ASSESSING NONMEDICAL USE OF PRESCRIPTION STIMULANTS USING AN IPHONE APPLICATION

by

Natalie N. DeLeon, B.A.

A thesis submitted to the Graduate Council of
Texas State University in partial fulfillment
of the requirements for the degree of
Master of Arts
with a Major in Psychological Research
May 2015

Committee Members:

Ty S. Schepis, Chair

Reiko Graham

Kelly B. Haskard Zolnierek

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

DEDICATION

To all the people who kept me sane during this process especially my fiancé, my family, and my cohort.

ACKNOWLEDGEMENTS

I'd like to thank my mentor, Dr. Ty Schepis, who was instrumental in my research and in my success at Texas State University. I'd also like to thank Dr. Graham, whose guidance and helpful 'kicks' have propelled me forward, and Dr. Haskard, who has been nothing but encouraging throughout my thesis process. This wouldn't have been possible without you all.

TABLE OF CONTENTS

Page

LIST OF ABBREVIATIONS

Abbreviation	Description
ADHD	Attention-deficit/hyperactivity disorder
EMA	Ecological Momentary Assessment
GPA	Grade Point Average
NUPS	Nonmedical Use of Prescription Stimulants
P.I.E.L. App	Participation in Everyday Life iPhone Application

ABSTRACT

The use of prescription stimulants has escalated in the past decade for both medical and nonmedical purposes and is increasingly problematic as evidenced by a drastic increase in hospitalizations. Studies have found conflicting evidence about how sociodemographic characteristics influence nonmedical prescription stimulant use. This study uses baseline questionnaires and ecological momentary assessment to evaluate characteristics associated with being a nonmedical prescription stimulant user, and sociodemographic characteristics associated with frequency of nonmedical prescription stimulant use. Finally, this study examines academic self-efficacy and stress in the moment to evaluate if these factors are psychological precipitants of the nonmedical use of prescription stimulants. Gender and involvement with Greek fraternities and sororities were not associated with likelihood to nonmedically use a prescription stimulant or frequency of nonmedical use. Grade point average was associated with a greater likelihood of being a nonmedical prescription stimulant user but not with frequency of use. Stress and academic confidence were significantly associated with the nonmedical use of prescription stimulants in the moment supporting the theory that prescription stimulants are used instrumentally to help users alleviate stress and increase academic confidence. Further research should explore these and other psychological precipitants of nonmedical prescription use to provide targets for prevention and treatment especially among college students.

CHAPTER I

DEMOGRAPHICS, SELF-EFFICACY, STRESS, AND THE NONMEDICAL USE OF PRESCRIPTION STIMULANTS

Several sources report the growing issue of the nonmedical use of prescription stimulants (NUPS). One study found a lifetime prevalence of NUPS as high as 43% in a college sample (Advokat, Guidry, & Martino, 2008). This is problematic for many reasons. One is the legal repercussions for obtaining prescription stimulants illegally. In Texas, possession of prescription stimulants, a schedule II controlled substance, without a prescription is a misdemeanor or felony depending on the amount possessed and has varying consequences, including large fines and a jail sentence (Abbott, 2012). Additionally, using a prescription stimulant can result in serious health consequences; as the incidence of NUPS has increased, negative side effects have also intensified. For example, the number of emergency department visits resulting from the use of stimulant medications (due to nonmedical use, adverse reaction or other reasons including suicide attempts and accidental ingestion) increased from 13,379 in 2005 to 31,244 in 2010. Of particular interest is the increase in use for the age ranges of 18 to 25, in which the number of hospital room visits related to NUPS increased from 2,131 to 8,148 in this same five-year time span. This age group accounts for the largest proportion of the total hospitalizations related to prescription stimulant use (Substance Abuse and Mental Health Services Administration, 2013). The Monitoring the Future survey also found that college students are more likely than same-age, non-college peers to engage in NUPS (Johnston, O'Malley, & Bachman, 2002). As NUPS is problematic to people's health and wellbeing, it is important to understand why people intentionally misuse this class of prescription

drugs.

The majority of research examining NUPS focuses on the demographic traits of college students but, for some characteristics, results are mixed. For instance, several researchers have found that NUPS is more common in men (Advokat et al., 2008; Garnier-Dykstra, Caldiera, Vincent, O'Grady, & Arria, 2012; Hall, Irwin, Bowman, Frankenburg, & Jewett, 2005; Low & Gendaszek, 2002; McCabe, Knight, Teter, & Wechsler, 2005; Substance Abuse and Mental Health Services Administration, 2013; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005). Conversely, several other researchers have found that there is not a difference in rates of use between genders (Bavarian, Flay, Ketcham, & Smit, 2013; Pilkinton, & Cannatella, 2012; Weyandt et al., 2009; White, Becker-Blease, & Grace-Bishop, 2006). Studies have more consistently shown that NUPS is higher in members of Greek organizations (sororities and fraternities) than nonmembers (McCabe et al., 2005; Teter et al., 2006; Shillington, Reed, Lange, Clapp, & Henry, 2006; Weyandt et al., 2009), but other studies have failed to find such an association (Garnier-Dykstra et al., 2012). Additional research is needed in order to clarify the associations between college-aged NUPS and demographic characteristics.

Stress

Stress is hypothesized to be associated with NUPS. Stress is any disturbance in homeostasis involving activation of the sympathetic nervous system and is a reaction to a perceived threat (Watson & Breedlove, 2012). While it is meant to serve an adaptive and protective function, the stress response can be damaging when prolonged. Several substances, including stimulants, are used to cope with stress. Stimulants in particular may be perceived to be helpful in reducing stress by increasing a person's energy that

they may use to cope with a stressful task. In this way, a stimulant may be helpful for problem-focused coping as the person can complete tasks that may cause stress.

Previous research has shown increases in stress are associated with an increase in legal stimulant use such as coffee consumption (Ratliff-Crain & Kane, 1995) and energy drink consumption (Pettit & DeBarr, 2011). A study examining the use of substances for cognitive enhancement found that those who use legal substances like caffeine for cognitive enhancement are more likely to use a prescription stimulant nonmedically than those who do not use any substances to improve their cognitive capabilities (Wolff & Brand, 2013). Also, overwhelming demands in school significantly predicted the frequency of using legal substances like caffeine or sugar while also predicting the likelihood of using a prescription stimulant nonmedically (Wolff & Brand, 2013). Maier, Liechti, Herzig, & Schaub (2013) also found that higher stress and being a senior student was associated with a greater likelihood to use psychoactive substances for cognitive enhancement. This supports the findings of Moore, Burgard, Larson, and Ferm (2014) who found an increased amount of prescription stimulant metabolites in campus waste water which coincided with increased self-reported stress during midterms and finals compared to the first week of class. Betancourt and colleagues (2013) found that among college students who nonmedically used a variety of prescription medications including stimulants, users reported that the use of prescription medication is an effective strategy for coping with stress. Nonmedical users of prescription stimulants may use prescription stimulants in order to deal with stress supporting a drug instrumentalization theory of drug use. The drug instrumentalization theory proposed by Müller and Schumann (2011) suggests that people use drugs because a drug's effects may be beneficial in attaining a

goal. The self-medication theory of drug use is one type of instrumental use in which a person may take a substance in order to treat an unpleasant condition like negative affect or stress (Khantzian, 2003).

