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**Predictors of Prescription Stimulant Medical Misuse and Diversion:
Conduct Problems and Perceptions of Risk**

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PSYC 499: Senior Thesis

Trinity College

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Abstract

For the past decade, researchers have been warning of an impending prescription stimulant crisis and consequently, an epidemic (Faraone et al., 2020). With the rise in legitimate prescriptions for stimulant medications, there is a greater possibility for these medications to be medical misused or diverted. Medical misuse is the “inappropriate use of a stimulant medication that was initially prescribed for the treatment of ADHD” such as taking too much or too little or using through alternative routes of administration (Sepúlveda et al., 2011, p. 551). Diversion is “transfer of medication of one patient for whom it is prescribed to one patient for whom it is not prescribed” (Wilens et al., 2006, p. 408). The purpose of this study was to examine predictors of prescription stimulant misuse and diversion, specifically conduct problems such as lying, stealing, and setting fires, and perceptions of legal, physical, and disciplinary risk. A total of 91 participants (67% identified as female, 21% identified as male) completed a baseline survey for a longitudinal study focused on students with stimulant prescriptions. Most participants denied a history of diversion ($n=65$; 71%), but the majority ($n=66$; 73%) reported medical misuse. As hypothesized, there was an indirect effect of conduct problems on diversion through perceptions of risk, such that students who endorsed more conduct problems perceived fewer risks associated with prescription stimulant misuse and, in turn, were more likely to divert their medication. Conduct problems and perceptions of risk were not associated with medical misuse, as hypothesized. These findings help broaden our understanding of characteristics associated with diversion and may inform future prevention programming.

Predictors of Prescription Stimulant Misuse and Diversion: Conduct Problems and Perceptions of Risk

“Generation Rx” has been used to describe a generation defined by increased diagnosis of attention deficit-hyperactivity disorder (ADHD) and subsequently, increased accessibility to medications that treat ADHD (Aikins, 2011). ADHD is among the most widely researched diagnoses in the United States (Pastor & Reuben, 2008), and is treated with stimulant medications that serve to alleviate symptoms (Benson & Flory, 2015). There has been an immense rise in the production of stimulant medications used to treat ADHD. Within 11 years, from 1987 to 1999, prescription stimulant consumption rose from 60 million to 360 million in the United States (Eisenberg, 2007). Consequently, from 1991 to 1999, prescriptions for these medications rose from 4 million to 11 million (Eisenberg 2007). This exponential rise also is reflected through research by Hall et al. (2005) who found that, from 1990 to 2000, the production of methylphenidate medications such as Ritalin and Concerta rose 900%. Subsequently, between 1993 and 2001, the production of amphetamines such as Adderall and Dexedrine rose almost 6,000% (Hall et al., 2005). Furthermore, the percentage of college students who are prescribed stimulant medications is at its highest in 15 years (Kilmer et al., 2015). For example, the prescription stimulant medication Adderall is the most commonly used within college students and has an annual prescription rate of 9% (Kilmer et al., 2015).

In the past decade, not only has the number of college students who are prescribed stimulants increased, the number of students engaging in the nonmedical use of prescription stimulants also has increased. Non medical use is the “use of a prescription stimulant without a prescription, or in a way other than prescribed” (Faraone et al., 2020, p. 101). McCabe et al. (2014) found that the frequency of both past year and lifetime nonmedical use of prescription

stimulants increased significantly between 2003 and 2013. Given that college students are in a time of transition, they are more likely to experiment and engage in risk taking behaviors like substance misuse (Ponnet et al., 2015). Indeed, college students were more likely to use prescription stimulants non-medically than those of the same age who did not attend college (McCabe, 2008; Schepis et al. 2018).

Prescription stimulant misuse (PSM) is the “intentional therapeutic use of a drug product in an inappropriate way and specifically excludes the definition for abuse” (Faraone et al., 2020, p. 11). Up to one third of all college students endorsed the nonmedical use of a prescription stimulant at least once (Ross et al., 2018). Kinman et al. (2017) noted that the rise in prescription stimulant use in college students was also reflected in the number of emergency room visits that rose exponentially. From 2005 to 2010, the number of emergency room visits related to prescription stimulant use increased from 5,212 to 15,585. In 2010, half of these visits were from prescription stimulant use either without a prescription or without an ADHD diagnosis (Kinman et al., 2017). Given the rise in PSM and its negative consequences in college students, the current study examined prescription stimulant misuse and diversion in college students who are prescribed stimulant medication, as well as predictors of these behaviors that have not been widely researched.

Background

Prescription Stimulant Medications. Before the official introduction of ADHD into the DSM III in 1980, individuals with ADHD were often referred to as a “brain-damaged child” (Eisenberg, 2007, p. 279). However, this supposed brain damage was not empirically supported and solely inferred based on behavioral symptoms (Eisenberg, 2007). Although it was an influential step for researchers to have an established diagnosis for ADHD, they had no idea that

diagnoses would exponentially multiply and that the treatment option of psychotropic drugs would soon “become a multibillion dollar market” (Eisenberg, 2007, p. 281). Around forty years ago, ADHD was a relatively uncommon diagnosis, but today it is estimated that around 8% of individuals aged 4-17 are diagnosed (Eisenberg, 2007).

Stimulants have been depicted as the “first line of therapy” for young adults, and specifically college students with ADHD (Weyandt & DuPaul, 2013, p. 77). Thus, for college students, they are the most frequent form of treatment. Prescription stimulant medications are the most studied and effective treatment for ADHD as they increase functioning within neurotransmitter systems, specifically dopamine, which has shown to be crucial in the motivation, reward, and attention systems of the brain (Weyandt & DuPaul, 2013).

