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Predictive Value of ADHD Symptomatology on Motives and Outcomes of Stimulant Misuse

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PREDICTIVE VALUE OF ADHD SYMPTOMATOLOGY ON MOTIVES AND OUTCOMES OF STIMULANT MISUSE

by

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ABSTRACT

PREDICTIVE VALUE OF ADHD SYMPTOMATOLOGY ON MOTIVES AND OUTCOMES OF STIMULANT MISUSE

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ADHD stimulant misuse is defined as taking a stimulant used to treat ADHD either without having a prescription for that stimulant or in a manner that deviates from the prescription's instructions. This has been a growing trend among undergraduate students over recent years. Prior research has found that misusers are likely to have severe symptoms of ADHD, misuse for primarily academic reasons, and display problems associated with substance abuse. The current study aimed to determine the predictive value of ADHD symptomatology on frequency of ADHD stimulant misuse, mediated by academic motives for misuse and substance abuse problems. The survey for this study was completed by 1,082 students at a state university in southeastern Virginia. Data from 184 misusers were analyzed using SEM path analysis. A significant direct effect was found with ADHD symptomatology on frequency of misuse, and this effect was mediated by academic motives for misuse, but not by substance abuse problems. The results suggest that undergraduate students with undiagnosed problems with attention and hyperactivity might have academic difficulties for which they would turn to ADHD stimulant misuse as a solution. While not analyzed in this study, such a student, who may already be using other substances for non-academic reasons, could later develop medical, social, and family problems associated with substance abuse.

This thesis is dedicated to my fiancée, Michelle Odette.

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CHAPTER I

INTRODUCTION

Prescription stimulant medications, such as Ritalin, Adderall, Focalin, Vyvanse, and Concerta, are typically used to treat attention-deficit/hyperactivity disorder (ADHD; Lakhan & Kirchgessner, 2012). Recently, however, studies report that undergraduate students nationwide have sometimes used these medications either without a physician prescription or in a manner that deviates from prescription instructions, constituting ADHD stimulant misuse (Teter, McCabe, Cranford, & Boyd, 2005).

Previous work has suggested that ADHD stimulant misuse may represent self-treatment for undiagnosed ADHD. Peterkin, Crone, Sheridan, and Wise (2011) surveyed 184 students at a large university in Northern Virginia. The students responded to questions regarding ADHD symptomatology as measured by the World Health Organization (WHO) Adult ADHD Self-Report Scale (ASRS), ADHD stimulant misuse, motives for misuse, and perceived impact on grades. Misusers were identified as students who reported taking ADHD medications that had not been prescribed to them. The researchers found that misusers were seven times more likely to report severe symptoms of ADHD compared to non-misusers. Additionally, they found that 87% of misusers cited academic reasons for misuse and 76% indicated that the misuse was improving their grades (Peterkin et al., 2011). The authors argued for the need to better understand the role ADHD symptomatology plays in characteristics and outcomes of ADHD stimulant misuse among undergraduates.

The current study further investigated the notion that ADHD stimulant misuse may be explained by self-treatment for undiagnosed ADHD using self-reported ADHD symptomatology to predict the frequency of ADHD stimulant misuse through the mediating mechanisms of

academic motives of misuse and substance abuse problems. The proposed model for this study can be seen in Figure 1.

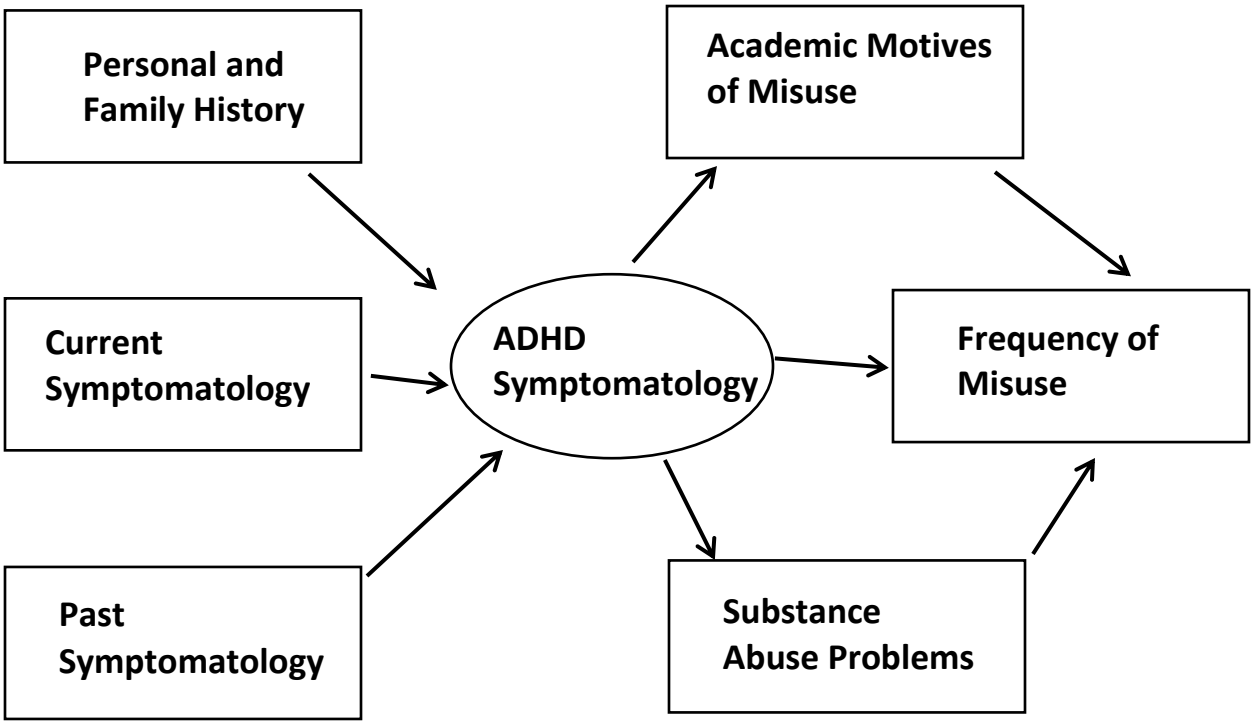

Figure 1. Predicted model for direct and indirect effects of ADHD symptom severity on frequency of ADHD stimulant misuse.

CHAPTER II

CHARACTERISTICS OF ADHD STIMULANT MISUSE

ADHD is a neurodevelopmental disorder characterized by problems with inattention, hyperactivity, distractibility, and impulsivity interfering with daily functioning (Matte et al., 2015). These problems are particularly detrimental in a workplace or school setting, especially among those who are untreated (Fried et al., 2012). While this disorder is typically perceived to be a childhood problem and its diagnosis requires childhood onset, approximately half of those diagnosed continue to display symptoms through adulthood (Lakhan & Kirchgessner, 2012). Though prevalence rates for ADHD are difficult to interpret due to the nature of sampling and variability in its diagnosis (Cuffe, Moore, & McKeown, 2005), current national estimates suggest an adult ADHD prevalence rate of 3-5% (Faraone & Bierderman, 2005; Matte et al., 2015).

Precise rates of undergraduate ADHD stimulant misuse are also hard to obtain. Reports have documented undergraduate misuse prevalence rates ranging from 8% (Teter et al., 2005) to 48% (Ilieva & Farah, 2015). There are no definitive explanations for these variations, but they are likely to be due to variability in sampling and how separate researchers identify misusers. Despite this, it is clear that ADHD stimulant misuse is a significant occurrence within the undergraduate population. Among undergraduate stimulant misusers, students have reported an average of 6-9 incidents of stimulant misuse during the span of their undergraduate studies (Ilieva & Farah, 2015).