The self-medication hypothesis is also supported by studies that show a link between experiencing ADHD symptoms and the NUPS (Benson, Flory, Humphreys, & Lee, 2015). Some students have endorsed beliefs of having ADHD as their main motive for NUPS (Advokat et al., 2008). This suggests that the NUPS may be to self-medicate symptoms of ADHD. In support of this self-medication hypothesis, Peterkin and colleagues (2011) found participants who used prescription stimulants nonmedically were nearly seven times more likely to have ADHD symptoms than non-stimulant users. Previous research suggests that people may use prescription stimulants instrumentally in order to lessen stress or to treat ADHD symptoms. Thus, both theories of drug use suggest that prescription stimulants can be used as an instrument to improve a person's functioning.

Academic Achievement and Self-Efficacy

Low grade point average (GPA) has been associated with higher rates of prescription stimulant misuse, particularly those commonly prescribed for the treatment of attention-deficit/hyperactivity disorder (ADHD; Advokat et al., 2008; Arria, Wilcox, Caldeira, Vincent, Garnier-Dykstra, & O'Grady, 2013; Arria, O'Grady, Caldeira, Vincent, & Wish, 2008; Bavarian et al., 2013; McCabe et al., 2005; Shillington et al., 2006; Weyandt et al., 2009). This is one of few consistent findings in the literature on NUPS, but few have proposed theories or tested hypotheses on the potential mechanisms of this relationship. The association between low GPA and increased likelihood of NUPS may

be attributed to differences in beliefs and behaviors related to school and achievement between people with high and low GPA. For example, Komarraju and Nadler (2013) found that people with high GPA and high self-efficacy believe that intelligence is determined by effort, and these individuals are better able to control their impulses and persist through challenging or boring academic tasks than people with low GPA and low self-efficacy. The association between NUPS and low GPA may be explained by drug instrumentalization theory. This theory suggests people may use prescription stimulants in order to enhance focus or cognitive capacity to earn better grades or augment their abilities in academics. People with higher GPA may find this less necessary as they may be better at regulating their effort without the help of a prescription stimulant.

This theory is supported by research on motives for NUPS that have shown students who believe prescription stimulants have a positive effect on academic achievement or a positive cognitive enhancement effect like increasing alertness and productivity are more likely to engage in the NUPS (Advokat et al., 2008; Bavarian et al., 2013; DeSantis & Hane, 2010; Franke, Lieb, & Hildt, 2012; Novak, Kroutil, Williams, & Van Brunt, 2007; Peterkin, Crone, Sheridan, & Wise, 2011; Sattler, Sauer, Mehlkop, & Graeff, 2013). Students who misuse prescription stimulants report receiving the effect they desired for attention and cognitive enhancement (Bavarian et al., 2013). Additionally, students perceive the cognitive enhancement effects of prescription stimulants to be more pronounced than those of caffeine (Franke et al., 2012). It is likely that this belief comes from a placebo effect as evidence suggests that nonmedically using a prescription stimulant is not effective for cognitive enhancement (Benson et al., 2015). Looby and Earleywine (2011) found that participants who had never taken a prescription

stimulant before reported feeling increased mood and cognitive enhancement but did not have better performance on cognitive tests after receiving a placebo that participants believed to be a stimulant compared to those who had never received a stimulant and did not receive placebo. Thus, it makes sense that students with low GPA may use a prescription stimulant nonmedically in an instrumental way to increase attention and attempt to improve their grades.

The application of drug instrumentalization theory to nonmedical prescription stimulant use suggests that people may use prescription stimulants in order to enhance academic abilities that they perceive to be poor or inadequate. This relates to the concept of academic self-efficacy. According to Albert Bandura, self-efficacy is a person's "belief in their capabilities to exercise control over their level of functioning and environmental demands" (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996, p. 1206). Self-efficacy beliefs influence aspirations, motivation, perseverance after setbacks, resilience, analytical thinking, causal attributions of success and failure, and levels of stress and depression (Bandura et al., 1996). Self-efficacy was theorized to relate to academic achievement such that a positive perception of one's own abilities would be correlated with greater academic achievement. Bandura and colleagues (1996) found that for children between the ages of 11 and 14, their perceived self-efficacy both directly and indirectly influenced academic achievement; those who had higher perceived self-efficacy for learning and academics were more likely to be successful in school.

Support for Bandura's research on self-efficacy and academic performance is vast. Brady-Amoon and Fuertes (2010) found that self-efficacy and self-rated abilities were predictive of adjustment and academic performance in college students. These

findings are also supported by Galyon, Blondin, Yaw, Nalls, and Williams (2012) who found high levels of self-efficacy were associated with greater class participation and higher grades on an exam especially among those with a high GPA. Zajacova, Lynch, and Espenshade (2005) found that academic self-efficacy significantly predicted three separate measures of academic performance in non-traditional college students. Higher rates of academic self-efficacy were associated with higher first year GPA, earning a higher number of completed credits, and a higher rate of college retention. Additionally, self-efficacy predicted academic outcomes significantly better than stress which did not significantly predict academic success as measured by these three outcomes. As NUPS is associated with lower GPA and motives that include increasing cognitive capabilities, it is likely that academic self-efficacy may relate directly to the NUPS.

However, one study has evaluated perceived academic competence and willingness to use a prescription stimulant for cognitive enhancement but did not find a significant association between the two. Sattler, Mehlkop, Graeff, and Sauer (2014) found that a person's willingness to use a hypothetical cognitive enhancement drug was influenced by many factors but not a participant's perceived academic competence. This study used vignettes to propose scenarios in which benefits and costs were varied between subjects and subjects reported their likelihood based on the scenario explained to use the cognitive enhancement drug. Sattler and colleagues found that a higher likelihood of using a drug for cognitive enhancement was associated with a higher likelihood of experiencing cognitive enhancement, a greater effect of cognitive enhancement, having friends that engage in the NUPS, procrastination, being less intrinsically motivated, having greater test anxiety, and previous use of a prescription stimulant (Sattler et al.,

2014). A decreased likelihood of using the cognitive enhancement drug was associated with the drug having more severe side effects, a higher likelihood of experiencing side effects, and greater internalization of social norms that discourage the use of substances (Sattler et al., 2014; Sattler et al., 2013). The individuals' perceived competence did not influence their willingness to use prescription stimulants, though this could be due to the unrealistic manipulation of perceived benefits and costs associated with prescription stimulant use and low variability in the academic competence scores.