Although prescription stimulant medications are classified as a Schedule II drug due to their potential for abuse, misuse, and diversion, 1.4 million individuals aged 12 and up reported non-medical use of prescription stimulants in the United States in 2016. This number is higher than the number of individuals aged 12 and up who use methamphetamine and cocaine combined (Faraone et al., 2020). The current status of prescription stimulant use has not yet reached that of an epidemic, but it has often been described as such. For the past decade, researchers have identified many possibilities that could lead to a prescription stimulant crisis, for example, the prevalence rates of prescription stimulant misuse as well as the use of different routes of administration (Faraone et al., 2020). Indeed, the increasing number of prescriptions for those with an ADHD diagnosis has come with a concurrent rise in public controversy due to concerns about these medications being used for unintended purposes (Rey & Sawyer, 2003). Eisenberg (2007) raised the controversial question of whether the public health gain for treatment of ADHD is greater than the increasingly concerning scale of misuse. Specifically, as more students are

prescribed stimulant medications, there is more potential for diversion and misuse of these medications, even by students who are prescribed, a term referred to as “medical misuse.” Furthermore, diversion has shown to be more common in those who medically misuse their prescription stimulant medications (Darradeu et al., 2007; Rabiner et al., 2009). Rabiner et al. (2009) further observed that of the college students who had medically misused their prescription stimulants, 56% had been approached in regards to diversion, and 25% had complied with such requests, suggesting that these behaviors may frequently co-occur.

Medical Misuse. Despite the effectiveness of stimulant medications as treatment for ADHD, they are the most commonly misused prescription drug in college students (Meisel & Goodie, 2015) and this misuse may be the result of a multitude of different motives (Sepúlveda et al., 2011). Medical misuse is defined as the “inappropriate use of a stimulant medication that was initially prescribed for the treatment of ADHD” (Sepúlveda et al., 2011, p. 551). Therefore, medical misuse differs from nonmedical use as the stimulant medications are being misused by individuals who are prescribed stimulants for the treatment of ADHD. Behaviors that constitute medical misuse include: using alternative routes of administration, taking more or less prescription stimulants than the recommended dose, intentionally using prescription stimulants with other drugs such as alcohol, or intentionally using prescription stimulants to get high (Sepúlveda et al., 2011). Weyandt and DuPaul (2013) noted the key motivations for misuse, which include academic motivations such as to improve academic performance and to improve focus, attention, and concentration. There are also non-academic motivations, which are often deemed to be more concerning, and these include recreational use, such as when drinking alcohol or using other substances (Weyandt & DuPaul, 2013).

Medical misuse is relatively common, as indicated by multiple studies. Sepúlveda et al. (2011) found that 40% of students misused their prescription stimulant medications, similarly to Rabiner et al. (2009) who found that 31% of college students reported misusing their prescription stimulant medications. Furthermore, the most frequent form of misuse was that of using too much of the prescription stimulant, which was also reflected in research by Wilens et al. (2006). The least prevalent form of misuse was that of using prescription stimulants to get high (Sepúlveda et al., 2011).

The method of medical misuse can take on many different forms which can be dependent on the desired outcome of using the stimulant. Darradeu et al. (2007) further noted the different methods of medical misuse, specifically that of alternative routes of administration and intentionally using prescription stimulants with other drugs. This research performed by Darradeu et al. (2007) included sixty-six adult participants, of which 84% reported oral misuse and 74% reported intranasal use. These data conflict with Rabiner et al. (2009), who found that about 8% of college students reported using their prescription stimulant medication intranasally. Rabiner et al. also found that 68% of participants who reported medical misuse and 100% of participants who reported exclusively misusing orally also reported purposefully using their prescription stimulants with alcohol (92%) and/or other illicit substances (Darradeu et al., 2007). The conflicting findings between Darradeu and Rabiner could be due to the discrepancies in participants: Darradeu et al. focused on an adult population, whereas Rabiner et al. focused on a population of college students. Rabiner et al. (2009) found that nearly one third of college students reported either taking their prescription stimulant more often than their prescriber intended or taking more than prescribed. This research demonstrates that medical misuse is prevalent and may increase college students' risks for harmful drug interactions or addiction.

There are, however, many limitations regarding previous research on medical misuse. First, many studies do not differentiate between medical misuse and non medical use, or misuse by those who are prescribed and those who are not prescribed a stimulant medication. Although both individuals with and without ADHD have reported misusing prescription stimulant medications, medical misuse has not been the focus of previous research (Wilens et al., 2008). Research regarding medical misuse is also limited due to the fact that medical and nonmedical use of prescription stimulants are often combined in research (Rabiner et al., 2009). Furthermore, Darradeu et al. (2007) note how there is still very little known about misuse specifically by individuals who are prescribed.

Diversion. Diversion is defined as the “transfer of medication of one patient for whom it is prescribed to one patient for whom it is not prescribed” (Wilens et al., 2006, p. 408). Of concern, diversion can further “facilitate access to these medications for those without a prescription” (Sepúlveda et al., 2011, p. 552). Diversion is also typically defined as “when an ADHD patient, with a prescription for stimulants, gives or sells any of his/her ADHD medication to nonprescribed users” (DeSantis et al., 2013, p. 455). Garnier et al. (2010) sought to understand prevalence rates, likelihood of diversion, and characteristics of diversion among college students. They found that within a sample of 483 students, 35.8% had diverted medication at least once. Further, the medication diverted most often was prescription stimulants with a 61.7% diversion rate (Garnier et al., 2010). Moreover, being asked to give away or sell one’s medication is common: Sepúlveda et al. (2011) found that of students prescribed stimulant medication, over half (54%) were asked to divert in the past year.

Research has underscored the prevalence of diversion and illustrated the methods in which these medications are diverted. Garnier et al. (2010) found that of the students who

diverted their medications, sharing was the most common method (33.6%) followed by selling (9.3%). Sharing is typical on college campuses, specifically among friends and peers. The majority (74%) of students who had non medically used a prescription stimulant had received it from a friend for free, in comparison to 49% who reported that they had bought it from a friend or family member (Ross et al., 2018). One student referred to their sources of prescription stimulant medications as “friends of friends” (DeSantis et al., 2008, p. 320). The most common method of receiving prescription stimulant medications, in particular, is through peers and students generally report that they are very easy to obtain (Benson & Flory, 2015).

Sepúlveda et al. (2011) noted that there are several limitations to the research on diversion as it is still in its infancy and few studies have assessed prescription stimulant diversion on college campuses or within college-aged individuals. Furthermore, Wilens et al. (2006) acknowledged the limited generalizability of the existing research, as most research is performed with males from middle to middle-upper socioeconomic classes. Weyandt and DuPaul (2013) corroborated this limitation noting that “most extant studies have been limited by small samples and an almost exclusive focus on white, male, middle-class students” (Weyandt & DuPaul, 2013, p. 88). In addition, Darradeu et al. (2007) noted that very little is known regarding the factors that are associated with diversion from those who are prescribed prescription stimulant medications. It is crucial to deepen our understanding of diversion given that “the nonmedical use of prescription medications has increased 162% in the past decade and has surpassed all illicit drugs except marijuana” (Fortuna et al., 2010, p. 1109).

