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ADHD Symptomology and Prescription Stimulant Misuse in College Students

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Introduction

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurological disorder characterized by developmentally inappropriate levels of hyperactivity/impulsivity and inattention symptoms (American Psychological Association, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders (2013), ADHD has a prevalence of 5% in children and 2.5% of adults. While common during childhood, symptoms have been shown to persist into adulthood for 50% or more of those diagnosed before reaching age 18 (Lakhan & Kirchgessner, 2012). According to the American Psychological Association (2013), there are three types of ADHD including predominantly inattentive, hyperactive-impulsive, and combined. The inattentive subtype of ADHD includes symptoms such as disorganization and inability to focus (CDC, 2016). More specifically, those diagnosed with the inattentive subtype also make careless errors in their work, do not seem present when spoken to, lose materials needed to complete their tasks, and resist participating in tasks that require focus (American Psychological Association, 2013). The hyperactive-impulsive subtype of ADHD is predominated by symptoms of fidgeting, tapping hands and feet, leaving seat when expected to sit, play using louder voices than expected, blurting answers in school, skipping others turn to take their own, and butting into others' conversations (American Psychological Association, 2013). The combined subtype of ADHD is a combination of symptoms from both the inattentive and the hyperactive-impulsive subtypes (American Psychological Association, 2013). Although males in childhood are more likely to be diagnosed with ADHD by a ratio of 2:1 in comparison to females, females are more likely than males to present with inattentive symptomology (American Psychological Association, 2013; Weyandt 2006 and Barkley 2006). African American and Latino patients are less likely to be diagnosed with ADHD than Caucasian patients (American Psychological Association, 2013).

Academic effects observed in those suffering with ADHD include a greater likelihood of withdrawal from high school, repeating academic years in high school, and decreased likelihood of attempting and/or completing a postsecondary education (DuPaul et al., 2009; Weyandt 2006). Although prescription stimulants have been shown to benefit those with ADHD, increased popularity of prescription stimulant misuse among those without ADHD has been reported, despite the potential harmful side effects that may accompany this use (Weyandt, Marraccini, et al., 2013). Specifically, Catalano, White, Fleming, & Haggerty (2011) found nonmedical use of

prescription stimulants during adolescence led to increased risk of crime commitment, while McCabe, West, Teter, & Boyd (2004) reported prescription stimulant misuse increased risk for subsequent addictions to other substances. Despite the negative effects of prescription stimulants on those misusing them, according to Weyandt and others (e.g. Dussault & Weyandt, 2013; Gudmondsdottir et al., 2016; Weyandt et al., 2009; Weyandt et al., 2013; Weyandt et al., 2014; Weyandt et al., 2016; Verdi et al., 2014) as many as 7% of undergraduate college students reported prescription stimulant medication misuse (DuPaul et al., 2009). In a study performed by White, Becker-Blease, and Grace-Bishop (2006), 16% of survey participants at a northeastern university admitted to incorrectly using prescription stimulant medication.

Primary motivations for misuse of prescription stimulants include neurocognitive enhancement and academic performance (Aria & Wish, 2006; Dussault and Weyandt, 2013; Weyandt et al., 2009). Specifically, Teter and colleagues (2010) examined the motives for the misuse of prescription stimulants among the college population, finding that the majority of participants reported their motives as to help them concentrate (58%), to help them increase their alertness (43%), and to help them get high (43%). Similarly, a separate study found that students misused these medications for the purposes of increasing focus, altering mental status at recreational festivities, and achieving higher marks (White, Becker-Blease & Grace-Bishop, 2006).

Previous research study has identified several demographic risk factors for misusing prescription stimulants. College students most at risk for misusing prescription stimulants were found to be those that are male, white, sorority/fraternity participants, achievers of B average or lower GPA, and students at northeastern colleges (McCabe et al., 2004; Weyandt et al., 2009; 2013; 2016). Bents & Marsh (2006) found that athletes are at a high risk for misusing prescription stimulants. Psychological factors such as depressive and inattentive symptoms have been shown to increase the risk of misuse of stimulants among college students (Weyandt et al., 2014). Less than a handful of studies have explored whether college students with ADHD are more or less likely to misuse prescription stimulants. For example Janusis & Weyandt (2010) found that college students exhibiting increasing numbers of ADHD symptoms resulted in an increased risk of misusing prescription stimulants in comparison to college students without ADHD.

