. (2013). Misuse of prescription stimulants for weight loss, psychosocial variables, and eating disordered behaviors. *Appetite*, *65*, 8-13.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2004). Monitoring the Future: National Survey Results on Drug Use, 1975-2003. Volume II: College Students & Adults Ages 19-45, 2003. *US Department of Health and Human Services*.

Kaye, S., & Darke, S. (2012). The diversion and misuse of pharmaceutical stimulants: what do we know and why should we care?. *Addiction*, *107*(3), 467-477.

Kilwein, T. M., Goodman, E. L., Looby, A., & De Young, K. P. (2016). Nonmedical prescription stimulant use for suppressing appetite and controlling body weight is uniquely associated with more severe eating disorder symptomatology. International Journal of Eating Disorders, 49(8), 813-816.

Koelega, H. S. (1993). Stimulant drugs and vigilance performance: a review. *Psychopharmacology*, *111*(1), 1-16.

Kolar, D., Keller, A., Golfinopoulos, M., Cumyn, L., Syer, C., & Hechtman, L. (2008). Treatment of adults with attention-deficit/hyperactivity disorder. *Neuropsychiatric disease and treatment*, *4*(1), 107.

Kollins, S. H., MacDonald, E. K., & Rush, C. R. (2001). Assessing the abuse potential of methylphenidate in nonhuman and human subjects: a review. *Pharmacology Biochemistry and Behavior*, *68*(3), 611-627.

Kollins, S. H., Rush, C. R., Pazzaglia, P. J., & Ali, J. A. (1998). Comparison of acute behavioral effects of sustained-release and immediate-release methylphenidate. *Experimental and clinical psychopharmacology*, *6*(4), 367.

Komarraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter?. *Learning and Individual Differences*, *25*, 67-72.

Konrad-Bindl, D. S., Gresser, U., & Richartz, B. M. (2016). Changes in behavior as side effects in methylphenidate treatment: review of the literature. Neuropsychiatric disease and treatment, 12, 2635.

Labbe, A. K., & Maisto, S. A. (2010). Development of the stimulant medication outcome expectancies questionnaire for college students. *Addictive Behaviors, 35*, 726-729. doi: 10.1016/j.addbeh.2010.03.010

Lakhan, S. E. and Kirchgessner, A. (2012), Prescription stimulants in individuals with and without attention deficit hyperactivity disorder: misuse, cognitive impact, and adverse effects. Brain and Behavior, 2: 661–677. doi: 10.1002/brb3.78

Leonard, B. E., McCartan, D., White, J., & King, D. J. (2004). Methylphenidate: a review of its neuropharmacological, neuropsychological and adverse clinical effects. Human Psychopharmacology: Clinical and Experimental, 19(3), 151-180.

Longo, M., Wickes, W., Smout, M., Harrison, S., Cahill, S., & White, J. M. (2010). Randomized controlled trial of dexamphetamine maintenance for the treatment of methamphetamine dependence. *Addiction*, *105*(1), 146-154.

Looby, A., & Earleywine, M. (2010). Psychometric evaluation of a Prescription Stimulant Expectancy Questionnaire. Experimental and clinical psychopharmacology, 18(4), 375.

Looby, A., Beyer, D. L., & Zimmerman, L. (2015). Non-medical prescription stimulant use: Investigating modifiable risk factors. Addiction Research & Theory, 23(2), 143-147.

Lookatch, S. J., Dunne, E. M., & Katz, E. C. (2012). Predictors of nonmedical use of prescription stimulants. *Journal of psychoactive drugs*, *44*(1), 86-91.

Low, K. G., & Gendaszek, A. E. (2002). Illicit use of psychostimulants among college students: A preliminary study. *Psychology, Health & Medicine*, *7*(3), 283-287. doi:10.1080/13548500220139386

MacDonald, E. K., & Kollins, S. H. (2000). Assessing the reinforcing effects of methylphenidate in children diagnosed with ADHD using a choice procedure. *Drug Alcohol Depend*, *60*, S134.

McCabe, S. E., & Teter, C. J. (2007). Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a Midwestern university. *Drug and alcohol dependence*, *91*(1), 69-76.

McCabe, S. E., Knight, J. R., Teter, C. J., & Wechsler, H. (2005). Non‐medical use of prescription stimulants among US college students: Prevalence and correlates from a national survey. *Addiction*, *100*(1), 96-106.

McCabe, S. E., Teter, C. J., & Boyd, C. J. (2004). The use, misuse and diversion of prescription stimulants among middle and high school students. *Substance use & misuse*, *39*(7), 1095-1116.