A particular characteristic of interest for the current study is the role that ADHD symptoms play in motivating misuse. Because the stimulants taken by misusers are traditionally used to treat ADHD, it seems likely that some relationship exists between the decision to misuse and the experience of ADHD symptoms. In fact, several studies have documented that misusers

are more likely to report more severe ADHD symptoms than non-misusers (Hartung et al., 2013; Ilieva & Farah, 2015; Peterkin et al., 2011; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2010). Additionally, Rabiner and colleagues (2010) found that self-reported attention difficulties significantly predicted incidents of new onset misuse among college students over a five week period. However, the relationship between ADHD symptoms and medication misuse is made more difficult to investigate by problems associated with self-report data. For example, misusers may self-perceive ADHD symptoms when no attention problems are actually present. In a study conducted by Ilieva and Farah (2015), self-reported attention problems and objectively measured attention problems were compared between misusers and non-misusers. While misusers had significantly higher self-reported attention problems compared to non-misusers, misusers did not show significantly different problems with omission errors, reaction time, or commission errors on an objective attention and impulsivity test compared to non-misusers.

Collectively, prior research literature highlights a fundamental limitation in the accuracy of self-report determined ADHD diagnoses and symptomatology. A proper clinical diagnosis of ADHD requires a combination of self-reported symptoms, peer- or family-reported symptoms, family history, neurological testing, clinical assessment, and diagnostic judgment from a licensed health care provider with the skills to make this assessment (Barkley, 2014). So while previous research has found that self-reported attention problems may be related to ADHD stimulant misuse, self-report alone is insufficient to diagnose ADHD. This is, in fact, a limitation of the current study as well. However, the current study improves upon this self-report process by inquiring about a childhood and family history of these symptoms. This study acknowledges the diagnostic limitation and does not purport to show a causal mechanism between ADHD and

characteristics of misuse, but limits this investigation to a preliminary assessment of the predictive value of self-reported attention problems for the decision to misuse stimulant drugs. In this study, personal and family history, current ADHD symptomatology, and past ADHD symptomatology, which are all components of a clinical assessment of ADHD, will serve as formative indicators for the latent variable called "ADHD symptomatology" (Figure 1). This latent variable is meant to theoretically represent a preliminary assessment of ADHD symptoms whereby scores on the formative indicators (personal and family history, current ADHD symptomatology, past ADHD symptomatology) are the root cause for a participant's outcomes on the latent variables (ADHD symptomatology; Bollen & Diamantopoulos, 2015).

Another variable and uncertain characteristic of ADHD stimulant misuse is how it affects academic performance. Studies have shown that students who misuse ADHD stimulants tend to have lower GPA and poorer study habits compared to non-misusers (Ilieva & Farah, 2015; Rabiner et al., 2010). However, the majority of misusers report a belief that their misuse of ADHD stimulants improves their grades (Peterkin et al., 2011). While it is likely that these variables are measuring different constructs, the results of these studies bring into question the exact academic benefit of misuse. On the other hand, proper use of stimulants for persons with ADHD is very strongly associated with an improved prognosis, with as much as 80% treatment efficacy (Barkley, 2014). Additionally, there has been research suggesting some cognitive benefit to stimulant medications even when someone does not have a diagnosis of ADHD (Lakhan & Kirchgessner, 2012). If ADHD stimulant misuse represents self-treatment for undiagnosed ADHD, then misusers may actually be deriving a cognitive benefit from misuse that improves their academic performance.

Understanding the nature of any academic benefits of misuse is particularly important for research because perceived academic benefit may be the major reason for misuse in the first place. A large body of evidence shows that misusers report academic reasons as their primary basis for misuse (Hartung et al., 2013; Peterkin et al., 2011; Rabiner et al., 2009; Teter et al., 2005). Typically, these include "help concentrate," "study for an exam," or "improve grades." Other common motives for misuse include social reasons, such as "socialize better" and "get energized," and personal enhancement reasons, such as "get high" and "lose weight" (Hartung et al., 2013; Peterkin et al., 2011; Rabiner et al., 2009; Teter et al., 2005). However, these alternative motives have all been reported significantly less often than academic enhancement reasons. Thus, there is a clear need to better understand how students perceive these stimulant medications to be affecting them.

Substance abuse is also often assumed and studied in the context of ADHD stimulant misuse, since prescription stimulants are considered Schedule II regulated drugs under the Controlled Substances Act (CSA; Lakhan & Kirchgessner, 2012). Many studies have found that misusers are more likely than non-misusers to experience problems with general substance abuse (Hartung et al., 2013; Rabiner et al., 2010; Sepúlveda et al., 2011; Teter et al., 2005). Additionally, a study conducted on those who distribute ADHD medications to misusers found that distributors are also more likely to experience substance abuse problems compared to non-distributors (DeSantis, Anthony, & Cohen, 2013). Rabiner et al. (2010) also found that substance abuse was a significant predictor of new incidents of ADHD stimulant misuse. Thus, substance abuse, as well as problems typically associated with it, may mediate the predictive value of ADHD symptomatology on stimulant medication misuse.

CHAPTER III

THE CURRENT STUDY

While many studies have been conducted that describe the characteristics of misusers, few have attempted to predict the frequency of ADHD stimulant misuse using these characteristics. The purpose of the current study is to identify the predictive value ADHD symptomatology has on several characteristics of ADHD stimulant misuse. This will be assessed using an online survey incorporating several validated measures. We hypothesize that as ADHD symptomatology increases, the frequency of ADHD stimulant misuse will also increase. This relationship will occur both directly and indirectly through academic motives of misuse and substance abuse problems mediators (Figure 1).

We propose that an undergraduate student suffering from unexplained problems with inattention and impulsivity would desire to find an easy solution for overcoming these problems. ADHD stimulant misuse may be perceived as one such simple solution. Additionally, students experiencing these problems will likely encounter academic difficulties as well. This would likely motivate them to address these problems and find a solution to improve their academic performance. ADHD stimulant misuse could be viewed as a solution to these academic difficulties. Finally, a student with undiagnosed ADHD symptoms may already be impulsively turning to substance abuse and be experiencing consequences associated with substance abuse. This may explain why such a student would turn to an illegal behavior as a solution to their academic problems.

CHAPTER IV

METHOD

PARTICIPANTS

A total of 1,082 students from a large university in southeastern Virginia completed the survey. Among these participants, 206 (19.04%) indicated that they had misused ADHD stimulants over the past six months. Twenty-two misusers were removed from analysis because they either were not undergraduate students, did not complete the survey as instructed, or had outliers, leaving 184 misusers for the final analyses. The mean age of the misusers was 22.31 years (*SD* = 5.55). The majority of misusers was female (65.80%), Caucasian (62.50%), and in their senior year of undergraduate studies (31.00%).

MEASURES

ADHD stimulant misuse. One question separated participants into two groups. Answering "Yes" to the question "During the past 6 months, have you ever taken an ADHD stimulant medication (ex: Ritalin, Adderall, Concerta, Focalin, Vyvanse) without having a prescription for that medication or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested)?" placed participants into the "Misuser" group. Answering "No" to this question placed participants into the "Non-Misuser" group.

Participants in the misuser group were asked seven questions regarding characteristics of their misuse (Appendix A). These included the name and dosage of their most often used stimulant, whether or not they were currently prescribed the stimulant, the frequency of misuse over the past six months, how they perceived the misuse had affected their grades, and the time of the day and day of the week they most often misuse stimulants. The dosage question also

served as an attention check as participants must write "Don't know" if they did not know the dosage of their most often used stimulant.