Purpose of Present Study

While research concerning the patterns of misuse among college students has been performed and documented, the association between those with ADHD and medical misuse of prescription stimulants has not been well studied. More specifically, research exploring the relationship between severity of ADHD symptoms and prescription stimulant misuse is sparse. Therefore, the aim of this honors thesis is to assess the association between self-reported ADHD symptoms and prescription stimulant misuse among students both with, and without, ADHD, and to explore whether males and females differ in reported rates of prescription stimulant misuse. Specifically, it is hypothesized that a) ADHD symptomatology will be positively correlated with prescription stimulant misuse in college students with and without ADHD, b) control participants will show a greater risk of prescription stimulant misuse compared to those with ADHD, and c) males without ADHD will report a greater risk of prescription stimulant misuse compared to females and males with and without ADHD.

Materials and Methods

The data used in this study was derived from the NIH R01 funded study, Trajectories Related to ADHD in College (TRAC). The present study is a 5-year longitudinal study conducted by Dr. Arthur Anastopoulos at the University of North Carolina at Greensboro (Lead Principle Investigator), Dr. George DuPaul at Lehigh University (Co-Principal Investigator), and Dr. Lisa Weyandt at the University of Rhode Island (Co-Principal Investigator). Five Hundred twenty-seven freshman college students were recruited for eligibility screening. Of these students, 456 were determined to have met criteria, and were enrolled into the study. There was an even enrollment of ADHD vs. non-ADHD participants with 228 of each category participating in the study. Of these, 142 students (65 ADHD, 77 non-ADHD; 85 Female, 57 Male) were eligible for use in this thesis due to their completion of the exit interview questionnaire. The TRAC study assesses the educational, social, and vocational outcomes of college students both with, and without, ADHD.

ADHD symptomology was determined using the Semistructured Interview for Adult ADHD. This interview assesses the symptoms of inattention and hyperactivity-impulsivity related to ADHD. The semistructured interview addresses full DSM-V criteria for ADHD.

Endorsement of five or more present systems of either inattention or hyperactivity-impulsivity was required as evidence of impairment due to ADHD.

Prescription stimulant misuse risk was determined using the abbreviated Stimulant Survey Questionnaire (SSQ) (Weyandt et al., 2009). The self-report questionnaire contains questions pertaining to participants' habits with misusing prescription stimulants. Participants chose from answer choices ranging from one (never) to six (always). This assessment contained six questions, which resulted in a prescription stimulant misuse risk ranging from six (least risk) to thirty-six (most risk).

Results

Multiple regression analyses were conducted to test the hypothesis that college students reporting more severe ADHD symptomology and identifying as male would report greater nonmedical prescription stimulant misuse. The sample size for each regression was 143 college students. For all the analyses, multivariate effect size was considered small, medium, or large for R^2 values of 0.02, 0.13, 0.26, respectively (Cohen, 1992). Effect sizes for micro results were considered small, medium, and large for standardized β weights (partial correlations) of 0.1, 0.3, 0.5, respectively (Cohen, 1988; Cohen, 1992).

The dependent variable for the first multiple regression was total SSQ score and the independent, predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 21.379$, $p < 0.0005$ with adjusted $R^2 = 0.223$, 95% CI [0.10544, 0.34056]. The standardized beta weight for ADHD symptomology was 0.468 with $t(1) = 6.331$, $p < 0.0005$ with 95% CI [0.214, 0.409]. The standardized beta weight for sex was 0.109 with $t(1) = 1.475$, $p = 0.142$ with 95% CI [-.256, 1.763]. Overall, the multiple regression was significant, with ADHD symptomology predicting stimulant misuse, as hypothesized. The multivariate effect size as reported by the adjusted R^2 value, which reflects the shared variance between independent variables and the dependent variable, was 0.223. The micro output indicates that only ADHD symptomology predicted stimulant misuse, with a large effect size, as evidenced by the standardized beta weight value of 0.468, which was a high correlation. The part correlation was 0.468, which attributed 22% of the variance to increased ADHD symptomology. Thus, ADHD symptomology significantly predicted nonmedical use of prescription stimulants.