McCabe, S. E., Teter, C. J., Boyd, C. J., Knight, J. R., & Wechsler, H. (2005b). Nonmedical use of prescription opioids among US college students: Prevalence and correlates from a national survey. Addictive behaviors, 30(4), 789-805.

McCabe, S. E., West, B. T., Schepis, T. S., & Teter, C. J. (2015). Simultaneous co‐ingestion of prescription stimulants, alcohol and other drugs: a multi‐cohort national study of US adolescents. *Human Psychopharmacology: Clinical and Experimental*, *30*(1), 42-51.

McCabe, S. E., West, B. T., Teter, C. J., & Boyd, C. J. (2014). Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. *Addictive behaviors*, *39*(7), 1176-1182.

Menard, S. (1995). Applied logistic regression analysis: Sage university series on quantitative applications in the social sciences.

Menard, S. (2002). Applied logistic regression analysis (No. 106). Sage.

Mitchell, S. H., Laurent, C. L., & Wit, H. D. (1996). Interaction of expectancy and the pharmacological effects of amphetamine: subjective effects and self-administration. Psychopharmacology, 125(4), 371-378.

Modi, N. B., Lindemulder, B. and Gupta, S. K. (2000), Single- and Multiple-Dose Pharmacokinetics of an Oral Once-a-Day Osmotic Controlled-Release OROS® (methylphenidate HC1) Formulation. Journal of Clinical Pharma, 40: 379–388. doi: 10.1177/00912700022009080

Patrzek, J., Sattler, S., van Veen, F., Grunschel, C., & Fries, S. (2015). Investigating the effect of academic procrastination on the frequency and variety of academic misconduct: a panel study. Studies in Higher Education, 40(6), 1014-1029.

Rabiner, D. L., Anastopoulos, A. D., Costello, E. J., Hoyle, R. H., McCabe, S. E., & Swartzwelder, H. S. (2009). The misuse and diversion of prescribed ADHD medications by college students. *Journal of Attention Disorders*, *13*(2), 144-153.

Racine, E., & Forlini, C. (2010). Cognitive enhancement, lifestyle choice or misuse of prescription drugs?. *Neuroethics*, *3*(1), 1-4.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353-387. doi:10.1037/a0026838.

Roehrs, T., Papineau, K., Rosenthal, L., & Roth, T. (1999). Sleepiness and the reinforcing and subjective effects of methylphenidate. *Experimental and clinical psychopharmacology*, *7*(2), 145.

Rothblum, E. D., Solomon, L. J., & Murakami, J. (1986). Affective, cognitive, and behavioral differences between high and low procrastinators. Journal of counseling psychology, 33(4), 387.

Rush, C. R., & Baker, R. W. (2001). Behavioral pharmacological similarities between methylphenidate and cocaine in cocaine abusers. Experimental and clinical psychopharmacology, 9(1), 59.

Rush, C. R., Essman, W. D., Simpson, C. A., & Baker, R. W. (2001). Reinforcing and Subject-Rated Effects of Methylphenidate and d-Amphetamine in Non–Drug-Abusing Humans. *Journal of clinical psychopharmacology*, *21*(3), 273-286.

Rush, C. R., Kollins, S. H., & Pazzaglia, P. J. (1998). Discriminative-stimulus and participant-rated effects of methylphenidate, bupropion, and triazolam in d-amphetamine-trained humans. *Experimental And Clinical Psychopharmacology*, *6*(1), 32-44. doi:10.1037/1064-1297.6.1.32

Sattler, S., Mehlkop, G., Graeff, P., & Sauer, C. (2014). Evaluating the drivers of and obstacles to the willingness to use cognitive enhancement drugs: the influence of drug characteristics, social environment, and personal characteristics. Subs Abuse Treat Prev Policy, 9, 14.

Schouwenburg, H. C. (2004). Procrastination in Academic Settings: General Introduction.

Schouwenburg, H. C., & Groenewoud, J. (2001). Study motivation under social temptation; effects of trait procrastination. Personality and Individual Differences, 30(2), 229-240.

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. Journal of Educational psychology, 99(1), 12.

Schunk, D. H., & Zimmerman, B. J. (2008). *Motivation and self-regulated learning: Theory, research, and applications*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Sepúlveda, D. R., Thomas, L. M., McCabe, S. E., Cranford, J. A., Boyd, C. J., & Teter, C. J. (2011). Misuse of prescribed stimulant medication for ADHD and associated patterns of substance use: preliminary analysis among college students. Journal of pharmacy practice, 24(6), 551-560.