Non-misuser participants were asked four questions regarding their knowledge of ADHD stimulant misuse (Appendix B). These included their awareness of misuse and whether they personally knew anyone who has misused or has distributed stimulant medications to other students. Additionally, non-misusers were asked to list any drug, medication, or substance they had used in the past six months for the purpose of academic improvement. This question was designed to catch any false negatives who may not have realized they were engaging in ADHD stimulant misuse. Additionally, this question served as an attention check as participants must write "N/A" if they have not used any substances for academic improvement in the past six months.

ADHD symptomatology. Three sets of questions were asked to determine the severity of ADHD symptomatology among participants.

Personal and family history. Four questions were asked regarding current and past diagnoses of ADHD, as well as a family history of ADHD. These included if the participant was ever diagnosed with ADHD by a healthcare professional, if the participant was currently diagnosed with ADHD, and whether their biological parents and siblings were ever diagnosed with ADHD. These were all yes or no questions.

Current symptomatology. The six screening questions from the WHO ASRS were used to assess current ADHD symptom severity (Appendix C). These six questions had the highest sensitivity (68.7%) and specificity (99.5%) of all the questions in the ASRS (Kessler et al., 2007). An example question from this scale was "How often do you have problems remembering appointments or obligations?" These questions were measured on a 5-point Likert scale ranging

from 1 (*Never*) to 5 (*Very Often*). The Cronbach's alpha for this scale was .63-.72. This was expected to be low because the methods used to develop the scale intentionally selected the least number of questions possible to capture the symptoms on two different dimensions: inattention and hyperactivity (Kessler et al., 2007). Test-retest reliability was found to be between .58-.77. Predictive validity, measured as the screener's ability to predict new cases of adult ADHD diagnosed by clinicians who did not use the scale, was .82 (Kessler et al., 2007).

Past symptomatology. Twenty-five questions from the Wender Utah Rating Scale (WURS) were used to measure past ADHD symptom severity (Appendix D). This was important to measure because proper clinical assessment of ADHD in adults is significantly improved by investigating symptoms retrospectively (Ward, Wender, & Reimherr, 1993). An example question from this scale was "As a child, I was (or had): concentration problems, easily distracted." These questions were measured on a 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*Very much*). Cronbach's alpha for this measure was .78-.91. Split-half reliability was found to be .9. Convergent validity, as measured by correlating the scores from the WURS to scores from the Conners Abbreviated Rating Scale, a short measure of childhood ADHD symptoms, was .41-.49 (Ward et al., 1993).

Academic motives of misuse. The six cognitive enhancement questions from the Caffeine Motives Questionnaire (CMQ-CE) were used to assess academic motives for ADHD stimulant misuse (Appendix E; Irons et al., 2014). This questionnaire was selected because the motives represented by these questions were analogous to the academic motives assessed in previous ADHD stimulant misuse research (Hartung et al., 2013; Peterkin et al., 2011; Rabiner et al., 2009; Teter et al., 2005). An example motive from the CMQ-CE was "to feel more alert." These questions were measured on a 5-point Likert scale ranging from 1 (*Never*) to 5 (*Almost*

always). Cronbach's alpha for the CMQ-CE was .92. Construct validity, measured as the correlation between CMQ-CE and frequency of caffeine consumption, was .2-.25. Discriminant validity, measured as the correlation between CMQ-CE and the three other motives used in the full CMQ (negative affect relief, reinforcing effects, and weight control), was .26-.58 (Irons et al., 2014).

Substance abuse problems. The Drug Abuse Screening Test, 10-item version (DAST-10) was used to assess problems with general substance abuse, excluding the use of ADHD stimulants (Appendix F). This was a short measure that has been shown to accurately capture substance abuse problems in diverse populations, including patients with ADHD (Yudko, Lozhkina, & Fouts, 2007). An example question from the DAST-10 was "Have you used drugs other than those required for medical reasons?" All of these were yes or no questions. The Cronbach's alpha for the DAST-10 was .86-.94. Concurrent validity, measured as the correlation between the DAST-10 and the longer DAST-20, was .97. Construct validity, measured as the correlation between the DAST-10 and the Addiction Severity Index, was .31-.4 (Yudko et al., 2007).

Demographics. Four demographic questions were included regarding the participants' age, gender, year in school, and race.

PROCEDURE

The online survey was developed using Qualtrics. After obtaining approval from the ODU IRB, an announcement webpage was created that included the link to the survey (Appendix G). This webpage was posted on the university's announcements website and a link to the webpage was incorporated into the university's student announcements email. This email was sent to all students every day around 12:20 am. A statement was included on the webpage

asking undergraduate students to participate in a study investigating college ADHD stimulant use. The webpage was posted for several weeks of the Fall 2016 semester. For the remaining few weeks of the Fall 2016 semester, participants were recruited through the university's psychology research participation system.

Before beginning the survey, participants read a consent form asking if they consented to participate in the study (Appendix H). To maintain anonymity, online signatures were not obtained. After consenting and completing the survey, participants were debriefed, provided with substance abuse and ADHD resources, and encouraged to leave any comments regarding the study (Appendix I). Upon completion of the survey, participants recruited through the announcements webpage were redirected to a separate survey where they could enter into a raffle to win a $50 Amazon gift card. This raffle was run by a third party unaffiliated with the current study. Information collected by this third party were never shared with the researcher. Participants recruited through the research participation system were granted 0.5 psychology research credits upon completion of the survey.

ANALYSIS

The strength of the predictions within the proposed model was assessed using structural equation modeling (SEM). For each scale, a total score was produced by adding the assigned point values for each of the selected responses together. Total score on the DAST-10 was the operationalization for substance abuse problems. The total score for the CMQ-CE was used to represent academic motives for misuse. For the ADHD symptomatology latent variable, the total scores on the WHO ASRS, WURS, and personal and family history questions were loaded as formative indicators. Models that either had perfect fit or a non-significant χ^2, root mean square error of approximation (RMSEA) of < .1, comparative fit index (CFI) > .90, and standardized

root mean square residual (SRMR) < .05 were considered to have adequate fit (Hooper, Coughlan, & Mullen, 2008).

Power analysis and sample size determination for SEM are difficult to apply. Currently, there are three generally accepted power analysis methods, and each one typically gives a different minimum sample size using similar variables as the others (MacCallum, Browne, & Sugawara, 1996; Muthén & Muthén, 2002; Satorra & Saris, 1985). Additionally, researchers using SEM have been known to cite general rules-of-thumb as their estimate of sample size (Wolf, Harrington, Clark, & Miller, 2013). A study by Wolf and colleagues (2013) assessed the utility of each of these approaches. They not only found that each method produced a different minimum sample size needed to meet desired power, but also that the results fluctuated with varying characteristics of the models, such as bias and missing data. As such, the authors concluded that power analysis or rules-of-thumb alone are not enough to determine desired sample size for a study using SEM. They instead suggested determining sample size by accounting for the unique characteristics of the model and the study's design in addition to a valid sample size estimation technique (Wolf et al., 2013).

Following these suggestions by Wolf et al. (2013), the current study sought a minimum misuser sample size with desired power at .8 and alpha at .05, and found the minimum sample size to be 90. This agrees with estimates for models using latent variables (Muthén & Muthén, 2002; Wolf et al., 2013), as well as an accepted SEM rule-of-thumb ratio of 20 participants per variable (Tanaka, 1987). Additionally, this is a close estimate to the percentage of misusers obtained in more recent surveys of undergraduate populations (Hartung et al., 2013; Ilieva & Farah, 2015).