Low academic achievement has been reliably associated with the nonmedical use of prescription stimulants. This may be attributable to students using prescription stimulants in an instrumental way as they perceive these drugs to effectively enhance cognitive abilities. This theory would be further supported by the addition of academic self-efficacy into the study of NUPS as it seems likely that students may find cognitive enhancement especially necessary or useful when confidence in completing school tasks is low. Only one study has examined the role of academic self-efficacy in the NUPS and the study created scenarios that may not have represented students' actual perceptions of the use of prescription stimulants. Further research is warranted into the role of academic self-efficacy in NUPS.

Ecological Momentary Assessment

Studies examining the NUPS have relied mainly on the use of retrospective, self-report data which are subject to recall bias, a systematic error in which accuracy for past memories is affected. The use of repeated or daily surveys decreases the time between assessments, thereby reducing recall bias. This can be executed through Ecological Momentary Assessment (EMA). EMA is also known as experience sampling or

ambulatory assessment and consists of participants reporting activities, mood, and other factors in real time in their daily environments. There are two complementary data sets that can be obtained from EMA: one type is initiated by random prompts to the participant to complete the measure; the other type is initiated by the participant after each episode of the target behavior(s) (Epstein, Willner-Reid, & Vahabzadeh, 2009). These repeated, real-time assessments can track changes across time and context, and assess multimodal factors like physiological, psychological, social and/or behavioral correlates of the target behavior or construct the researcher wishes to examine (Ebner-Priemer & Trull, 2009; Epstein, Willner-Reid, & Vahabzadeh, 2009; Shiffman, Stone, & Hufford, 2008). This data collection technique has contributed to the areas of phenomenology, etiology, psychological models, biological mechanisms, treatment, and gene-environment interactions (Ebner-Priemer & Trull, 2009; Kuntsche & Labhart, 2013a).

EMA assessment has many benefits over traditional in-lab questionnaires. These include capturing acute precipitants of target behaviors, decreasing recall bias and cognitive restructuring of memories, and increasing ecological validity and generalizability. Some limitations unique to EMA are that it is labor intensive for the participant, requires complex data analysis, requires the experimenter to train the participant in the use of the data collection device, and issues with the EMA software may require participants to return to see the experimenter for troubleshooting (Kuntsche & Labhart, 2013b). Additionally, the use of EMA data collection via cell-phones may limit subjects to customers of a certain type of phone because of software or operating system compatibility, customers with higher media literacy, and customers with greater

financial means as data transfer relies on advanced cell-phone technology and an internet connection to a wireless network. This may target specific populations and limit generalizability (Kuntsche & Labhart, 2013b). Additionally, because EMA relies on self-report data from participants, it is only as accurate as the participants' responses.

Studies employing EMA are common in smoking research but rare in the study of illicit drug use. Research using EMA has furthered the understandings of the precipitants of drug use by shedding light on some discrepancies in previous literature. For example, while a plethora of studies using retrospective, self-report methods found a link between stress and cocaine use, Preston and Epstein (2011) found that stress in the moment predicted cravings but was weakly related to cocaine use. Additionally, another study using EMA found that stress alone did not predict relapse to smoking despite a great amount of retrospective, recall evidence supporting a link between increased stress and smoking relapse (Shiffman & Waters, 2004). Using EMA to target precipitants of NUPS could elucidate additional psychological and contextual factors related to this problematic activity.

CHAPTER II

PURPOSE AND HYPOTHESES OF THE CURRENT STUDY

While a growing number of articles have been published since the early 2000s addressing characteristics of stimulant misusers, few have addressed psychological factors associated with NUPS. Additionally, previous research has exclusively used retrospective, self-report methodology, which is highly prone to recall bias, to gather data about NUPS. Another issue with research in this area is that the literature on NUPS uses varying definitions for stimulant misuse. Some definitions include people prescribed a stimulant who misuse the substance and some only consider nonmedical use to include those who obtain and use prescription stimulants without a prescription. This study will address NUPS using the definition of Bavarian and colleagues (2013), who describe illicit use of prescription stimulants as the "use of any prescription stimulant without a prescription from a healthcare provider, use for nonmedical purposes, and/or use in excess of what is prescribed" (p. 665). This includes both misuse of another individual's prescription stimulant and medical misuse of one's own prescription.

By assessing the misuse of prescription stimulants with baseline measures and with an iPhone application for EMA, this study addresses three objectives. The first objective is to use baseline information to examine which demographic characteristics are associated with NUPS. The characteristics studied are gender, involvement in Greek organizations, and GPA. Based on previous research, it is expected that males will be more likely to nonmedically use prescription stimulants than females, participants in social, Greek organizations will be more likely to nonmedically use prescription stimulants than non-Greek participants, and those who nonmedically use prescription

stimulants will have a lower GPA than those who do not use prescription stimulants nonmedically. As an extension of these topics and a second objective, it is also expected that men, those affiliated with Greek organizations, and those with low GPA will misuse prescription stimulants more often than women, non-Greek students, and students with high GPA. This hypothesis about the frequency of use has not been examined in previous literature but is an exploratory extension of the characteristics associated with NUPS. The next objective is to identify if stress and academic self-efficacy affect a nonmedical prescription stimulant user's likelihood of engaging in NUPS in the moment. It is expected that high levels of stress and low academic self-efficacy in the moment will precipitate instances of use.

CHAPTER III

METHOD

Participants

In order to participate in the study, people had to meet several inclusion criteria. These inclusion criteria were that the person had an iPhone, was enrolled in classes at the time of the study, were between the ages of 18 and 25, did not work for Texas State University, had never been diagnosed with a mental health disorder excluding ADHD, and fit into one of the participant type groups. These groups were non-user, medical user, and nonmedical user. Non-users were people who self-reported that they had never used a prescription stimulant in their lifetime. Medical users were people who had a legitimate prescription for a stimulant medication from a medical professional to treat ADHD. Nonmedical users are people who either have a prescription for a stimulant but use it in excess of what was prescribed or people who do not have a prescription but have taken a prescription stimulant after obtaining it from another source. Additionally, those who were nonmedical users had to self-report using a prescription stimulant nonmedically five times or more within the last year.

The original sample was comprised of 39 individuals. However, six participants were excluded from analysis as they indicated that they had never used a prescription stimulant during the pre-study screening but revealed in the baseline self-report measures that they had used a prescription stimulant during their lifetime. When comparing those excluded in analysis to those included in analysis, there was no significant difference in age, race, or Greek organization affiliation ($p > .05$). However, the excluded participants were significantly more likely to be female than included participants, [X^2 (1) = 4.432, p

= .035].

The remaining sample was comprised of 18 non-users, 4 medical users, and 11 nonmedical prescription stimulant users. Sample characteristics are included in Table 1.

Variables and Research Instruments

At the initial meeting, several sociodemographic variables were assessed via self-report. These included gender and participation in Greek organizations. GPA was assessed on a scale of 0-4.0, which is the way in which GPA is measured by Texas State University.