Sevak, R. J., Stoops, W. W., Hays, L. R., & Rush, C. R. (2009). Discriminative stimulus and subject-rated effects of methamphetamine, d-amphetamine, methylphenidate, and triazolam in methamphetamine-trained humans. Journal of Pharmacology and Experimental Therapeutics, 328(3), 1007-1018.

Shaywitz, S. E., Hunt, R. D., Jatlow, P., Cohen, D. J., Young, J. G., Pierce, R. N., ... & Shaywitz, B. A. (1982). Psychopharmacology of attention deficit disorder: pharmacokinetic, neuroendocrine, and behavioral measures following acute and chronic treatment with methylphenidate. *Pediatrics*, *69*(6), 688-694.

Simon, V., Czobor, P., Bálint, S., Mészáros, Á., & Bitter, I. (2009). Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. *The British Journal of Psychiatry*, *194*(3), 204-211.

Smith, M. E., & Farah, M. J. (2011). Are prescription stimulants "smart pills"? The epidemiology and cognitive neuroscience of prescription stimulant use by normal healthy individuals. Psychological bulletin, 137(5), 717.

Spiller, H., Hays, H., & Aleguas, A. (2013). Overdose of Drugs for Attention-Deficit Hyperactivity Disorder: Clinical Presentation, Mechanisms of Toxicity, and Management. CNS Drugs, 27(7), 531-543. doi:10.1007/s40263-013-0084-8

Substance Abuse and Mental Health Services Administration. The NSDUH Report: Nonmedical Use of Adderall® among Full-Time College Students. Office of Applied Studies; Rockville, MD: 2009a.

Sweeney, C. T., Sembower, M. A., Ertischek, M. D., Shiffman, S., & Schnoll, S. H. (2013). Nonmedical use of prescription ADHD stimulants and preexisting patterns of drug abuse. *Journal of addictive diseases*, *32*(1), 1-10.

Teter, C. J., McCabe, S. E., Cranford, J. A., Boyd, C. J., & Guthrie, S. K. (2005). Prevalence and Motives for Illicit Use of Prescription Stimulants in an Undergraduate Student Sample. *Journal Of American College Health*, *53*(6), 253-262.

Teter, C. J., McCabe, S. E., LaGrange, K., Cranford, J. A., & Boyd, C. J. (2006). Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, *26*(10), 1501-1510.

Wagner, H., & Silber, K. (2004). *Physiological Psychology.* London and New York: BIOS Scientific Publishers.

Weyandt, L. L., Janusis, G., Wilson, K. G., Verdi, G., Paquin, G., Lopes, J., ... & Dussault, C. (2009). Nonmedical prescription stimulant use among a sample of college students: relationship with psychological variables. *Journal of Attention Disorders*.

Weyandt, L. L., Oster, D. R., Marraccini, M. E., Gudmundsdottir, B. G., Munro, B. A., Zavras, B. M., & Kuhar, B. (2014). Pharmacological interventions for adolescents and adults with ADHD: stimulant and nonstimulant medications and misuse of prescription stimulants. *Psychology research and behavior management*, *7*, 223.

Whiteside, L. K., Cunningham, R. M., Bonar, E. E., Blow, F., Ehrlich, P., & Walton, M. A. (2015). Nonmedical prescription stimulant use among youth in the emergency department: Prevalence, severity and correlates. *Journal of substance abuse treatment*, *48*(1), 21-27.

Wilens, T. E., Adler, L. A., Adams, J., Sgambati, S., Rotrosen, J., Sawtelle, R., ... & Fusillo, S. (2008). Misuse and diversion of stimulants prescribed for ADHD: a systematic review of the literature. *Journal of the American Academy of Child & Adolescent Psychiatry*, *47*(1), 21-31.

Wolters, C. A. (2003). Understanding procrastination from a self-regulated learning perspective. *Journal of Educational Psychology*, *95*(1), 179.

Woodworth, T. (2000). DEA Congressional Testimony, Committee on Education and the Workforce: Subcommittee on Early Childhood, Youth and Families, 16 May 2000.

Zachor, D. A., Roberts, A. W., Hodgens, J. B., Isaacs, J. S., & Merrick, J. (2006). Effects of long-term psychostimulant medication on growth of children with ADHD. *Research in developmental disabilities*, *27*(2), 162-174.

Zimmerman, B., & Kitsantas, A. (2007). Reliability and validity of self-efficacy for learning form (SELF) scores of college students. Zeitschrift für Psychologie/Journal of Psychology, 215(3), 157-163.

Zuvekas, S. H., & Vitiello, B. (2014). Stimulant medication use in children: a 12-year perspective. *American Journal of Psychiatry*.