CHAPTER V

RESULTS

INTERNAL CONSISTENCY

Cronbach's alpha was used to determine the internal consistency of the scales used. The WURS ($\alpha = .944$), CMQ-CE ($\alpha = .854$), and the personal and family history measure ($\alpha = .713$) all displayed good internal consistency. The ASRS ($\alpha = .603$) had relatively low internal consistency. However, this was not considered problematic as this level of Cronbach's alpha was expected to occur for this scale and is in agreement with results from its validation study (Kessler et al., 2007). The DAST-10 ($\alpha = .644$) was also found to have relatively low internal consistency. This was considered problematic, and the implications of this are described in the Discussion.

NON-MISUSER CHARACTERISTICS

The majority of non-misusers in this sample were aware that ADHD stimulant misuse was occurring (76.70%; Table 1). Most non-misusers also personally knew someone who had misused ADHD stimulants in the past (52.50%). Most non-misusers did not personally know someone who had distributed ADHD stimulants though (59.60%). Finally, six students (0.74%) indicated they were using ADHD stimulants for the purposes of academic improvement despite indicating that they were not a misuser and did not currently have a prescription for stimulant medication. It is possible that these false negatives did not consider what they were doing as ADHD stimulant misuse.

Table 1
Non-Misuser Characteristics

Characteristic	Frequency (%)
Know ADHD Stimulant Misuse	
Yes	621 (76.70)
No	186 (23.00)
Missing	3 (0.40)
Know Misuser	
Yes	425 (52.50)
No	331 (40.90)
Missing	54 (6.70)
Know Distributor	
Yes	280 (34.60)
No	483 (59.60)
Missing	47 (5.80)

Note. $N = 810$

MISUSER CHARACTERISTICS

Misusers were described in this study as someone who either obtained and used a stimulant without having a prescription for it or someone who used their currently prescribed stimulant in a manner that deviates from the prescription's instructions (e.g. taking more pills than suggested, taking pills at times not suggested). The majority of misusers in this sample belonged to the former category (72.30%; Table 2). The most commonly misused stimulant was Adderall (68.50%). The mean number of incidents of misuse over the past six months was 3.56 ($SD = 2.55$). On average, misusers indicated that their misuse was only slightly improving their grades ($M = 3.55$, $SD = 0.78$). Most misusers were taking the stimulants on Mondays (25.00%) and in the morning (41.30%). According to the Physicians' Desk Reference (PDR, 2017), most misusers seemed to take an appropriate dosage of their indicated medication (85.05%). It should be noted, however, that decisions regarding appropriate dosage relate to symptom intensity, body weight, side effect tolerance, and actual effects of the medication and can only be made by a

licensed health care professional (PDR, 2017). Thus, we cannot be certain whether or not an appropriate dosage was taken by misusers in this study.

Table 2
Misuser Characteristics

Characteristic	Frequency (%)
Type of Misuse	
Prescribed	51 (27.70)
Non-Prescribed	133 (72.30)
Stimulant Misused	
Ritalin	9 (5.30)
Adderall	126 (68.50)
Concerta	6 (3.30)
Focalin	1 (0.50)
Vyvanse	27 (14.70)
Intuniv*	1 (0.55)
Methylphenidate*	1 (0.55)
Missing	13 (7.10)
Effect on Grades	
Significantly decreased	3 (1.60)
Decreased	5 (2.70)
Neither decreased nor increased	74 (40.20)
Increased	73 (39.70)
Significantly increased	16 (8.70)
Missing	13 (7.10)
Time of Day for Misuse	
Morning	76 (41.30)
Afternoon	43 (23.40)
Evening	53 (28.80)
Missing	12 (6.50)
Day of Week for Misuse	
Monday	46 (25.00)
Tuesday	23 (12.50)
Wednesday	27 (14.70)
Thursday	18 (9.80)
Friday	24 (13.00)
Saturday	13 (7.10)
Sunday	13 (7.10)
Missing	20 (10.90)

Note. $N = 184$; *Write-in answers for "Other" option.

SEM ANALYSIS

For all SEM analysis, missing data was handled using maximum likelihood (ML) estimation (Messer & Natarajan, 2008). Bootstrapping was used to reduce the impact of non-normality (Preacher & Hayes, 2004). All results were estimated using STDYX estimation. Means, standard deviations (SDs), and bivariate correlations for all predictor, outcome, and demographic variables can be found in Table 3. Because age was found to significantly correlate with frequency of misuse, age was added as a covariate to all models that predicted frequency of misuse.

Table 3
Mean, SDs, and Correlations between Predictor, Outcome, and Demographic Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. ADHD symptomatology[1]	-	.19*	.19*	.21*	.45**	.62**	.99**	.15	-.01	-.01	.03
2. Academic motives of misuse		-	.18*	.19*	-.02	.11	.12*	-.10	.12	-.01	.04
3. Substance abuse problems			-	.16	-.04	.11	.21**	.15	-.07	.02	.02
4. Frequency of misuse				-	.25**	.25**	.20*	.21*	-.07	.08	.10
5. Personal and family history					-	.25**	.40**	.22**	-.13	-.09	.10
6. Current symptomatology						-	.58**	.14	-.04	.02	.04
7. Past symptomatology							-	.13	.01	.01	.03
8. Age								-	-.03	.41**	.10
9. Gender									-	.17*	-.02
10. Year in school										-	-.01
11. Race											-
Mean	57.70	18.51	2.95	3.56	1.20	14.05	42.41	22.31	-	-	-
SD	22.49	5.46	1.86	2.55	1.34	3.53	21.00	5.55	-	-	-
Min	0	6	0	1	0	0	0	18	-	-	-
Max	109	30	9	12	4	30	100	50	-	-	-

Note. 1- Measured as a composite variable. * $p < .05$ ** $p < .001$

A confirmatory factor analysis (CFA) was first run to determine the factor loadings (*b**) of personal and family history, current symptomatology, and past symptomatology on the ADHD symptomatology latent variable. This model was found to have perfect fit. However, while past symptomatology was found to strongly load onto the latent variable, personal and family history

as well as current symptomatology did not strongly load onto the latent variable (Table 4). Therefore, ADHD symptomatology was not considered a latent variable for the remainder of the analysis. Instead, the total scores of the personal and family history questions, ASRS, and WURS were added together to form an aggregate construct, whereby a composite variable is created to represent the cumulative effects of each variable contributing to the construct (Edwards, 2001).

Table 4
Factor Loadings onto ADHD Symptomatology Latent Variable

Index	*b**	*SE*	*p*	*95% CI*
Personal and family history	.42	.08	.001	[0.27, 0.57]
Current symptomatology	.60	.08	.001	[0.44, 0.76]
Past symptomatology	.97	.11	.001	[0.76, 1.19]

To determine the strength of the proposed model when treating all variables as composite scores, a path analysis, bootstrapping with 10,000 replications, was run on the full model (Figure 2). The full model was found to have perfect fit. All path coefficients (*b**) can be seen in Table 5. There were significant direct effects between ADHD symptomatology and frequency of misuse ($b^* = .18$, $p = .050$, $R^2 = .14$), academic motives of misuse ($b^* = .19$, $p = .009$, $R^2 = .05$), and substance abuse problems ($b^* = .19$, $p = .015$, $R^2 = .06$). There was also a significant direct effect between academic motives of misuse and frequency of misuse ($b^* = .17$, $p = .032$). However, there was not a significant direct effect between substance abuse problems and frequency of misuse ($b^* = .06$, $p = .623$). Additionally, there was a marginally significant indirect effect between ADHD symptomatology and frequency of misuse via academic motives of misuse ($b^* = .04$, $p = .054$) and no significant indirect effect via substance abuse problems ($b^* = .01$, $p = .817$).