SSQ2 on the exit interview survey read, “I have taken prescription stimulants to perform better in my schoolwork.” Therefore, the dependent variable for the multiple regression analysis was SSQ2 score while the independent predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 29.983$, $p < 0.0005$ with adjusted $R^2 = 0.290$, 95% CI [0.16750, 0.41250]. The standardized beta weight for ADHD symptomology was 0.514 with $t(1) = 7.261$, $p < 0.0001$ with 95% CI [0.109, 0.191]. For sex, the standardized beta weight was 0.177 with $t(1) = 2.507$, $p = 0.013$, with 95% CI [0.114, 0.963]. Therefore, both ADHD symptomology and sex were significant in predicting stimulant misuse for SSQ2 score. The multivariate effect size as reported by the adjusted R^2 value was 0.290. The micro output showed that ADHD symptomology and identifying as male, predicted non-medical prescription stimulant misuse for purposes of performing better in school, due to its large effect size, as exhibited by the standardized beta weight of 0.514, which suggested a strong relationship between ADHD symptomology, gender, and prescription stimulant misuse for the purpose of performing better in school. More specifically, the part correlations showed that 26% of the variance seen in SSQ2 scores was explained by ADHD symptomology, while 3% was explained by identifying as male.

On the exit interview survey, SSQ3 read, “I have taken prescription stimulants to feel better about myself.” The dependent variable for the third multiple regression analysis was SSQ3 score, while the independent predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 9.789$, $p < 0.0005$, with an adjusted $R^2 = 0.110$, 95% CI [0.01543, 0.20457]. The standardized beta weight for ADHD symptomology was 0.331 with $t(1) = 4.180$, $p < 0.0005$, with 95% CI [0.026, 0.074]. For sex, the standardized beta weight was -0.123, with $t(1) = -1.556$, $p = 0.122$, with 95% CI [-0.438, 0.052]. Of the two independent predictor variables, ADHD symptomology showed a significant predictive relationship for misusing prescription stimulants for the purpose of feeling better about themselves. The multivariate effect size as reported by the adjusted R^2 value was 0.110. The micro output showed that ADHD symptomology predicted stimulant misuse on SSQ3 due to its large effect size, shown by the standardized beta weight of 0.331, which was a medium correlation between ADHD symptomology and stimulant misuse for the purpose of feeling better about themselves. More

specifically, the part correlation showed that 11% of the variance in SSQ3 scores was attributable to increased ADHD symptomology.

SSQ4 read, “I have been offered prescription stimulants by other students.” For this multiple regression analysis, the dependent variable was SSQ4 score, while the independent predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 6.793$, $p = 0.002$. The adjusted R^2 value was 0.075 with a 95% CI [-0.00616, 0.15616]. The standardized beta weight for ADHD symptomology was 0.158, with $t(1) = 1.9551$, $p = 0.053$ and a 95% CI [0.000, 0.053]. For sex, the standardized beta weight was 0.248, with $t(1) = 3.074$, $p = 0.003$, and a 95% CI [0.154, 0.709]. The multivariate effect size as reported by the adjusted R^2 value was 0.075. The micro output showed that both ADHD symptomology and sex predicted prescription stimulant misuse by being offered prescription stimulants by other students, due to their effect sizes, represented by the standardized beta weight of 0.158 and 0.248, respectively. The predictive relationship between ADHD symptomology and being offered prescription stimulants by other students was a small relationship, with 2.5% of the variance being attributed to ADHD symptomology. The predictive relationship between sex and being offered prescription stimulants by other students was a small to medium relationship, with 6.2% of the variance being attributed to sex.

SSQ5 read, “I have tried someone else’s prescription stimulant medication.” For this multiple regression analysis, the dependent variable was SSQ5 score, while the independent predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 3.382$, $p = 0.037$. The adjusted R^2 value was 0.032 with a 95% CI [-0.02348, 0.08748]. The standardized beta weight for ADHD symptomology was 0.204, with $t(1) = 2.470$, $p = 0.015$ and a 95% CI [0.005, 0.045]. For sex, the standardized beta weight was 0.062, with $t(1) = 0.750$, $p = 0.454$, and a 95% CI [-0.129, 0.286]. The multivariate effect size as reported by the adjusted R^2 value was 0.032. The micro output showed that ADHD symptomology predicted prescription stimulant misuse by using others’ stimulant medication, due to its effect size, shown by the standardized beta weight of 0.204, which was a small to medium correlation between ADHD symptomology and misusing other’s stimulant medication. More specifically, the part correlation showed that 4.2% of the variance in SSQ5 scores was explained by ADHD symptomology.