Although the research on diversion and misuse is limited, one way to extend this research is to extend beyond solely documenting prevalence rates. Specifically, focusing on potential

distal and proximal predictors of these behaviors is crucial for developing the research on misuse and diversion.

Conduct Disorder

Problem Behavior Theory helps to explain the nature of problem behaviors as they diverge from societal norms and are considered unacceptable. These behaviors include “substance use, early sexual activity, delinquency, school truancy, and other socially deviant behaviors” (Boyd et al., 2009, p. 544). Impulsiveness has been shown to influence problem behaviors such as substance misuse (Boyd et al., 2009). Problem behaviors also help to explain conduct problems and conduct disorder. Conduct disorder, a behavioral disorder typically diagnosed in adolescence, implies that someone is exhibiting an array of problem behaviors including aggression towards humans and/or animals, the destruction of property, deceitfulness or theft, and other serious violations of rules, such as lying, setting fires, running away from home, destroying others’ property, stealing, and using a weapon that can physically harm someone else (American Psychiatric Association, 2013). Weyandt and DuPaul (2013) noted that children who are diagnosed with ADHD present a greater risk for emotional and behavioral disorders such as conduct disorder. This is explained through the association between impulsivity and inattention, two symptoms of ADHD, and an “increased risk of academic, social, and behavioral difficulties” (Weyandt & DuPaul, 2013, p. 7), which may manifest as one or more of the aforementioned problem behaviors.

Problem Behavior Theory may be especially relevant to understanding why some students might be at greater risk for engaging in PSM. This is due to the overlap in problem behaviors and the behavioral aspects of conduct problems such as impulsiveness, school truancy, and early delinquency (Boyd et al., 2009). The relation between PSM and conduct problems is

supported by Garnier et al. (2010), who found through comparative analyses that of 483 college students, those who diverted their prescription stimulant medications demonstrated more childhood conduct problems than those who did not divert their medications. Further, they found that even independent of demographics and other risk factors, the non-medical use of prescription drugs was significantly associated with diversion. Moreover, each individual conduct problem behavior was shown to increase the risk of prescription stimulant diversion by 13% (Garnier et al., 2010). Wilens et al. (2006) reported similar findings and found that around 80% of the participants, 98 males aged 16 to 27, who misused or diverted their medications had comorbid conduct disorder or substance use disorder.

VanEck et al. (2012) sought to evaluate whether there was an association between college students' ADHD symptoms and prescription stimulant misuse and whether conduct problems moderated that association (i.e., relation between ADHD symptoms and PSM was more pronounced for those higher in conduct problems). They studied 660 students ages 18-25 at a public university and assessed conduct problems through the Self-Reported Delinquency Scale, which included questions that correlate to specific diagnostic criteria from the DSM-IV-TR. They found that the risk of misusing prescription stimulant medications was, in fact, more pronounced at higher levels of ADHD symptoms as well as conduct problem symptoms; that is, as symptoms of both of these disorders increased, so did the risk for PSM (VanEck et al., 2012).

Khoddam and Leventhal (2016) similarly sought to test whether conduct problems serve as a predictor of substance use in high school students. They found that conduct problems were positively associated with any substance use within the past 6 months. Furthermore, they found that conduct problems were associated with fewer alternative reinforcers and more complementary reinforcers, which led to a higher likelihood of substance use (Khoddam &

Leventhal, 2016). Although this research was performed with a sample of high school students rather than college students, it is still pertinent since we are looking at conduct problems before the age of 18. There is, however, very limited research regarding conduct disorder in relation to prescription stimulant misuse or diversion, and most recent of this research was conducted five or more years ago which demonstrates the significance and cruciality of novel research regarding these factors.

Perceived Risk

Social Norms Theory helps to explain the impact of social norms on prescription drug misuse in college students (Silvestri & Correia, 2016). Specifically, this theory contends that a “certain set of motivational factors, including personal attitudes, subjective norms, and perceived behavioral control affect the intention to perform a behavior” (Ponnet et al., 2015, p. 276). In line with this theory, overestimating the prevalence and acceptance of others’ substance use can impact the substance use of an individual (McCabe, 2008). This phenomenon is reflected in research by Kilmer et al. (2015), who found that students who misuse stimulant medications tend to highly overestimate the average substance use of their peers. Through overestimating the prevalence of peer prescription stimulant use, normative perceptions arise. These normative perceptions of peer prescription stimulant use are shown to be positively correlated with the individual’s own non medical use of prescription stimulant medications (Kilmer et al., 2015).

Holt and Looby (2018) identified that cognitive and behavioral factors differentiated at-risk non users from those who misused prescription stimulants; perceived safety of prescription stimulants was one key factor that distinguished the groups. Specifically participants who considered prescription stimulant use as harmless were more likely to engage in PSM (Holt & Looby, 2018). Similarly, Holt & Looby (2018) found that concern or worry of being caught,

including negative reactions from parents or prescribers, was associated with a lower risk for diversion.

DeSantis and Hane (2010) found that college students considered prescription drugs, including stimulants, to be much safer than illicit drugs. They also noted that there is limited research regarding the perceptions of college students surrounding the health and legal risks of stimulant use (DeSantis & Hane, 2010). Regarding health risks, one study found that of the students who endorsed misusing prescription stimulants, none pursued any information from medical or health professionals or the internet before using (DeSantis et al., 2008). This “general lack of guilt or dissonance over taking illegal stimulants” may stem from the perception that prescription stimulants are “not only physically and psychologically harmless, but also morally acceptable” when used for academic purposes (DeSantis et al, 2008, p. 322). These findings suggest that college students may not discern any health risks with prescription stimulant use, may not recognize the potential severity of these health risks, or may believe the potential benefits to their academic performance outweigh any risks (Kinman et al., 2017).

Prescription stimulants are classified as a Schedule II Drug due to their potential for abuse and misuse, and are only obtainable legally through a prescription due to the risk of dependence (Desantis et al., 2008). Desantis et al. (2008) found that despite this public information, college students tend to have insufficient knowledge of the legal repercussions related to diversion, such as possible imprisonment. Destantis et al. (2008) also found that The Drug Enforcement Administration (DEA) has stated the legalities of prescription stimulant misuse, however, college students still do not deem it illegal to use stimulant medication without a prescription (Drug Enforcement Administration, 2014). One student was quoted to say “the stuff is everywhere. Just ask anybody, and they will either have it or know somebody that has it.