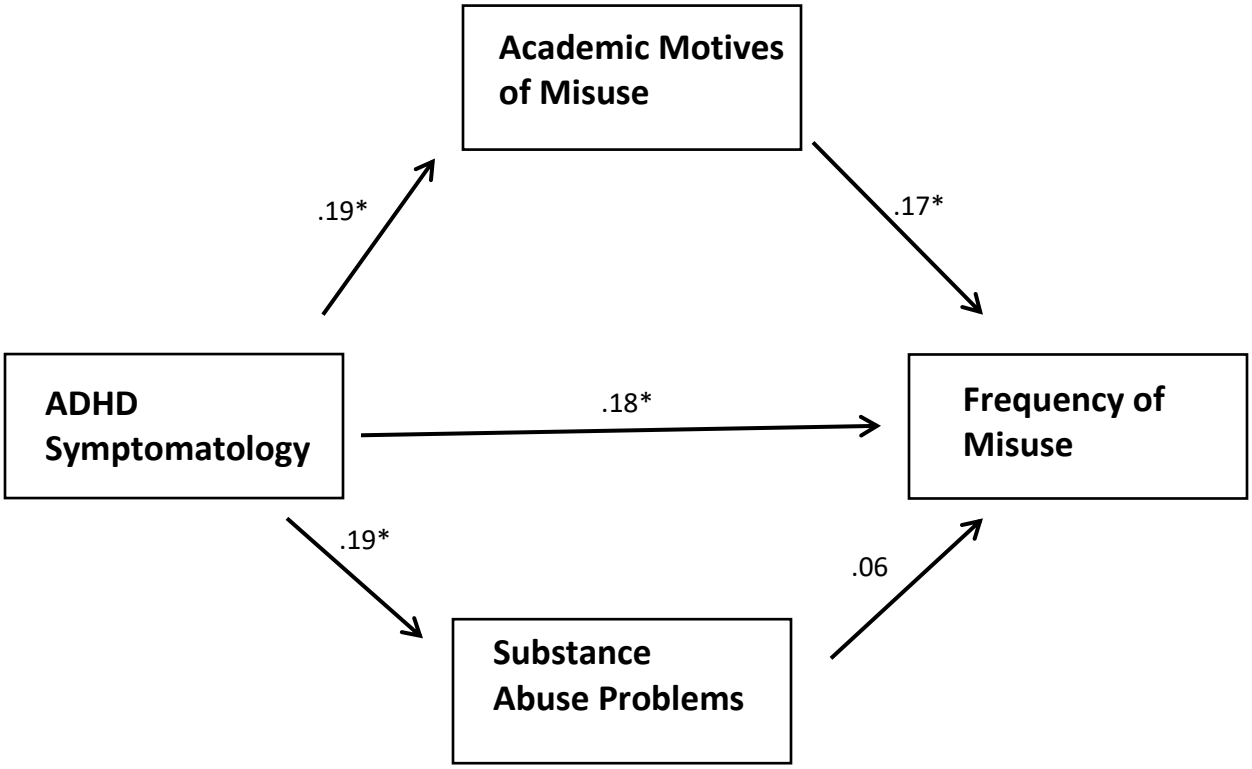

Figure 2. Standardized path coefficients for full model. Significance is based off bootstrapped CI. * indicates that 95% CI does not include 0. Although not graphically represented, age was included as a significant covariate.

Table 5
Direct and Indirect Effects for the Full Model

Pathway	*b**	*SE*	*p*	*95% CI*
Direct effect between frequency of misuse and				
ADHD symptomatology	.18	.01	.050	[0.01, 0.04]
Academic motives of misuse	.17	.03	.032	[0.01, 0.14]
Substance abuse problems	.06	.15	.623	[-0.22, 0.38]
Direct effect between ADHD symptomatology and				
Academic motives of misuse	.19	.02	.009	[0.01, 0.09]
Substance abuse problems	.19	.01	.015	[0.01, 0.03]
Indirect effect via				
Academic motives of misuse	.04	.02	.054	[-0.01, 0.09]
Substance abuse problems	.01	.02	.817	[-0.04, 0.05]

Note. Age was included as a significant covariate in this model.

Because the DAST-10 displayed low internal consistency within this sample, the substance abuse problems variable was removed from the model and the path analysis, bootstrapping with 10,000 replications, was re-run (Figure 3). This model was also found to have perfect fit. Significant direct effects were again found between ADHD symptomatology and frequency of misuse (b^* = .19, p = .037, R^2 = .14) as well as between ADHD symptomatology and academic motives of misuse (b^* = .19, p = .009, R^2 = .06). There was also a significant direct effect between academic motives of misuse and frequency of misuse (b^* = .18, p = .026). Finally, the indirect effect between ADHD symptomatology and frequency of misuse via academic motives of misuse was significant (b^* = .05, p = .048; see Table 6).

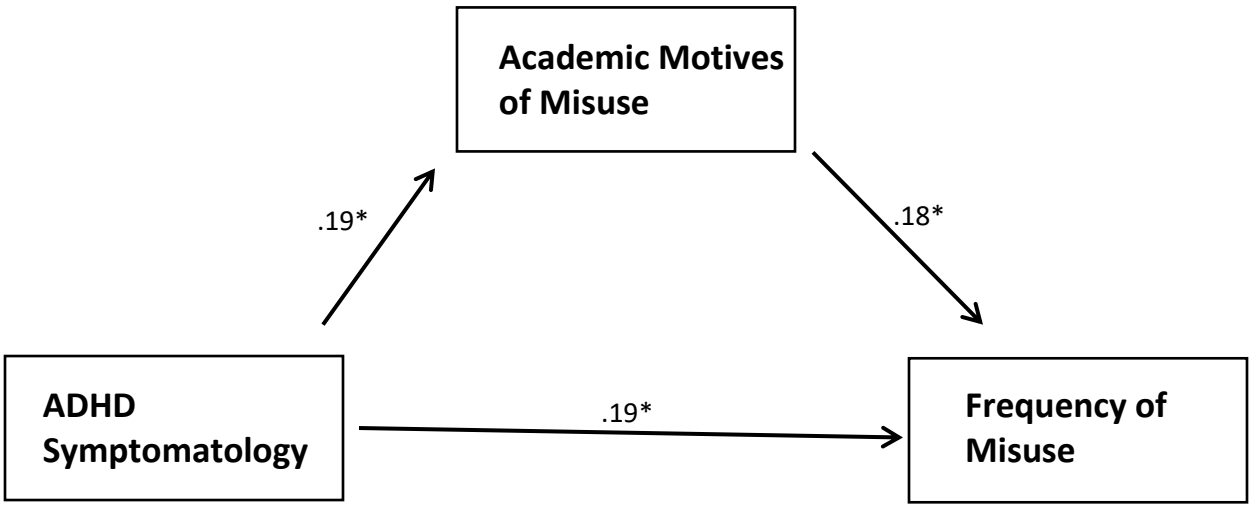

Figure 3. Standardized path coefficients for model without substance abuse problems. Significance is based off bootstrapped CI. * indicates that 95% CI does not include 0. Although not graphically represented, age was included in the model as a significant covariate.

Table 6

Direct and Indirect Effects for the Model Without Substance Abuse Problems

Pathway	*b**	*SE*	*p*	*95% CI*
Direct effect between frequency of misuse and				
ADHD symptomatology	.19	.01	.037	[0.01, 0.04]
Academic motives of misuse	.18	.03	.026	[0.01, 0.14]
Direct effect between ADHD symptomatology and				
Academic motives of misuse	.19	.02	.009	[0.01, 0.09]
Indirect effect via				
Academic motives of misuse	.05	.02	.048	[0.01, 0.09]

Note. Age was included as a significant covariate in this model.