NUPS was assessed during the phone screening by asking, "Have you ever used a prescription stimulant like Adderall, Vyvanse, or other prescription drugs for ADHD?" This question and follow-up questions determined if the individual was a non-user, medical user, nonmedical user, or does not fit criteria for the study. NUPS was measured as a categorical variable with three groups: those who use prescription stimulants nonmedically, those who use prescription stimulants as prescribed, and nonusers. Nonusers denied any prescription stimulant use with or without a prescription in their lifetime. Medical users were those prescribed a stimulant for the treatment of ADHD and who report using it only as instructed by medical professionals. Nonmedical users of stimulants reported having taken a prescription stimulant either without a prescription (i.e., attaining it from a friend) or among those who have a prescription for a stimulant, took their own prescription stimulant at a higher dose and/or more often than prescribed by a medical professional on five or more occasions within the last year.

NUPS was assessed again via self-report on the Stimulant Survey Questionnaire (SSQ; see Appendix A; Weyandt et al., 2009). The SSQ is a 40-item questionnaire with

four scales that measure prescription stimulant use, perceptions of prescription stimulant use prevalence, atypical use among peers, and perceptions of prescription stimulant safety. There are 20 items that are answered on a five-point, Likert scale from 1 (never) to 5 (always), 10 items that are measured on a five-point, Likert scale with values ranging from 1 (strongly disagree) to 5 (strongly agree), and 10 items measured on a yes/no, forced-choice response. Initial psychometric testing by the scale developers demonstrated that the questionnaire has adequate internal consistency with a Cronbach's alpha coefficient of .849 for all items (Weyandt et al., 2009). Participants' statuses as non-users, medical users, or nonmedical users were confirmed based on their responses to questions 1 through 16. If participants had reported being non-users during the phone interview but indicated using a prescription stimulant on the SSQ, they were excluded from analysis.

Frequency of NUPS was assessed in the moment through one question. This question is, "Since the last survey, have you misused a stimulant?" and was answered by selecting yes or no in the EMA application. Participants were informed what constituted stimulant misuse, also referred to as the nonmedical use of prescription stimulants, during the study. After completion of data collection, the total number of NUPS episodes throughout the duration of the participants' data collection period was recorded as the frequency variable.

Through the EMA application, academic self-efficacy was assessed using the Academic Behavioral Confidence Scale (ABCS; see Appendix B; Sander & Sanders, 2003). The ABCS is a 24-item questionnaire that measures academic self-efficacy on six factors: studying, understanding, verbalizing, clarifying, attendance, and grades.

Responses to the ABCS are on a five-point Likert scale from "not at all confident" to "very confident."

In the scale's original psychometric evaluation, the ABCS demonstrated high internal reliability with a Cronbach alpha score of 0.88 (Sander & Sanders, 2003). Within the current sample, the Cronbach's alpha was 0.892. The ABCS was also highly correlated with estimates of future grades ($p < .05$) which demonstrated concurrent validity (Sander & Sanders, 2009). Baseline academic self-efficacy was examined as the sum of all items values ranging from 24-120. Academic self-efficacy was also studied in the moment as a potential predictor of stimulant use through a shortened version of the ABCS. This shortened scale contains the two items from each category with the highest factor loadings based on the initial psychometric examination completed by Sander and Sanders (2009). The shortened scale has 12 questions and responses are measured on a five-point Likert scale ranging from 1, "not at all confident," to 5, "very confident." The reliability for the shortened ABCS in this sample was high, (Cronbach's alpha = .943). The composite score from all 12 questions (with values ranging from 12-60) was analyzed.

Stress was assessed using the Perceived Stress Scale-4, which is a four-question, scale which was administered twice daily through the EMA application (PSS-4; see Appendix C; Cohen & Williamson, 1988). The PSS-4 showed adequate reliability during initial psychometric analysis (Cronbach's alpha = 0.60) and was correlated with stress measures, self-reported health and health services measures, health behavioral measures, smoking status, and help seeking behavior (Cohen & Williamson, 1988). In this sample, the Cronbach alpha was slightly higher than that of Cohen and Williamson's initial

analysis, (Cronbach's alpha = .682).

Apparatus

The Participation in Everyday Life Survey Application was created for gathering data with an EMA or experience sampling design (P.I.E.L. App; Jessup, Bian, Chen, & Bundy, 2012). The P.I.E.L. App was available only on Apple mobile devices running the iOS operating software and administered the same questionnaire at times programmed by the researcher. Data is transferred from the application to the researcher through email at completion of a time period set by the researcher/programmer.

Procedure

This study was approved by the Texas State University Internal Review Board. Participants were recruited via flyers posted in public campus locations, announcements in psychology and history classes, and participants were encouraged to refer friends to participate in the study. Interested participants called or emailed the researcher in order to participate in a screening protocol over the phone. During the phone screening, participants were informed about the nature of the study including the procedure, variables measured, and duration of data collection. If the potential participants were still interested, they were asked their age, if they were currently enrolled in classes, if they owned an iPhone, if they were employed by Texas State University, if they had ever been diagnosed with a mental health disorder like anxiety or depression, and about their current or history of prescription stimulant use. Potential subjects were invited to participate if they were between the ages of 18 and 25, were enrolled in classes, owned an iPhone, did not work for the school, had never been diagnosed with a mental health disorder (excluding ADHD for medical users), and fit criteria to be in one of the

prescription stimulant use categories: non-users reported having never used a prescription stimulant in their lifetime, medical users were prescribed a stimulant for the treatment of ADHD by a physician and reported using it only as prescribed, and nonmedical users reported taking a prescription stimulant without a prescription (i.e., obtaining it from a friend or seller), or with a prescription but in excess of that prescribed by their physicians on five or more occasions in the last year.

Participants met the researcher for an initial session in which the participant gave informed consent, completed baseline measures, installed a researcher-assigned Gmail account, and installed the EMA P.I.E.L. application on their phones. The Gmail account was installed in order for the researcher to send data from the participants' phones confidentially. Thus, each participant was assigned a Gmail account without any identifying information so that their data could be retrieved by the researcher without risking a breach of confidentiality. The researcher programmed a survey file to be uploaded onto the P.I.E.L. app which was installed onto the participant's phone by sending a link within an email. Once the file was opened within the P.I.E.L. app, the participant began receiving a notification twice daily at semi-random times to complete a survey on prescription stimulant use, perceived academic self-efficacy, and stress. The application generated an alert at random times within the time frame created by the researcher; the first alert occurred between 9:00 AM and 3:00 PM and the second alert was between 4:00 PM and 10:00 PM. This allowed the researchers to track changes in these variables over time in order to describe predictors of prescription stimulant misuse. The participants typically completed the survey within two to four minutes. The participant could open the P.I.E.L. application from the alert screen or could disregard it

and begin the survey by opening the application within one hour. If the participant did not begin the survey within one hour, the survey expired and was no longer available to the participant. Participants responded to 72.72% of alerts to complete the survey. There was not a significant difference in response rate between nonmedical prescription stimulant users, medical users, and non-users, [F (3, 34) = .490, p = .692]. The completed participant's data was sent via email from the Gmail address assigned by the researcher to the researcher's school email address.