It's really no biggie" (DeSantis et al., 2008, p. 320). The ignorance or lack of legal knowledge or perceptions of danger surrounding prescription stimulant use within college students serves as a hindrance to public health (Kinman et al., 2017).

Regarding disciplinary consequences in an academic setting, there has been very limited research evaluating the efficacy of institutional policies in deterring the prevalence of prescription stimulant misuse (Faraone et al., 2020). Policies regarding academic integrity have demonstrated that institutions of higher education tend to approach PSM as a legal problem rather than taking disciplinary action (Faraone et al., 2020). This gap in previous research is confirmed through the definitions of risk, which typically omit disciplinary risk, and include physical harmfulness, health risks, and safety risks (Benson & Flory, 2015). Including the academic domain when discussing perceptions of risk is crucial because of the emphasis on academic performance in a college environment (Kinman et al., 2017). Furthermore, if college students are not observing any consequence for their peers' prescription stimulant use, they may perceive prescription stimulants as less harmful specifically in regard to the college environment (Kinman et al., 2017). Academic penalties could serve as a preventative measure to combat the use of prescription stimulants, but further research must be performed to determine if such penalties have any effect on behavior (Kinman et al., 2017).

The Current Study

The widespread availability of prescription stimulants has led to the looming possibility of a prescription stimulant crisis for many years (Faraone et al., 2020). Benson and Flory (2015) noted the dire need to continue research regarding prescription stimulant misuse as the prevalence rates continue to rapidly rise. Faraone et al. (2020) noted that "more research is urgently needed" as much of the previous literature is only scratching the surface regarding the

predictors, motives, and consequences of prescription stimulant use. College environments provide constant and convenient access to prescription stimulant medications and this is demonstrated through the rising prevalence rates among college students (Benson & Flory, 2015). Furthermore, it would be beneficial from a clinical viewpoint for clinicians and prescribers to better understand specific precursors, predictors, or characteristics of medical misuse and diversion when treating ADHD (Sepúlveda et al., 2011).

In recent years there have been influential discoveries regarding ADHD, medical misuse, and diversion in college students; nonetheless, there are still countless gaps and crucial areas that require further research (Weyandt & DuPaul, 2013). This study addresses several gaps in the previous literature. First, there is very limited research regarding conduct disorder or conduct problems in relation to medical misuse and diversion. This is an essential facet to study when considering the implementation of interventions that could prevent or decrease the prevalence rates of medical misuse and diversion. Furthermore, in comparison to other predictors, such as descriptive norms and demographic characteristics, perceptions of risk have been researched much less (Benson & Flory, 2015). It is imperative to study these factors in relation to medical misuse and diversion in order to understand more about the factors that may be fueling the uptick in prescription stimulant misuse in college students.

Hypotheses

Hypothesis 1: College students who present with more conduct problems will be more likely to medically misuse and divert their prescription stimulant medication.

Hypothesis 2: College students who present with higher perceptions of risk will be less likely to medically misuse and divert their prescription stimulant medication.

Hypothesis 3: Conduct problems will be inversely associated with perceptions of risk.

Hypothesis 4: College students who present with more conduct problems will be less likely to medically misuse and divert their prescription stimulant medication if they have higher perceptions of risk.

Research Questions

Previous research by Garnier-Dykstra et al. (2012) found that the time between the first opportunity to use a prescription stimulant and first use was approximately one year, so I formulated a research question to examine any associations between class year and perceptions of risk. Previous research by Pérez-Marfil et al. (2020) found that differences in socioeconomic status were significantly associated with differences in rule-breaking behaviors and aggressive behaviors. Furthermore, they found that those with lower socioeconomic status presented with more conduct problems (Pérez-Marfil et al., 2020). Thus, I formulated another research question to examine any relationships between conduct problems and socioeconomic status. Previous research by Arria et al. (2008) found that participants with a 4-year college degree had higher perceptions of harmfulness of prescription stimulants than those who had attended less than 4 years of college. Thus, I formulated a research question to examine any associations between perceptions of risk and socioeconomic status. To my knowledge, there is no previous research regarding relationships between socioeconomic status and prescription stimulant diversion, so I formulated a research question to examine any associations.

Research Question 1: How do perceptions of risk differ by participants' class year?

Research Question 2: Are conduct problems associated with socioeconomic status?

Research Question 3: Are perceptions of risk associated with socioeconomic status?

Research Question 4: Does diversion differ based on socioeconomic status?

Method

Participants

A total of 91 college students completed the online survey: 39 (42.9%) attended Trinity College, 34 (37.4%) attended Texas State University, and 18 (19.8%) attended University of Wyoming. The average participant was 20.31 years old ($SD=1.74$) with 19 (20.9%) assigned male sex at birth and 72 (79.1%) assigned female sex at birth. Gender identity was as follows: 19 (20.9%) identified as male, 61 (67%) identified as female, 6 (6.6%) identified as gender variant or gender nonconforming, 1 (1.1%) identified as genderqueer, 1 (1.1%) identified as transgender, 2 (2.2%) identified as other or nonbinary, and 1 (1.1%) declined to answer. 1 (1.1%) participant was a graduate student and 90 (98.9%) participants were undergraduate students, of which 19 (20.9%) were freshmen, 24 (26.4%) were sophomores, 23 (25.3%) were juniors, and 24 (26.4%) were seniors. 18 (19.8%) participants were a member of Greek life (fraternity/sorority) and 73 (80.2%) were not. Participants rated their socioeconomic status on a scale from 1 to 9 and the average participant reported a 4.98 ($SD = 1.81$). For more detail on the participants' demographic characteristics, see Table 1.

Measures

Medical misuse. Medical misuse was measured through questions adapted from Sepúlveda et al. (2011) and Wilens et al. (2006) in which participants indicated how many times they had engaged in specific misuse behaviors in the past 3 months. These behaviors included:

- Taking medication through alternative routes of administration
- Taking more or less than the recommended dose
- Taking someone else's prescribed stimulants
- Taking stimulants with other drugs in order to experience intoxicating effects

- Intentionally getting high off of stimulants.