As an exploratory analysis, the model in Figure 2 was re-tested using only misusers who were not prescribed their most often misused stimulant (N = 133). This was run because it is theoretically possible that problems related to substance abuse are more likely to arise in non-prescribed misusers, as their act of misuse more similar to constructs of substance abuse problems compared to prescribed misusers (Yudko et al., 2007). The path analysis was re-run, bootstrapping with 10,000 replications. This model was found to have perfect fit. However, the direct effect between substance abuse problems and frequency of misuse remained non-significant (b^* = .18, p = .16, R^2 = .05). Additionally, the indirect effect of ADHD symptomatology and frequency of misuse via substance abuse problems also remained non-significant (b^* = .03, p = .24).

CHAPTER VI

DISCUSSION

The purpose of this study was to determine the predictive value of ADHD symptomatology on the frequency and characteristics of ADHD stimulant misuse. Results from the path analyses revealed that ADHD symptomatology significantly predicted frequency of ADHD stimulant misuse. Based on these findings, an undergraduate student with higher ADHD symptom severity is at particular risk for misusing ADHD stimulants more often. This provides support to the notion that ADHD stimulant misuse may represent a form of self-treatment for undiagnosed or under-treated ADHD (Hartung et al., 2013; Peterkin et al., 2011; Rabiner et al., 2009). Additionally, academic motives for misuse were also found to significantly predict frequency of ADHD stimulant misuse. Finally, a significant mediation effect of ADHD symptomatology on frequency of ADHD stimulant misuse via academic motives for misuse was found. Taking the whole model into account, the results seem to support the notion that a student experiencing unexplained problems such as difficulty concentrating on finishing assignments or staying awake or alert to study for a test would turn to stimulant misuse as a potential solution. To help determine whether this behavior might be seen by treatment providers as an adaptive or maladaptive self-assessment and self-treatment strategy, a follow-up to this study might identify to what degree misusers actually have untreated ADHD by having misusers undergo a formal clinical assessment for ADHD. It is especially important to use a formal clinical assessment for ADHD because this is what the ADHD symptomatology latent variable was meant to represent in the current study. As the CFA showed poor factor loadings on this latent variable, it may be best if future studies use a formal clinical assessment rather than latent variable analysis to study the effects of ADHD on stimulant misuse.

It was also hypothesized that a misuser might already be impulsively turning to substance abuse and experiencing associated problems from it, perhaps revealing the misuser's attempt to justify another form of substance abuse to help solve academic difficulties. However, this hypothesis was not supported by this study's data. Possible explanations for the failure of this hypothesis to be borne out by the data include, first, that there were problems discovered with the reliability of the substance abuse measure. However, this does not likely represent a problem with the DAST-10, which has been found to be a highly valid and reliable measure in past research (Yudko et al., 2007). Second, this study may have been underpowered for detecting the hypothesis, a notion discussed below in greater detail. Third, independent substance abuse problems may simply have little predictive value on frequency of misuse. While prior studies using the DAST-10 found that the majority of ADHD stimulant misusers reported significant substance abuse associated problems (McCabe & Teter, 2007; Sepúlveda et al., 2011), these studies did not use predictive models in their research design. Thus, a question has been raised regarding which behavior, stimulant misuse or substance abuse problems, preceded the other (Sepúlveda et al., 2011). A study conducted by Arria et al. (2012) found that a positive assessment of either cannabis use disorder or alcohol use disorder did significantly predict ADHD stimulant misuse. Since problems associated with substance abuse are likely to occur after the development of a substance use disorder, ADHD stimulant misuse may precede substance abuse problems. Thus, in theory, a student who is using other mind altering substances such as alcohol or cannabis and is experiencing academic difficulties due to unexplained problems with attention and impulsivity may turn to another substance, an ADHD stimulant, for solutions. In the long term, this form of polysubstance use may lead to medical, social, and family problems. Future studies could develop a predictive model that tests this hypothesis.

Future studies could also examine other factors that may predict frequency of misuse. Since the effect sizes found in this current study were relatively small, there are several apt to be other variables not examined here that could also contribute to a student's desire to misuse ADHD stimulants. For example, this study identified age as a variable that showed a trend in this regard, such that older students tended to misuse ADHD stimulants more often. Other factors that are known correlates with both ADHD and substance abuse, such as antisocial behavior (Mannuzza, Klein, & Moulton, 2008; Van Eck, Markle, & Flory, 2012) and low conscientiousness (Lackner, Unterrainer, & Neubauer, 2013; Nigg et al., 2002), may also play mediating roles in the relationship between ADHD symptomatology and frequency of misuse. Future studies might investigate such potential intervening motives as misusers' disinclination to seek medical treatment for possible ADHD symptoms as predictors of misuse among students with both attention and academic difficulties.

Several other inferences and future research ideas can be drawn from the misuser and non-misuser characteristics. Data from the non-misusers show that ADHD stimulant misuse is well-known to many students and relatively common on undergraduate campuses. Thus, there is a need to develop targeted interventions that address reasons and preventative strategies for stimulant misuse, particularly for the misusers who are using stimulants without a prescription. Under the CSA, this is considered an illicit act (Lakhan & Kirchgessner, 2012). Additionally, ADHD stimulants may cause detrimental cardiovascular side-effects and at particularly high dose levels have addictive potential (PDR, 2017). Therefore, finding alternative methods for addressing academic difficulties in these students, perhaps with new study techniques or assessments by medical professionals to obtain stimulants in a controlled manner, is crucial. Another finding of interest from this study was that misusers most often took the stimulants on

Monday mornings. Given findings here and previously that academic reasons motivates ADHD stimulant misuse (Hartung et al., 2013; Peterkin et al., 2011; Rabiner et al., 2009; Teter et al., 2005), Monday mornings may represent important or key times for optimal academic performance. Future studies could further investigate when and why ADHD stimulants are misused in order to reach these students with alternatives to misuse. Finally, misusers reported slight grade improvement from misuse, in agreement with previous work (Peterkin et al., 2011). However, there has still been no study of the precise effects ADHD stimulant misuse has on grades. Research models tested by Arria and colleagues (2012) did include GPA changes in data gathered, but these data were used to predict incidents of ADHD stimulant misuse. Studying objective (rather than self-report) effects of ADHD stimulant misuse on grades is an important area of inquiry because ADHD stimulants seem to produce cognitive benefits for those with and without an ADHD diagnosis (Barkley, 2014; Lakhan & Kirchgessner, 2012).

LIMITATIONS

One of the more pressing limitations of this study is that it might be underpowered for detecting some hypotheses. As previously discussed, power analysis and sample size determination for SEM studies can use a variety of methods that generate different results under similar parameters (MacCallum et al., 1996; Muthén & Muthén, 2002; Satorra & Saris, 1985). This study adapted guidelines described by Wolf et al. (2013) to determine a needed sample size of 90 misusers. However, Fritz and MacKinnon (2007) described a post-hoc power analysis technique to assess if adequate power was achieved in mediation models. Using their approach, this study required a very broad range of 78 to 558 misusers to achieve adequate power. While the current study's sample size fits within the lower end of that range, the extent of the range suggests that the sample size may have been problematic. To make this analysis still more

uncertain, Loeys, Moerkerke, and Vansteelandt (2014) argue that in studies that test for indirect effects, such as the current study, the Fritz and MacKinnon (2007) method may not always be reliable. Nevertheless, power may have been a concern that should be addressed by future research with larger samples of misusers to avoid weak statistical power and both falsely significant and falsely non-significant results (Maxwell, 2004).