A mid-study payment session took place between 10 and 14 days after the initial session. The participants sent the researcher the data they had completed (from the Gmail account to the researcher's Texas State account) and were compensated for the surveys they had completed to that point.

The final session took place between 21 and 30 days after the initial session. The purpose of the final session was to receive data from the participant, uninstall the P.I.E.L. app and the Gmail account, provide final payment, and to thank the participant for completing the study.

Compensation

Participants were compensated $15.00 for the initial session, $0.75 for each EMA assessment completed on their phones, and $10.00 for completing the entire study.

Statistical Analyses

A chi-square test was used to analyze whether males or females are more likely to be nonmedical prescription stimulant users and an independent samples t-test was used to determine which sex uses more frequently. A chi-square test examined if involvement in Greek organizations was associated with NUPS and an independent samples t-test was

used to determine if there was a difference in the frequency of NUPS between Greek or non-Greek participants. An ANOVA tested if there was a relationship between NUPS and GPA. A correlation was used to determine if there was an association between GPA and frequency of use among all participants, and among nonmedical users only. In order to account for within-subject differences, multilevel modeling was used to analyze the relationships between stress and assessment type among nonmedical users in the moment. The assessment types were nonuse episode, pre-use episode, use episode, and post-use episode. Use episode assessments were those in which the participant indicated that he or she had 'misused' or nonmedically used a prescription stimulant since the last survey. Assessments were considered pre or post if they were the assessment directly before or after a use episode and occurred within 24 hours of the use episode. All analyses were executed in IBM SPSS Statistics 21.0 and used an alpha level of .05.

CHAPTER IV

RESULTS

Analysis of Baseline Data

There was no significant difference in gender between non-users, medical stimulant users, and nonmedical stimulant users, [X^2 (2) = 2.567, p = .277]. Additionally, there was not a significant difference in the frequency of nonmedical prescription stimulant use between genders, [t (31) = .515, p = .611].

There was no significant difference in the frequency of Greek membership between non-users, medical stimulant users, and nonmedical stimulant users, [X^2 (2) = 5.357, p = 0.069]. There was a trend for more non-users and medical users to not be affiliated with Greek organizations. Also, nonmedical users were more often in a Greek sorority or fraternity, but this difference was small. There was also not a significant difference in frequency of use by Greek affiliation, [t (31) = -1.051, p = .301].

In order to examine the relationship between GPA and participant type (non-user, medical user, and nonmedical user), medical users had to be excluded due to missing GPA data. When comparing non-users and nonmedical users, there was a significant difference in GPA such that non-users' GPA is higher than nonmedical users' GPA, [t (22) = 2.381, p = .026].

Among all included participants, GPA was not significantly correlated with the frequency of NUPS, [r (23) = -.319, p =.120]. Also, GPA was not significantly correlated with the frequency of NUPS when analyzing nonmedical users only, [r (7) = -.038, p =.923].

Analysis of Longitudinal, EMA Data

Analysis of EMA data was completed on only nonmedical stimulant users. There was a significant difference in perceived stress based on assessment type such that perceived stress was significantly higher in non-use episodes than in pre-use and use-episodes, [F (3, 268) = 4.400, p = .005]. There was not a significant difference between post-use and any other assessment type.

There was a significant difference in academic self-efficacy based on assessment type such that academic confidence was significantly higher in use episodes and non-use episodes than in post-use episodes, [F (3, 268) = 3.444, p = .017]. Pre-use academic self-efficacy was not significantly different than academic self-efficacy at pre-use, use, or non-use assessments.

CHAPTER V

DISCUSSION

The first objective of this study was to evaluate if certain demographic characteristics like gender, involvement in Greek organizations, and low GPA are associated with being a nonmedical user of prescription stimulants, Gender and being in a Greek sorority or fraternity were not associated with a higher likelihood of being a nonmedical prescription stimulant user. The lack of significance indicates that, among Texas State students, gender or involvement in a Greek organization does not increase the risk of NUPS. This could be because these groups have generally homogenous life and current experiences, which makes them equally likely to engage in NUPS. It was determined that low GPA was associated with NUPS, and this is in line with previous findings.

The second objective of the study was to determine if the same characteristics described in object one might predict the frequency of NUPS. Gender, Greek affiliation and GPA was not associated with frequency of nonmedical prescription stimulant use. Because gender and Greek affiliation are most often considered to be enduring traits, they may not affect the frequency of use within the 21-day, data collection period. Also, as GPA is stable it may have little impact on the frequency of use during a 21-day study. Furthermore, given the relatively low frequencies of NUPS, we may have been underpowered to analyze the influence of current GPA on frequency of NUPS; perhaps, in a longer study, a significant association would have been found. Together, the findings related to the first two objective of this study suggest that aside from GPA which is consistently associated with higher likelihood of engaging in NUPS, demographics and

baseline measures are poor predictors of whether someone will nonmedically use a prescription stimulant and of the frequency of use among nonmedical prescription stimulant users.

The third objective was to examine psychological precipitants of the NUPS. Among nonmedical users of prescription stimulants, stress was higher in non-use episodes than in the 24 hours leading up to a use episode and in the hours following a use episode. This supports the theory that prescription stimulants may be taken to decrease stress. The theory of instrumentalization supports this finding as it appears that participants experienced some relief from stress in the time leading up to using a stimulant in which they likely anticipated that the drug would effectively help them cope with stress. The participants also experienced less stress in the hours after use suggesting that they perceived their stress to be lower after use of a prescription stimulant and experienced relief. This relationship may help to perpetuate or increase the frequency of use if participants associate stress relief with the use of these drugs. This could help explain why those who have used legal substances like caffeine for cognitive enhancement are more likely to use a prescription stimulant nonmedically (Wolff & Brand, 2013) and why those who have used a prescription stimulant nonmedically in the past endorse a greater willingness to engage in NUPS (Sattler et al., 2014)

Also, academic confidence was higher in non-use episodes and in use episodes than in the 24 hours following NUPS. The application of drug instrumentalization theory to this finding would suggest that participants do not feel the need to enhance their academic abilities when their confidence is high as evidenced by higher confidence in non-use episodes and that the use of a prescription stimulant is associated with high

academic confidence in the hours immediately following use. Academic confidence was at its highest following a nonmedical use episode. Additionally, academic confidence was lowest in the 24 hours following a use episode which suggests that once the effects of the drug are gone, a person may experience exacerbated academic confidence issues. This may be attributable to a perception that they are incapable of performing tasks without the help of a cognitive enhancement supplement like a prescription stimulant or to a perception that the academic task for which they used the stimulant was not sucessful. For instance, a person may take a prescription stimulant before an exam in order to study and perform better on the exam. This person may perceive their academic abilities to be high after taking the drug and before the exam but may realize after the academic task is completed that he or she did not perform well. This is supported by the association between low GPA and the NUPS. This may explain the decreased academic self-efficacy in the post-use assessment. This should be further examined in a study with a larger, representative sample.