Diversion. Diversion was measured through questions adapted from DeSantis et al. (2013, p. 448) in which participants indicated how many times they have engaged in specific behaviors related to diversion in the past 3 months. These questions asked about how often students had sold, traded, or given away their medication. These questions included:

- “Approximately how many times in the past three months (if any) have you given away your stimulant medication for free?”
- “Approximately how many times in the past three months (if any) have you sold your stimulant medication or traded it for something else?”
- “Approximately how many times in the past month (if any) have you given away your stimulant medication for free?”
- “Approximately how many times in the past month (if any) have you sold your stimulant medication or traded it for something else?”

Conduct Problems. Conduct problems were measured based on a measure adapted from Garnier et al. (2010) and Johnson et al. (1995) in which participants indicated how often they engaged in specific behaviors before the age of 18. Participants were asked “How many times did you engage in the following behaviors before you turned 18?” and then reported the frequency with which they engaged in those eleven behaviors using a five-point response scale of never, once, twice, three times, and more than three times (Johnson et al., 1995, p. 663-664).

The eleven behaviors included:

1. Took property belonging to others
2. Damaged other people’s property on purpose
3. Lied

4. Started physical fights with others
5. Broke rules
6. Hurt others physically
7. Skipped school
8. Ran away from home overnight
9. Used a weapon in a fight
10. Broke into someone's house/building/or car
11. Set fires

These eleven behaviors were weighted differently based on severity and depending on the number of times that each behavior was engaged in. Consistent with the approach of Johnson et al. (1995), we counted 1 point for the item(s) “took property belonging to others; damaged other people’s property on purpose; lied; started physical fights with others; broke rules” if they were engaged in three times or more than three times. We counted 1 for “hurt others physically; skipped school; ran away from home overnight; used a weapon in a fight; broke into someone’s house/building/or car; set fires” if they were engaged in two times, three times, or more than three times. Conduct problem scores could range from 0-11.

Perceived Risk. Perceived risk was measured based on five questions regarding the legal, physical, and disciplinary risks associated with the misuse or diversion of prescription stimulants. The questions were adapted from Harris et al. (2015) and Arria et al. (2008). Each item was measured using a four-point response scale from perceiving no risk, a slight risk, a moderate risk, or a great risk ($\alpha = .71$).

Legal Risk. Legal risk was measured through two questions adapted from Harris et al. (2015). Participants were asked “How much legal risk do you think is associated with: buying,

selling, trading, or giving away your prescription stimulant medication” and “How much legal risk do you think is associated with: approaching a doctor for prescription stimulant medication for nonmedical use” (Harris et al., 2015, p. 6). Responses to these two items were averaged to produce a legal risk composite score.

Physical Risk. Physical risk was measured through two questions adapted from Arria et al. (2008). Participants were asked “How much do you think people risk harming themselves (physically or in other ways) if they take stimulants without a prescription” and “How much do you think people risk harming themselves (physically or in other ways) if they use their prescription in a way a prescriber did not intend (ex: taking too much, snorting, mixing with other drugs)” (Arria et al., 2008, p. 194). Responses to these two items were averaged to produce a physical risk composite score.

Disciplinary Risk. Disciplinary risk was measured with a single question that was investigator derived: “How much risk for disciplinary consequences from your college/university do you think is associated with buying, selling, trading, or giving away your prescription stimulant medication?”

Design and Procedure

We recruited students through posting flyers throughout campus (including dining halls, the library, coffee shops, the student academic accommodations center, and the counseling center), distributing business cards, giving announcements in classes, asking professors to share information with students via email, and sending emails to randomly selected students. The inclusion criteria for participation include being prescribed a stimulant medication such as Adderall, Concerta, Ritalin, or Vyvanse. Students had to be 18 or older to complete the informed

consent form, and if they were under 18, we provided an assent form including consent from a parent/guardian.

Study participation was completely remote to avoid the risk of COVID-19 transmission. Students who were interested in participating initially completed our screening survey to confirm their eligibility (ages 17-25, current stimulant prescription, would be enrolled at their institution in six months). Informed consent was received prior to starting the study. The participants then completed a Zoom session with a research assistant in which they completed the baseline survey and viewed a web based presentation. Participants earned \$25 via an e-gift card for participating in this session. Although this study followed participants longitudinally for six months, my study focused on the baseline data since the study is ongoing and there was not yet a sufficient number of longitudinal records to analyze.

Results

Prevalence of Diversion and Medical Misuse

In a sample of 91 participants, 26 (29%) reported any diversion in the previous three months which could include giving away their prescription stimulant medication for free, and/or selling or trading their prescription stimulant medication for something else. When looking at the different forms of diversion, 26% reported giving it away for free, 13% reported selling or trading, and 11% endorsed both behaviors. Of those who reported giving away their prescription stimulant medication for free, 5 (6%) reported once, 1 (1%) twice, 6 (7%) three times, 1 (1%) four times, 3 (3%) five times, and 2 (2%) ten or more times. When looking at diversion in the form of selling or trading medication for something else, 79 (87%) reported that they had not sold or traded their prescription stimulant medication in the past 3 months, 4 (4%) reported that they had not in the past 3 months but that they had in the past year. Out of those who reported

selling or trading their prescription stimulant medication for something else, 3 (3%) reported once, 2 (2%) twice, 1 (1%) three times, 1 (1%) four times, 1 (1%) six times, and 1 (1%) seven times.

Regarding frequency of medical misuse, 66 (73%) reported any medical misuse. However, this percentage included students who reported taking less than their recommended dose. Excluding participants who reported taking less than their recommended dose, less than half (45%, $n=41$) reported medical misuse. Within the measure of medical misuse, 4 (4%) reported using through alternative routes of administration such as snorting, 33 (36%) reported taking more than their recommended dose, 56 (62%) reported taking less than their recommended dose, 13 (14%) reported taking someone else's prescription, 6 (7%) reported taking with other drugs, and 4 (4%) reported taking their medication to intentionally get high. Figure 1 shows the reported frequencies of different types of medical misuse of prescription stimulants.