A second limitation of the current study is the low internal consistency found for the DAST-10. While the notion that Cronbach's alpha must be greater than .7 to be considered reliable has been refuted (Lance, Butts, & Michels, 2006), the internal consistency found in this study was noticeably lower than those in previous studies that utilized the DAST-10 (McCabe & Teter, 2007; Yudko et al., 2007). Again, the most likely explanation is that the current study was underpowered. However, it should also be noted that the DAST-10 has never been validated within a population of ADHD stimulant misusers. Should adequately-powered follow-up studies also experience internal consistency problems with the DAST-10, it may mean that the constructs represented by this measure are not prevalent among ADHD stimulant misusers. This would mean that studies would be needed to verify that substance abuse problems as measured by the DAST-10 are experienced by ADHD stimulant misusers similarly to other forms of substance abuse.

A final noteworthy limitation of this study was the method for determining frequency of misuse. In the survey, participants were given a blank space to freely input how often they misused ADHD stimulants over the past six months. Unfortunately, many participants gave uninterpretable answers, such that data for this variable was considered "missing" for many participants. While this problem was corrected for by ML estimation, the study's findings would

be significantly more accurate if participants had been prompted to enter a single number to describe their frequency of misuse.

CONCLUSIONS

In this study, ADHD symptomatology did seem to predict frequency of ADHD stimulant misuse and, as predicted, this effect was mediated by academic motives for misuse. Thus, undergraduate students experiencing dual problems with inattention/hyperactivity and academic difficulties might turn to ADHD stimulant misuse as a solution. As ADHD stimulant misuse is considered an illicit behavior, has associated health problems, and its effects on academic performance are not currently well understood, this may be a poor solution. Though previous research clearly shows that substance abuse plays a role in ADHD stimulant misuse, problems associated with substance abuse may occur in response to stimulant misuse alongside other forms of substance abuse. Age and other variables not analyzed in this study may also play mediating roles in ADHD stimulant misuse. Follow-up studies are crucial to continued efforts to delineate the motives and outcomes of what appears to be common and well-known ADHD stimulant misuse among college students seeking help for attention-related academic problems.

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APPENDIX A

MISUSER QUESTIONS

During the past 6 months, which one of the following ADHD stimulant medications have you used the most frequently without having a prescription for it or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested)?

- ❍ Ritalin
- ❍ Adderall
- ❍ Concerta
- ❍ Focalin
- ❍ Vyvanse
- ❍ Other _____

What is the dosage of the medication indicated above that you most often use? If you do not know, please write "don't know"
(Open ended response)

What time of day during the past 6 months do you typically use ADHD stimulant medications without having a prescription for it or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested)?

- ❍ Morning
- ❍ Afternoon
- ❍ Evening

Which day of the week during the past 6 months do you typically use ADHD stimulant medications without having a prescription for it or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested)?

- ❍ Monday
- ❍ Tuesday
- ❍ Wednesday
- ❍ Thursday
- ❍ Friday
- ❍ Saturday
- ❍ Sunday

During the past 6 months, approximately how many times have you used any ADHD stimulant medication without having a prescription for it or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested)?
(Open ended response)

During the past 6 months, how has taking ADHD stimulant medications (ex: Ritalin, Adderall, Concerta, Focalin, Vyvanse) without having a prescription for that medication or in a manner not recommended by the prescription's instructions (ex: taking more pills than suggested, taking pills at times not suggested) affected your grades?

- ❍ Significantly decreased
- ❍ Decreased
- ❍ Neither decreased nor increased
- ❍ Increased
- ❍ Significantly increased

APPENDIX B

NON-MISUSER QUESTIONS

In undergraduate colleges across the United States, it has been reported that some students use ADHD stimulant medications without having a prescription for them or in a manner not recommended by the prescription instructions.

Were you aware of this trend before enrolling in this study?
- ❍ Yes
- ❍ No

Do you personally know anyone who has engaged in this activity?
- ❍ Yes
- ❍ No
- ❍ Don't know

Do you personally know anyone who has distributed their prescription ADHD stimulant medication to other students who do not have a prescription for them?
- ❍ Yes
- ❍ No
- ❍ Don't know

Please list any drug, medication, or substance you have used in the past 6 months for the purpose of academic improvement. If you have not used any, please write "N/A"
(Open ended response)

APPENDIX C

ADULT ADHD SELF-REPORT SCALE

Please answer the questions below, rating yourself on each of the criteria shown using the provided scale. As you answer each question, select the response that best describes how you have felt and conducted yourself over the past 6 months.

1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Very Often

2. How often do you have difficulty getting things in order when you have to do a task that requires organization?
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Very Often

3. How often do you have problems remembering appointments or obligations?
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Very Often

4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Very Often

5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Very Often

6. How often do you feel overly active and compelled to do things, like you were driven by a motor?

1. Never
2. Rarely
3. Sometimes
4. Often
5. Very Often

APPENDIX D

WENDER-UTAH RATING SCALE

As a child, I was (or had):

1. Concentration problems, easily distracted
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

2. Anxious, worrying
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

3. Nervous, fidgety
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

4. Inattentive, daydreaming
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

5. Hot- or short-tempered, low boiling point
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

6. Temper outbursts, tantrums
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit

5. Very much

7. Trouble with stick-to-it-tiveness, not following through, failing to finish things started
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

8. Stubborn, strong-willed
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

9. Sad or blue, depressed, unhappy
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

10. Disobedient with parents, rebellious, sassy
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

11. Low opinion of myself
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

12. Irritable
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

13. Moody, ups and downs
    1. Not at all

2. Mildly
3. Moderately
4. Quite a bit
5. Very much

14. Angry
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

15. Acting without thinking, impulsive
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

16. Tendency to be immature
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

17. Guilty feelings, regretful
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

18. Losing control of myself
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

19. Tendency to be or act irrational
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

20. Unpopular with other children, didn't keep friends for long, didn't get along with other children
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

21. Trouble seeing things from someone else's point of view
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

22. Trouble with authorities, troubles with school, visits to principal's office
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

23. Overall a poor student, slow learner
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

24. Trouble with mathematics or numbers
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

25. Not achieving up to potential
    1. Not at all
    2. Mildly
    3. Moderately
    4. Quite a bit
    5. Very much

APPENDIX E

CAFFEINE MOTIVES QUESTIONNAIRE, COGNITIVE ENHANCEMENT

I choose to take ADHD stimulant medication (ex: Ritalin, Adderall, Concerta, Focalin, Vyvanse) without having a prescription for that medication or in a manner not recommended by the prescription's instructions…

1. To feel more alert
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Almost always

2. To help me concentrate
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Almost always

3. To combat drowsiness
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Almost always

4. To help me focus my attention
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Almost always

5. Because I like the “jolt” of energy rush I feel
    1. Never
    2. Rarely
    3. Sometimes
    4. Often
    5. Almost always

6. To stay awake
    1. Never
    2. Rarely

3. Sometimes
4. Often
5. Almost always

APPENDIX F

DRUG ABUSE SCREENING TEST, 10-ITEM VERSION

Answer the following questions regarding your behavior over the past 6 months *excluding any use of ADHD stimulants (ex: Ritalin, Adderall, Concerta, Focalin, Vyvanse)*

1. Have you used drugs other than those required for medical reasons?
    1. Yes
    2. No

2. Do you abuse more than one drug at a time?
    1. Yes
    2. No

3. Are you always able to stop using drugs when you want to? (If never used drugs, answer Yes)
    1. Yes
    2. No

4. Have you had "blackouts" or "flashbacks" as a result of drug use?
    1. Yes
    2. No

5. Do you ever feel bad or guilty about your drug use? (If never used drugs, answer No)
    1. Yes
    2. No

6. Does your spouse or parents ever complain about your involvement with drugs?
    1. Yes
    2. No

7. Have you neglected your family because of your use of drugs?
    1. Yes
    2. No

8. Have you engaged in illegal activities in order to obtain drugs?
    1. Yes
    2. No

9. Have you ever experienced withdrawal symptoms (felt sick) when you stopped taking drugs?
    1. Yes
    2. No

10. Have you had medical problems as a result of your drug use (e.g., memory loss, hepatitis, convulsions, bleeding, etc.)?
    1. Yes
    2. No

APPENDIX G

UNIVERSITY ANNOUNCEMENT WEBPAGE

Online Survey "ADHD Stimulant Usage"- Win a $50 Amazon Gift Card!