The sixth, and final SSQ item on the exit interview read, "I have been pressured into letting someone else have my prescription stimulant medication." For this multiple regression analysis, the dependent variable was SSQ6 score, while the independent predictor variables were ADHD symptomology and sex. For this multiple regression analysis, $F(2, 140) = 7.620$, $p = 0.001$. The adjusted R^2 value was 0.098 with a 95% CI [0.00753, 0.18847]. The standardized beta weight for ADHD symptomology was 0.274, with $t(1) = 3.409$, $p = 0.001$, with a 95% CI [0.014, 0.052]. For sex, the standardized beta weight was -0.160 with $t(1) = -0.1989$ and a 95% CI [-0.396, -0.001]. The multivariate effect size as reported by the adjusted R^2 value was 0.098. The micro output showed that ADHD symptomology had a predictive relationship with being pressured into allowing others use their medication for non-medical purposes, due to the standardized beta weight of 0. 274, which represented a medium relationship. With a beta weight of -0.160, sex was predicted to have a small relationship with being pressured into allowing others to use their stimulant medication for non-medical purposes.

The dependent variable in the final multiple regression analysis was total SSQ score, while the independent predictors were hyperactive-impulsive symptoms and inattentive symptoms. For this analysis, $F(2, 140) = 21.842$, $p < 0.0005$. The adjusted R^2 value was 0.227 with a 95% CI [0.10900, 0.34500]. The standardized beta weight for hyperactive-impulsive symptomology was 0.398 with $t(1) = 3.835$, $p < 0.0005$ and a 95% CI [0.260, 0.813]. For inattentive symptoms, the standardized beta weight was 0.117, with $t(1) = 1.123$, $p = 0.264$, and a 95% CI [-0.100, 0.364]. The multivariate effect size as reported by the adjusted R^2 value was 0.227. The micro output showed that hyperactive-impulsive symptoms were predictive of prescription stimulant misuse in terms of total SSQ score due to the standardized beta weight of 0.398, which suggested a large relationship between prescription stimulant misuse and hyperactive-impulsive symptoms.

Discussion

As hypothesized, the results of this study suggest that ADHD symptomology is a significant predictor of non-medical prescription stimulant use, including taking prescription stimulants to perform better on schoolwork, to feel better about themselves, to take others' stimulant medications, and be pressured into giving others' their own stimulant medication. The results

also suggested that hyperactive-impulsive symptoms significantly predict prescription stimulant misuse as opposed to inattentive symptoms, which does not predict prescription stimulant misuse according to the multiple regression analysis. It was hypothesized that identifying as male would be a greater predictor of prescription stimulant misuse, however, the multiple regression analyses provide evidence that there is a negative relationship between identifying as male and reporting a high SSQ6 score, but there is a positive relationship between identifying as female and reporting a high SSQ6 score. In other words, findings suggest that females are more likely to be pressured into allowing others to use their prescription stimulant medication. The analyses show that identifying as male is a significant predictor of using prescription stimulants to perform better on schoolwork and being offered prescription stimulants by other students.

It is important to note several limitations of the study. First, the SSQ2 is worded "I have taken prescription stimulants to perform better on my schoolwork." Although the results suggested that increased ADHD symptom severity is predictive of this non-medical use, some participants with ADHD use prescription stimulants in order to control their symptoms to help them complete their day-to-day tasks. Participants may not have differentiated nonmedical use to perform better in school from using their prescription correctly to perform better in school, which may have led to the significant relationship between ADHD symptomology and SSQ2 score.

In conclusion, increased ADHD symptomology predicted prescription stimulant misuse for the purposes increasing school performance, feeling better about themselves, trying someone else's prescription stimulation, and being pressured into allowing others to use their prescription stimulant medication. Additionally, identifying as male predicted stimulant misuse for the purpose of performing better in school, while identifying as female predicted stimulant misuse by being pressured into allowing others use their stimulant medication. Finally, rather than inattentive symptoms, hyperactive-impulsive symptoms predicted greater prescription stimulant misuse in terms of total SSQ score.

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