Hypotheses

Conduct problems and medical misuse and diversion. To test my first hypothesis that college students who presented with a history of more conduct problems would be more likely to medically misuse and divert their prescription stimulant medication, I conducted a correlational analysis. I found a positive correlation between conduct problems and medical misuse ($r = .222$, $p = .035$). Here, medical misuse excluded the students who reported taking less than their recommended dose of prescription stimulant medication. There was no correlation between conduct problems and medical misuse when including students who just endorsed taking less than their recommended dose ($r = .131$, $p = .216$). Furthermore, I did not find a correlation between conduct problems and diversion ($r = .108$, $p = .310$) or between intentions to divert and

giving away for free ($r = .051$, $p = .635$) or intentions to divert and selling or trading ($r = .024$, $p = .818$). Thus, my first hypothesis is partially supported. Figure 2 shows differences in conduct problems by medical misuse. I followed up on the initial analysis by examining how the groups differed by item and found that there was a significant difference between the response for “broke rules” between those who endorsed misusing their prescription stimulants and those who did not.

Perceptions of risk and medical misuse and diversion. To test my second hypothesis that college students who endorsed greater perceptions of risk would be less likely to medically misuse and divert their prescription stimulant medication, I conducted a correlational analysis. I found a significant, inverse correlation between perceptions of risk and medical misuse including participants who reported taking less than their recommended dose ($r = -.234$, $p = .025$). I also found a significant inverse correlation between perceptions of risk and diversion ($r = -.278$, $p = .008$). Thus, my second hypothesis was supported. Figure 3 shows the mean perceptions of legal, physical, and disciplinary risk. The highest perception of risk reported was that of “physical risk for taking in a way prescriber did not intend”. The lowest perception of risk reported was that of “physical risk for taking without a prescription”. Figure 4 shows the differences in perceptions of legal, physical, and disciplinary risk by diversion. Between those who reported diversion and those who did not, there was a significant difference in the perceptions of legal risk regarding buying, selling, or giving away prescription stimulant medications.

Conduct problems and perceptions of risk. To test my third hypothesis that a history of conduct problems would be inversely associated with perceptions of risk, I conducted a correlational analysis. This hypothesis was supported, as I found a significant inverse correlation

between perceptions of risk and conduct problems ($r = -.245, p = .019$). Thus, higher perceptions of risk were associated with fewer conduct problems before the age of 18.

Medical misuse, diversion, conduct problems, and perceptions of risk. To test the first part of my fourth hypothesis that participants who endorsed more conduct problems before the age of 18 would be less likely to divert their prescription stimulant medication due to higher perceptions of risk, I conducted a mediational analysis in two steps using the PROCESS macro version 3.4 for SPSS (Hayes, 2013). In the first step, I examined associations between conduct problems and the covariates, sex assigned at birth and class year, with the outcomes of perceptions of risk and diversion, respectively. The models predicting perceptions of risk ($R^2 = .1829$) and diversion (Nagelkerke $R^2 = .2438$), respectively, were significant (both $p < .05$). There was a significant positive association between sex assigned at birth and perceptions of risk (standardized coefficient = $.4568, p = .0006$), as well as conduct problems and perceptions of risk (standardized coefficient = $-.0785, p = .0132$). Class year, however, was not significant predictors of perceptions of risk.

In the second step of the mediational analysis, the dichotomous outcome of diversion was regressed onto the independent variable (conduct problems), the hypothesized mediator (perceived risks), and the covariates (sex assigned at birth and class year). Although conduct problems were not associated with diversion directly, there was an indirect effect of conduct problems through perceptions of risk [indirect effect = $.1155, SE (.0741), 95\% CIs [.0024 .2283]$. Table 2 shows the model coefficients for hypothesized mediation model predicting diversion.

To test the second part of my fourth hypothesis that participants who endorsed more conduct problems before the age of 18 would be less likely to medically misuse their prescription stimulant medication due to higher perceptions of risk, I conducted a mediational analysis in two

steps using the PROCESS macro version 3.4 for SPSS (Hayes, 2013). I also ran a mediational analysis to examine the associations between conduct problems with the outcomes of perceptions of risk and medical misuse, respectively. The models predicting perceptions of risk ($R^2 = .0309$) and medical misuse (Nagelkerke $R^2 = .0947$), respectively, were not significant.

In the second step of the mediational analysis, the dichotomous outcome of medical misuse was regressed onto the independent variable (conduct problems) and the hypothesized mediator (perceived risks). There were no indirect effects of medical misuse through perceptions of risk [indirect effect = .0621, $SE (.0577)$, 95% CIs [-.0411 .1936].

My fourth hypothesis that participants who endorsed more conduct problems before the age of 18 would be less likely to medically misuse or divert their prescription stimulant medication due to higher perceptions of risk was partially supported. There was an indirect effect of conduct problems through perceptions of risk, but not an indirect effect of medical misuse through perceptions of risk. Figure 5 shows the test of the mediation model, with solid lines indicating significant paths.

Research Questions

Perceptions of risk and class year. To test my first research question regarding how perceptions of risk differ by class year, I conducted an ANOVA. I did not find any significant associations between class year and perceptions of risk ($F(3, 86) = .131, p = .941$).

Conduct problems and socioeconomic status. To test my second research question regarding whether conduct problems differ based on socioeconomic status, I conducted a correlational analysis. There was no significant correlation between conduct problems and socioeconomic status ($r = -.122, p = .248$).

Perceptions of risk and socioeconomic status. To test my third research question regarding whether perceptions of risk differ based on socioeconomic status, I conducted a correlational analysis. I found a significant positive correlation between perceptions of risk and socioeconomic status ($r = .378, p = <.001$). Higher perceptions of risk were associated with a higher socioeconomic status.

Diversion and socioeconomic status. To test my fourth research question regarding whether diversion differs based on socioeconomic status, I conducted a correlational analysis. I found a significant inverse correlation between diversion and socioeconomic status ($r = -.289, p = .005$). Thus, higher socioeconomic status was associated with less diversion. Specifically, when examining both types of diversion assessed, socioeconomic status was associated with both selling or trading ($r = -.275, p = .014$) and giving away for free ($r = -.271, p = .009$).

Discussion

The aim of the current study was to address gaps in the literature regarding predictors of prescription stimulant medical misuse and diversion, and to examine predictors of these behaviors including conduct problems and perceptions of risk. I examined the prevalence of diversion and medical misuse in a sample of college students, and how conduct problems and perceptions of risk were associated with these behaviors. My key findings were that there was an indirect effect of conduct problems on diversion through perceptions of risk, such that students who endorsed more conduct problems perceived fewer risks associated with prescription stimulant misuse and, in turn, were more likely to divert their medication. These findings help to fill gaps in the literature and broaden our understanding of characteristics associated with diversion, which may inform future prevention programming.