Limitations

There are limitations to this study that should be addressed in future research. The first limitation relates to the sample. The sample size was small, especially for medical prescription stimulant users and nonmedical prescription stimulant users. Also, of the participants who offered to help recruit other participants by telling their friends, most were nonmedical prescription stimulant users and often were in a fraternity or sorority. Thus, the sampling may have targeted Greek affiliated students who engaged in the NUPS. This may explain why there was a trend for students in sororities and fraternities to be nonmedical stimulant users. An additional concern about the sample is

that participants had to own an iPhone to participate, so this limited the number of potential participants; it also may have led to having a non-representative sample as participants were likely of higher socioeconomic status or had greater financial means than people who do not own an iPhone.

Another limitation is that the EMA application did not allow participants to initiate the survey. The participants answered the questionnaire when alerted and their answers were based on how they felt "since the last survey." Because responses were based upon the time since the previous survey, this time period may vary greatly between participants as participants often skipped several surveys, especially those that fell between Friday and Sunday. Thus, participants with a high rate of compliance to the protocol answered based on an approximately 4 to 24 hour time span while those who let many surveys lapse without responding, may base their responses on a 72-hour time period.

Clinical Implications

In order to address the high rates of NUPS in college students, professionals across disciplines must work together to target both the prevention and treatment of prescription stimulant abuse. Health professionals, especially those prescribing prescription stimulants, should share information about proper use, side effects, the consequences of giving their medication to others, and dispel ideas that the use of NUPS is beneficial for academic enhancement in people without ADHD. Additionally, physicians could consider using a non-stimulant medication for the treatment of ADHD like Strattera (atomoxetine) as it does not seem to be as prone to abuse and diversion (Eli Lilly and Company, 2015).

Health professionals, researchers, and college administrators should advocate for better monitoring of prescription use programs and for the development of medications that are less prone to abuse (Tapscott & Schepis, 2013). College administrators may also educate new students during orientation (Garnier-Dykstra et al., 2012). College programs should inform students about the risk factors associated with NUPS, legal and academic consequences of using these substances, and should stress proper techniques to relieve stress and bolster academic confidence. Collegiate staff could also explain the true effects of these drugs to expel some expectancy beliefs; Looby, De Young, & Earleywine (2013) found that an intervention focused on modifying beliefs about positive effects of NUPS was not effective but suggest that addressing negative consequences may benefit students because these negative expectancies were associated with a reduced likelihood of NUPS. Physicians, health professionals, researchers, and college staff should concomitantly address the use of prescription stimulants nonmedically in college students in an effort to reduce the prevalence and consequences of this rampant, maladaptive behavior.

Conclusion

This study failed to find an association of gender and involvement with a sorority or fraternity and both the likelihood of being a nonmedical prescription stimulant user and the frequency of nonmedical prescription stimulant use. Low GPA was associated with a higher likelihood of NUPS but was not associated with frequency of NUPS. This lack of significant findings for baseline data coupled with inconsistent findings in previous literature reinforce the need for additional research into other factors that can better predict likelihood and frequency of NUPS.

Drug instrumentalization theory can be applied to the use of prescription

stimulants in college students in order to explain use associated with high stress and low academic confidence. Additional research should attempt to replicate this finding and further explore the decrease in academic confidence following NUPS.

Further research should continue to analyze the potential relationship between stress, academic confidence, and the NUPS in order to better understand how these experiences affect one another. This could help guide the development of interventions geared toward the prevention of NUPS and the treatment of prescription stimulant misuse. The successful prevention and treatment of NUPS would lead to significant decreases in negative personal outcomes to users and a reduction in the cost to society that is attributed to the wide misuse of this drug especially among college students.

Table 1. Participant Demographic Information. This table shows the demographic information for included participants, which is also broken down by non-user, medical user, and nonmedical user, and for excluded participants.

	Age	Gender	Race	Greek
Included	M= 19.91 SD= 1.548 Range= 18-23	15 Male (45.5%), 18 Female (54.5%)	19 White (57.6), 8 Hispanic (24.2%), 4 African American (12.1%), 2 Bi-racial (6.1%	10 In sorority/fraternity (30.3%) 23 Not in sorority/fraternity (69.7%)
Non-user	M= 19.72 SD= 1.708 Range= 18-23	6 Male (33.3%), 12 Female (66.7%)	8 White (44.4%) 6 Hispanic (33.3%) 4 African American (22.2%)	4 In sorority/fraternity (22.2%) 14 Not in sorority/fraternity (77.8%)
Medical User	M= 19.75 SD=1.258 Range= 18-21	2 Male (50%) 2 Female (50%)	4 White (100%)	4 Not in sorority or fraternity (100%)
Nonmedical User	M= 20.27 SD= 1.421 Range= 18-22	7 Male (63.6%) 4 Female (36.4%)	7 White (63.6 %) 2 Hispanic (18.2%) 2 Bi-racial (18.2%)	6 In sorority/fraternity (54.5 %) 5 Not in sorority/ fraternity (45.5%)
Excluded	M= 21.17 SD=2.137 Range 19-25	6 Female (100%)	4 White (66.7%) 1 African American (16.7%) 1 Bi-racial (16.7%)	1 In sorority/fraternity (16.7%) 5 Not in sorority/fraternity (83.3%)

APPENDIX SECTION

APPENDIX A: STIMULANT SURVEY QUESTIONNAIRE

	Never				Always
1 I have used prescription stimulants for nonmedical purposes.	1	2	3	4	5
2 I have used prescription stimulants at parties.	1	2	3	4	5
3 I have used prescription stimulants with alcohol.	1	2	3	4	5
4 I have snorted prescription stimulants.	1	2	3	4	5
5 I have injected prescription stimulants.	1	2	3	4	5
6 I have smoked prescription stimulants.	1	2	3	4	5
7 I have taken prescription stimulants to focus better in class.	1	2	3	4	5
8 I have taken prescription stimulants to perform better on tests.	1	2	3	4	5
9 I have taken prescription stimulants to help me socialize better.	1	2	3	4	5
10 I have taken prescription stimulants to help me lose weight.	1	2	3	4	5
11 I have taken prescription stimulants to perform better in schoolwork.	1	2	3	4	5
12 I have taken prescription stimulants to feel energetic	1	2	3	4	5
13 I have taken prescription stimulants to feel better about myself.	1	2	3	4	5
14 I have taken prescription stimulants to "get high."	1	2	3	4	5
15 I have been offered prescription stimulants by other students.	1	2	3	4	5
16 I have tried someone else's prescription stimulants.	1	2	3	4	5
17 I have purchased prescription stimulants from other students.	1	2	3	4	5
18 I have sold prescription stimulants to other students.	1	2	3	4	5
19 I have given prescription stimulants to other students.	1	2	3	4	5
20 I have been pressured into letting someone else have my prescription stimulant medication.	1	2	3	4	5