Are you interested in winning a free $50 Amazon gift card? Then come participate in a study investigating undergraduate ADHD stimulant medication usage! The survey will take no more than 15 minutes to complete. All undergraduates over the age of 18 are invited to participate. Upon completion of the survey, you will be entered into a raffle to win a $50 Amazon gift card. Please click on the link below to complete the survey:

https://odu.co1.qualtrics.com/SE/?SID=SV_da64slsuf3lXSvP

If you have any questions, please send them to Alex Peterkin at apete047@odu.edu

APPENDIX H

CONSENT FORM

PROJECT TITLE: ADHD Stimulant Usage

INTRODUCTION
The purpose of this form is to give you information that may affect your decision whether to say YES or NO to participation in this research, and to record the consent of those who say YES.

RESEARCHERS
Alex Peterkin, Old Dominion University, Psychology Department
Val Derlega, PhD, Old Dominion University, Psychology Department

DESCRIPTION OF RESEARCH STUDY
This research investigates undergraduate students' use of ADHD stimulant medications, including the use of such medications without a prescription or in a manner not recommended by the prescription's instructions.

EXCLUSIONARY CRITERIA
To be eligible for this study you must be at least 18 years of age or older and an undergraduate student at Old Dominion University

RISKS AND BENEFITS
RISKS: Participants are asked to report potentially sensitive information regarding their substance-use behaviors; this may cause some psychological discomfort. You are free to leave any question blank that you do not feel comfortable answering.

BENEFITS: There are no direct benefits to participating in this study.

COSTS AND PAYMENTS
There are no costs to participate in this study. If you decide to participate in this study, you will be entered into a raffle for a $50 Amazon gift card.

NEW INFORMATION
If the researchers find new information during this study that would reasonably change your decision about participating, then they will make this available to you.

CONFIDENTIALITY
All information obtained about you in this study is strictly confidential unless disclosure is required by law. The researchers will take reasonable steps to keep private information, such as surveys and demographic data, confidential. The results of this study may be used in reports, presentations, and publications, but the researcher will not identify you.

WITHDRAWAL PRIVILEGE

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study at any time. Your decision will not affect your relationship with Old Dominion University, or otherwise cause a loss of benefits to which you might otherwise be entitled. The researchers reserve the right to withdraw your participation in this study, at any time, if they observe potential problems with your continued participation.

VOLUNTARY PARTICIPATION
By participating in this research study, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied, and you understand this form, the research study, and its risks and benefits. If you have any questions later on, please contact the researcher:
Alex Peterkin at apete047@odu.edu
Val Derlega at vderlega@odu.edu

DO YOU CONSENT TO PARTICIPATE IN THIS RESEARCH?
❍ YES
❍ NO

APPENDIX I

DEBRIEFING PAGE

DEBRIEFING
In the study you just participated in, we were interested in information regarding undergraduate ADHD stimulant misuse. This is the use of ADHD stimulants by someone who either doesn't have a prescription for that medication or who does have a prescription, but uses the medication in a manner not recommended by the prescription's instructions.

If you would like to make any comments regarding this study or provide feedback that may improve future studies on this topic, you may do so here

SUBSTANCE ABUSE RESOURCES
ADHD stimulant misuse is thought to be a method used by students to improve academic performance and does not seem to be associated with short- or long-term consequences of addiction and dependency. Despite this, the use of stimulant medications without a prescription or in a manner that deviates from the prescription's instructions is considered illegal drug use by the Controlled Substances Act (CSA) and may have some potentially serious health consequences.

If you or anyone you know would like to seek help for substance abuse problems, please contact any of the following resources:

ODU Counseling and Human Services
110 Education Building
Norfolk, VA, 23529
757-683-3326

Real Solutions of Virginia
5900 East Virginia Blvd
Janaf Office Building, Suite 101
Norfolk, VA, 23502
757-351-0693

The Counseling Center
400 North Center Dr
Building 3, Suite 202
Norfolk, VA, 23502

757-461-4141

ADHD
Additionally, we and many other researchers believe that ADHD stimulant misuse may be a form of self-treatment for undiagnosed ADHD. If you feel that you may be suffering from problems with inattention, hyperactivity, distractibility, or impulsivity that is interfering your daily functioning, social interactions, or school or job performance, please discuss this with your primary care physician or contact ODU Student Health Services at 757-683-3132.

THANK YOU FOR YOUR PARTICIPATION AND COMPLETION OF THE SURVEY! REMEMBER THAT THERE IS NO WAY TO LINK THE ANSWERS YOU GAVE HERE TO YOUR NAME OR ANY OTHER IDENTIFIERS. IF YOU HAVE ANY QUESTIONS REGARDING THE STUDY, PLEASE CONTACT ALEX PETERKIN AT APETE047@ODU.EDU OR VAL VERLEGA AT VDERLEGA@ODU.EDU. PLEASE CONTINUE TO THE NEXT PAGE AND YOU WILL BE REDIRECTED TO THE RAFFLE FOR THE $50 AMAZON GIFT CARD.

VITA

Alexander Laszlo Peterkin
Old Dominion University
Department of Psychology
340 Mills Godwin Building
Norfolk, VA, 23529

EDUCATION

B.A. **University of Virginia**
Psychology, 2013

M.S. **Eastern Virginia Medical School**
Biomedical Science, 2014

M.S. **Old Dominion University**
Psychology, 2017 (Expected)

PRESENTATIONS

Poster, Bivens, T. S., Roberts, L. B., **Peterkin, A.**, Hacker, D., & Derlega, V. "Factors Related to African-American Students' Experiences of Distress of Race-Related Violence in the Media," Association for Psychological Science (May 2016)

Poster, **Peterkin, A. L.,** Derlega, V. J., & Rushlow, R. A. "Effects of HIV Disclosure, Harm to Sexual Partners, and Knowledge of HIV Nondisclosure Law on Evaluative Reactions Directed at an HIV Positive Person," Association for Psychological Science (May 2016)

Poster, Nealy, Z., Halvorsen, R., **Peterkin, A.**, Zimmerman, C., & Babineau, T. "Detection of Medical Charting Errors Using Systematic Chart Review," Society of Student Run Free Clinics (February 2015)

Poster, **Peterkin, A.,** Cedar, C., Nealy, Z., Zimmerman, C., Aktan, S., & Babineau, T. "The Chart Review Project: An Analysis of the Care of Patients at HOPES Free Clinic," Society of Student Run Free Clinics (February 2015)

PUBLICATIONS

Roberts, L. B., Maduro, R. S., Derlega, V. J., **Peterkin, A. L.**, Hacker, D. S., & Ellis, K. T. (2017). Race-based rejection sensitivity and racial identity predict African American students' reactions to the fatal shooting of other African Americans. *Journal of Loss and Trauma*. Advanced online publication.

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,* 263-268.