Medical Misuse

I expected to replicate previous findings regarding the prevalence rates of medical misuse within college students. Sepúlveda et al. (2011) found that 40% of students misused their prescription stimulant medications, similarly to Rabiner et al. (2009), who found that 31% of college students reported misusing their prescription stimulant medications. We found, however, that 66 (73%) reported medical misuse. This percentage may be higher than previous studies because we included “taking less than their recommended dose” in our measure of medical misuse. Furthermore, taking less than the recommended dose was the most frequent form of medical misuse ($n=56$; 62%). However, many may not consider taking less than the recommended dose as a form of misuse. When excluding participants who reported taking less than their recommended dose from the measure of medical misuse, less than half ($n=41$; 45%) reported medical misuse which was more consistent with previous research by Sepúlveda et al. (2011) and Rabiner et al. (2009). The second most prevalent form of misuse was that of taking more than one’s recommended dose ($n=33$; 36%). This is concordant with previous data from Rabiner et al. (2009), who found that nearly one third of college students reported either taking their prescription stimulant more often than their prescriber intended or taking more than prescribed. Furthermore, Wilens et al. (2006) found that the most frequent form of misuse was taking more than their recommended dose. Previous research has suggested that the least common form of misuse is using prescription stimulants to get high (Sepúlveda et al., 2011). Our results support these findings, as only 4 (4%) participants reported using prescription stimulants to get high. Similarly, we found that 4 (4%) participants reported using prescription stimulants through alternative routes of administration, somewhat lower than Rabiner et al. (2009), who found that about 8% of college students reported using their prescription stimulant medication

intranasally. Rabiner et al. (2009) also found that 68% of participants who reported medical misuse also reported purposefully using their prescription stimulants with alcohol (92%) and/or other illicit substances. However, we found that only 6 (7%) participants reported taking prescription stimulants with other drugs. Discrepancies in these findings may be due to the wording of our measure as we asked about prescription stimulant use with other drugs rather than specifying alcohol. Furthermore, participants who use illicit drugs may be less likely to participate in a longitudinal study regarding their experiences in college.

Diversion

I expected to replicate previous findings regarding the prevalence rates of diversion within college students. Garnier et al. (2010) found that within a sample of 483 students, 35.8% had diverted medication at least once. Our results found, however, that only 26 (29%) reported any diversion. Our prevalence rate may be slightly lower due to the fact that our sample size is significantly smaller than that of Garnier et al. (2010). Furthermore, those endorsing diversion may be less likely to participate in a study regarding their use of prescription stimulant medications. Those who do elect to take part in a longitudinal study may be less likely to engage in diversion.

When looking at methods of diversion, previous research has found that the most common method was sharing (33.6%) followed by selling (9.3%) (Garnier et al., 2010). Within our sample, 26% reported giving it away for free, 13% reported selling or trading, and 11% reported endorsing both behaviors. These results support previous research that found the most common method to be sharing followed by selling. The number of those who endorsed both behaviors is similar to the percentage of those who endorsed selling their prescription stimulant medication. This may be due to the fact that those who sell their medications are also

comfortable with giving them away for free since the risk for selling may be deemed higher than the risk for giving away for free.

Conduct problems and medical misuse and diversion

My hypothesis that college students who present with more conduct problems will be more likely to medically misuse and divert their prescription stimulant medication was partially supported. I found a positive correlation between conduct problems and medical misuse, meaning that more conduct problems was associated with more medical misuse. This supports previous research by VanEck et al. (2012), who found that higher levels of conduct problems increased the risk of misusing prescription stimulant medications. However, our measure for medical misuse excluded participants who reported taking less than their recommended dose as there was no correlation between conduct problems and medical misuse when including students who just endorsed taking less than their recommended dose. Out of the 11 conduct problem behaviors, a significantly greater number of participants who reported medical misuse also reported that they broke rules than the number of participants who reported no misuse.

I did not find a correlation between conduct problems and diversion. Therefore, I performed exploratory analyses to examine whether conduct problems were associated with intentions to divert. However, I did not find a correlation between conduct problems with intentions to divert whether giving away for free, selling, or trading. These results conflict with prior findings showing that conduct problems were associated with a greater likelihood of diversion (Garnier et al., 2010). In addition, Garnier et al. (2010) found that each individual conduct problem behavior increased the risk of diversion by 13%. Our results may be due to having a sample size almost a quarter of the size of Garnier et al. (2010). Similarly to Garnier et al. (2010), Wilens et al. (2006) reported that of their participants, 98 males aged 16 to 27, around

80% of the participants who misused or diverted their medications had comorbid conduct disorder or substance use disorder. Although we found support for medical misuse, the discrepancy regarding diversion could be due to gender differences as Wilens et al. (2006) had all male participants and we had a majority of female participants. The lack of association between conduct problems and diversion in this study may be due to the fact that we had a majority of female participants because conduct problems are less prevalent in females than in males.

Perceptions of Risk and Medical Misuse and Diversion

The hypothesis that college students who endorse greater perceptions of risk will be less likely to medically misuse and divert their prescription stimulant medication was supported. There was significant inverse correlation between perceptions of risk and medical misuse as well as a significant inverse correlation between perceptions of risk and diversion. Similarly, Holt and Looby (2018) found that participants were more likely to engage in prescription stimulant misuse if they considered it more harmless. Furthermore, they found that concern or worry of being caught, including negative reactions from parents or prescribers, was associated with a lower risk for diversion (Holt & Looby, 2018). Our findings show that for legal, physical, and disciplinary risks, those who reported no diversion had higher perceptions of risks while those who reported diversion had lower perceptions of risk.

Legal Risks. There was a significant difference in the perceptions of legal risk regarding buying, selling, or giving away prescription stimulant medications between those who reported no diversion and those who reported any diversion. Previous research suggests that despite public information regarding the legal repercussions related to diversion, college students are less educated on this topic (Desantis et al., 2008) However, our findings suggest that college

students perceive legal risks to be the most prominent in comparison to physical and disciplinary risks.