	Strongly disagree				Strongly agree
21 Prescription stimulants are easy to get on this campus.	1	2	3	4	5
22 Prescription stimulants are as easy to get as alcohol.	1	2	3	4	5
23 Prescription stimulants are as easy to get as marijuana.	1	2	3	4	5
24 Using prescription stimulants occasionally is harmless.	1	2	3	4	5
25 Using prescription stimulants daily is harmless.	1	2	3	4	5
26 Prescription stimulant use on campus is a problem.	1	2	3	4	5
27 Prescription stimulants are safer than marijuana.	1	2	3	4	5

28 Prescription stimulants are safer than alcohol.	1	2	3	4	5
29 I feel I am knowledgeable about prescription stimulants.	1	2	3	4	5
30 I feel I am knowledgeable about the side effects of prescription stimulants.	1	2	3	4	5

	No	Yes
31 I know students who use prescription stimulants at parties.	1	2
32 I know students who use prescription stimulants with alcohol.	1	2
33 I know students who use prescription stimulants with other drugs.	1	2
34 I know students who use prescription stimulants while studying.	1	2
35 I know students who use prescription stimulants during finals week.	1	2
36 I know students who use prescription stimulants during tests.	1	2
37 I know students who snort prescription stimulants.	1	2
38 I know students who inject prescription stimulants.	1	2
39 I know students who smoke prescription stimulants.	1	2
40 I hide my prescription stimulant medication so that no one will take it.	1	2

APPENDIX B: ACADEMIC BEHAVIORAL CONFIDENCE SCALE

Answer questions 1-24 using the following scale:

Not at all confident				Very confident
1	2	3	4	5

How confident are you that you will be able to:

1. Study effectively on your own in independent / private study
2. Produce your best work under examination conditions
3. Respond to questions asked by a lecturer in front of a full lecture theatre
4. Manage your work load to meet coursework deadlines
5. Give a presentation to a small group of fellow students
6. Attend most taught sessions
7. Attain good grades in your work
8. Engage in profitable academic debate with your peers
9. Ask lecturers questions about the material they are teaching in a one-to-one setting
10. Ask lecturers questions about the material they are teaching during lecture
11. Understand the material outlines and discussed with you by lecturers
12. Follow the themes and debates in lectures
13. Prepare thoroughly for tutorials
14. Read the recommended background materials
15. Produce coursework at the required standard
16. Write in an appropriate academic style
17. Ask for help if you don't understand
18. Be on time for lectures

19. Make the most of the opportunity of studying for a degree at university

20. Pass assessments at the first attempt

21. Plan appropriate revision schedules

22. Remain adequately motivated throughout

23. Produce your best work in coursework assignments

24. Attend tutorials

APPENDIX C: SHORTENED ACADEMIC BEHAVIORAL CONFIDENCE SCALE

Answer questions 1-24 using the following scale:

Not at all confident				Very confident
1	2	3	4	5

How confident are you that you will be able to:

1. Produce your best work under examination conditions
2. Respond to questions asked by a lecturer in front of a full lecture theatre
3. Give a presentation to a small group of fellow students
4. Attend most taught sessions
5. Engage in profitable academic debate with your peers
6. Follow the themes and debates in lectures
7. Prepare thoroughly for tutorials
8. Write in an appropriate academic style
9. Pass assessments at the first attempt
10. Plan appropriate revision schedules
11. Remain adequately motivated throughout
12. Attend tutorials/discussions/labs

APPENDIX D: PERCEIVED STRESS SCALE 4

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate (by circling the number) how often you felt or thought a certain way.

1. In the last month, how often have you felt that you were unable to control the important things in your life?

Never	Almost never	Sometimes	Fairly often	Very often
0	1	2	3	4

2. In the last month, how often have you felt confident about your ability to handle your personal problems?

Never	Almost never	Sometimes	Fairly often	Very often
0	1	2	3	4

3. In the last month, how often have you felt that things were going your way?

Never	Almost never	Sometimes	Fairly often	Very often
0	1	2	3	4

4. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Never	Almost never	Sometimes	Fairly often	Very often
0	1	2	3	4

REFERENCES

Abbott, G. (2012) Penal code offenses by punishment range including updates from the 82nd legislative session. https://www.texasattorneygeneral.gov/criminal/publications_cj.shtml

Advokat, C. D., Guidry, D., & Martino, L. (2008). Licit and illicit use of medications for attention-deficit hyperactivity disorder in undergraduate college students. *Journal of American College Health*, *56*(6), 601-606.

Arria, A. M., O'Grady, K. E., Caldeira, K. M., Vincent, K. B., & Wish, E. D. (2008). Nonmedical use of prescription stimulants and analgesics: Associations with social and academic behaviors among college students. *Journal of Drug Issues*, *38*(4), 1045-1060.

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. doi:10.1016/j.addbeh.2012.10.002

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996) Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*, 1206-1222.

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

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*, doi:10.1007/s10567-014-0177-z

Betancourt, J., Rios, J. L., Pagan, I., Fabian, C., Gonzalez, S. Y., Cruz, M. J., … Rivera, C. P. (2013) Non-medical use of prescription drugs and its association with socio-demographic characteristics, dietary pattern, and perceived academic load and stress in college students in Puerto Rico. *Puerto Rico Health Sciences Journal, 32*(2), 89-94.

Brady-Amoon, P., & Fuertes, J. N. (2010) Self-efficacy, self-related abilities, adjustment, and academic performance. *Journal of Counseling & Development, 89*, 431-438.

Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapam & S. Oskamp (Eds.). *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology.* Newbury Park, CA: Sage.

DeSantis, A. D., & Hane, A. C. (2010). "Adderall is definitely not a drug": Justifications for the illegal use of ADHD stimulants. *Substance Use & Misuse, 45*, 31-46. doi: 10.3109/10826080902858334.

Ebner-Priemer, U. W., & Trull, T. J. (2009) Ambulatory assessment: An innovative and promising approach for clinical psychology. *European Psychologist, 14*(2), 109-119. doi: 10.1027/1016-9040.14.2.109

Eli Lilly and Company. (2015). Highlights of prescribing information. Retrieved from http://www.strattera.com/adult/why-strattera.html

Epstein, D. H., Willner-Reid, J., & Vahabzadeh, M. (2009). Real-time electronic diary reports of cue exposure and mood in the hours before cocaine and heroin craving and use. *Archives of General Psychiatry, 66*(1), 88-94.

Franke, A. G., Lieb, K., & Hildt, E. (2012). What users think about the differences between caffeine and illicit/prescription stimulants for cognitive enhancement. *Plos ONE*, *7*(6), doi:10.1371/journal.pone.0040047

Galyon, C. E., Blondin, C. A., Yaw, J. S., Nalls, M. L., & Williams, R. L. (2012). The relationship of academic self-efficacy to class participation and exam performance. *Social Psychology of Education*, *15*(2), 233-249. doi:10.1007/s11218-011-9175-x

Garnier-Dykstra, L. M., Caldeira, K. M., Vincent, K. B., O'Grady, K. E., & Arria, A. M. (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

Hall, K. M., Irwin, M. M., Bowman, K. A., Frankenberg, W., & Jewett, D. C. (2005). Illicit use of prescribed stimulant medication among college students. *Journal of American College Health*, *53*(4), 167-174.

Jessup, G., Bian, S., Chen, Y., & Bundy, A. (2012) P.I.E.L. Survey Application Manual [PDF Document]. Retrieved from http://libguides.library.usyd.edu.au/content.php?pid=27362&sid=3350309

Johnston, L.D., O'Malley, P.M., & Bachman, J.G. (2002). Monitoring the Future national survey results on drug abuse 1975-2001. Volume II: College students and adults ages 19-40 (NIH Publication No. 02-5107). Bethesda. MD: National Institute on Drug Abuse. Retrieved from http://monitoringthefuture.org/pubs.html

Khantzian, E. J. (2003) Understanding addictive vulnerability: An evolving psychodynamic perspective. *Neuro-Psychoanalysis, 5*(1), 5-21.

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.

Kuntsche, E., & Labhart, F. (2013a). ICAT: Development of an internet-based data collection methods for ecological momentary assessment using cell-phones. *European Journal of Psychological Assessment, 29*(2), 140-148. doi: 10.1027/1015-5759/a000137

Kuntsche, E., & Labhart, F. (2013b). Using personal cell phones for ecological momentary assessment. *European Psychologist, 18*(1), 3-11. doi: 10.1027/1016-9040/a000127

Looby, A., & Earleywine, M. (2011) Expectation to receive Methylphenidate enhances subjective arousal but not cognitive performance. *Experimental and Clinical Psychology, 19*(6), 433-444. doi: 10.1037/a0025252

Looby, A., De Young, K. P., & Earleywine, M. (2013). Challenging expectancies to prevent nonmedical presription stimulant use: A randomized controlled trial. *Drug and Alcohol Dependence, 132*, 362-368. doi: 10.1016/j.drugalcdep.2013.03.003

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

Maier, L. J., Liechti, M. E., Herzig, F., & Schaub, M. P. (2013). To dope or not to dope: Neuroenhancement with prescription drugs and drugs of abuse among Swiss university students. *Plos ONE*, *8*(11), 1-10. doi:10.1371/journal.pone.0077967

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, 99*, 96-106. doi: 10.1111.j.1360-0443.2004.00944.x

Moore, D. R., Burgard, D. A., Larson, R. G., & Ferm, M. (2014) Psychostimulant use among college students during periods of high and low stress: An interdisciplinary approach utilizing both self-report and unobtrusive chemical sample data. *Addictive Behaviors, 39*, 987-993. doi:10.1016/j.addbeh.2014.01.02

Müller, C. P., & Schumann, G. (2011). Drugs as instruments: A new framework for non-addictive psychoactive drug use. *Behavioral and Brain Sciences*, *34*(6), 293-347. doi:10.1017/S0140525X11000057

Novak, S. P., Kroutil, L. A., Williams, R. L., & Van Brunt, D. L. (2007). The nonmedical use of prescription ADHD medications: Results from a national internet panel. *Substance Abuse Treatment, Prevention, and Policy*, *2,* 1-17. doi:10.1186/1747-597X-2-32

Peterkin, A. L., Crone, C. C., Sheridan, M. J., & Wise, T. N. (2011). Cognitive performance enhancement: Misuse or self-treatment? *Journal of Attention Disorders*, *15*(4), 263-268. doi:10.1177/1087054710365980

Pettit, M. L., & DeBarr, K. A. (2011). Perceived stress, energy drink consumption, and academic performance among college students. *Journal of American College Health*, *59*(5), 335-341. doi:10.1080/07448481.2010.510163

Pilkinton, M., & Cannatella, A. (2012). Nonmedical use of prescription stimulants: Age, race, gender, and educational attainment patterns. *Journal of Human Behavior in the Social Environment*, *22*, 409-420. doi: 10.1080/10911359.02012.664968

Preston, K. L., & Epstein, D. H. (2011). Stress in the daily lives of cocaine and heroin users: Relationship to mood, craving, relapse triggers, and cocaine use. *Psychopharmacology*, *218*(1), 29-37. doi:10.1007/s00213-011-2183-x

Ratliff-Crain, J., & Kane, J. (1995). Predictors for altering caffeine consumption during stress. *Addictive Behaviors*, *20*(4), 509-516. doi:10.1016/0306-4603(95)00012-2

Sander, P. & Sanders, L. (2003) Measuring confidence in academic study: A summary report. *Electronic Journal of Research in Educational Psychology and Psychopedagogy, 1*(1), 1-17.

Sander, P. & Sanders, L. (2009) Measuring academic behavioural confidence: the ABC scale revisited. *Studies in Higher Education, 34*(1), 19-35. doi:10.1080/03075070802457058

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. *Substance Abuse Treatment, Prevention, and Policy*, *9*. doi:10.1186/1747-597X-9-8

Sattler, S., Sauer, C. Mehlkop, G., & Graeff, P. (2013). The rationale for consuming cognitive enhancement drugs in university students and teachers. *PLoS ONE, 8*(7), 1-10. doi: 10.1371/journal.pone.0068821

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *The Annual Review of Clinical Psychology, 4*, 1-32. doi: 10.1146/annurev.clinpsy.3.022806.091415

Shiffman, S., & Waters, A. J. (2004). Negative Affect and Smoking Lapses: A Prospective Analysis. *Journal of Consulting And Clinical Psychology*, *72*(2), 192-201. doi:10.1037/0022-006X.72.2.192

Shillington, A. M., Reed, M. B., Lange, J. E., Clapp, J. D., & Henry S. (2006). College undergraduate Ritalin abusers in southwestern California: Protective and risk factors. *Journal of Drug Issues, 36*, 999-1014.

Substance Abuse and Mental Health Service Administration (2013, Jan. 24) Emergency department visits involving attention deficit/hyperactivity disorder stimulant medications. *The Dawn Report*. Retrieved from: http://www.samhsa.gov/data/2k13/dawn073/sr073-add-adhd-medications.htm

Tapscott, B. E. & Schepis, T. S. (2013) Nonmedical use of prescription medication in young adults. *Adolescent Medicine, 024*, 597-610.

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*, 253-262.

Watson, N. V. & Breedlove, S. M. (2012) *The mind's machine: Foundations of brain and behavior*. Sunderland, MA: Sinauer Associates, Inc.

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 13*(3), 284-296. dio: 10.1177/1087054709342212

White, B. P., Becker-Blease, K. A., & Grace-Bishop, K. (2006). Stimulant medication use, misuse, and abuse in an undergraduate and graduate student sample. *Journal of American College Health, 54*(5), 261-268.

Wolff, W. & Brand, R. (2013). Subjective stress in school and their relation to neuroenhancement: A behavioral perspective on students' everyday life "doping." *Substance Abuse Treatment, Prevention, and Policy, 8*(23), 1-6.

Zajacova, A., Lynch, S. M., & Espenshade, T. J. (2005). Self-Efficacy, Stress, and Academic Success in College. *Research in Higher Education*, *46*(6), 677-706. doi:10.1007/s11162-004-4139-z