Health Risks. DeSantis et al. (2008) found that of the students who endorsed misusing prescription stimulants, none pursued any information from medical or health professionals or the internet before using. Our findings suggest no significant difference in diversion based on perceptions of health risks. This may indicate that students either did not pursue information about the health risks as stated by DeSantis et al. (2008), or they don't believe that these health risks are of enough concern to prevent diversion. Previous research by DeSantis and Hane (2010) found that college students reported considering prescription drugs including stimulants as much safer than illicit drugs. Thus, since prescription stimulant medications are so readily available, they may appear as more safe in comparison to other drugs.

Disciplinary Risks. One of the most predominant gaps in the literature is that of disciplinary risks. Faraone et al. (2020) note that institutions of higher education tend to focus on the legal risks rather than academic penalties that would imply disciplinary risks. This is the first study, to my knowledge, that includes disciplinary risk in the definition and measure of perceptions of risk. Although we did not find a significant difference in diversion based on perceptions of disciplinary risk, it is imperative that it be further studied, especially with a population of college students.

Conduct Problems and Perceptions of Risk

The hypothesis that conduct problems will be inversely associated with perceptions of risk was supported. I found a significant inverse correlation between perceptions of risk and conduct problems, meaning that higher perceptions of risk were associated with lower conduct problems. This study made a novel contribution by examining this link since to my knowledge

there is no previous research regarding this association. These results are particularly influential since perceptions may be modifiable, while past conduct problems are not.

Medical Misuse, Diversion, Conduct Problems, and Perceptions of Risk

The hypothesis that participants who endorse more conduct problems before the age of 18 will be less likely to medically misuse or divert their prescription stimulant medication due to higher perceptions of risk was partially supported. There was an indirect effect of conduct problems on diversion through perceptions of risk, such that students who endorsed more conduct problems perceived fewer risks associated with prescription stimulant misuse and, in turn, were more likely to divert their medication. This type of mediation model is a novel contribution to the literature and helps to explain why conduct problems have been associated with diversion in previous research.

Conduct problems and perceptions of risk were not associated with medical misuse, as hypothesized. This could be due to the fact that college students may deem diversion as more problematic than medical misuse because medical misuse is of their stimulant medication that they are prescribed.

Exploratory Analyses

I sought to examine whether there were any demographic characteristics that could influence the variables of diversion, perceptions of risk, and conduct problems, and further their relationships with each other. My first research question examined a relationship between perceptions of risk and class year. I expected that perceptions of risk would differ based on time spent in a college environment, but I did not find any significant relationships between class year and perceptions of risk. This may be due to the prevalence of prescription stimulant misuse and diversion in college regardless of class year. My second research question examined a

relationship between conduct problems and socioeconomic status. I expected that there would be a negative correlation between conduct problems and socioeconomic status, but there was no significant correlation. This may be due to the fact that our sample size is entirely that of a college-attending population. A college-attending population may be of a higher socioeconomic status than those who do not attend college, so we may not have included participants of a lower socioeconomic status. Arria et al. (2008) found that perceived harmfulness differed between those with a 4-year college degree and those who had attended less than 4 years of college. Furthermore, students of a lower socioeconomic status who present with symptoms of ADHD may be less likely to be evaluated and medicated due to the costs associated with these services. My third research question examined a relationship between perceptions of risk and socioeconomic status. Results show a significant positive correlation between perceptions of risk and socioeconomic status, meaning that higher perceptions of risk were associated with a higher socioeconomic status. Those with a higher socioeconomic status could perceive more perceptions of risk due to the environment prior to college. For example, parental education status as well as high school education could play a role. My fourth research question examined a relationship between diversion and socioeconomic status. There was a significant inverse correlation between diversion and socioeconomic status, meaning that higher socioeconomic status was associated with less diversion. This association was present for all methods of diversion, selling or trading, and giving away for free. This could be due to the fact that those with a higher socioeconomic status reported higher perceptions of risk which could prevent them from endorsing behaviors such as diversion.

Limitations and Future Directions

Although the current study adds to the literature regarding predictors of medical misuse and diversion, there are several limitations that must be addressed. Our sample size was relatively small ($N=91$) in comparison to previous studies. Further research should be performed to replicate our findings. Furthermore, our sample was mostly White. Previous research has acknowledged the limited generalizability of findings that are performed on smaller sample sizes of white middle-class students (Weyandt & DuPaul, 201; Wilens et al. 2006). However, previous research has predominantly focused on male populations, whereas the current study was majority female. Although having more female participants addresses gaps in the previous literature, which has predominantly focused on males, an overrepresentation of females can also present limitations. Females may be less likely to present with conduct problems and more likely to report higher perceptions of risks. Further research should be performed in an attempt to replicate findings with less variability regarding gender.

Our sample was also majority from Trinity College (43%) in comparison to Texas State University (37%) and University of Wyoming (20%). This could skew some of the results due to differences in perceptions of risk based on geographic locations. In geographic locations where rates of substance use are higher, perceptions of risk may be lower. Therefore, if medical misuse and diversion differ by geographic area such as a particular college campus, then perceptions of risk may differ as well.

Our study focused on medical misuse rather than prescription stimulant misuse as a whole. Thus, we only focused on those who have a prescription rather than those who may misuse or divert without a prescription. Previous research has found that “diversion was not limited to students with a current prescription” (Lam et al., 2020, p. 337). Thus, there may be

another population of diverters who we are not addressing in this study due to the inclusion criteria of needing to be prescribed stimulant medication. Although it is important to include medical misuse findings to the literature, this could also explain variability in results in comparison to previous studies that had a more generalizable definition of misuse. This demonstrates the challenge of defining misuse. Within our definition of misuse, we included the measure of “taking less than the recommended dose”. Many may not consider this to be a form of medical misuse as participants could be taking less of their prescription stimulant due to side effects or being prescribed too high of a dose. To account for this limitation, we measured medical misuse with and without the participants who endorsed taking less than their recommended dose. Furthermore, those who medically misuse and divert their medications may be less likely to participate in a longitudinal study regarding their experiences with their medication

When looking at conduct problems, it is important to note that our sample was college students. This population of emerging adults may be less prone to conduct problems because they are enrolled in a 4 year college. Furthermore, we looked at self reported conduct problems from before the age of 18. Students may be biased in their self report of behaviors, and/or may not remember the accurate number of times that they may have endorsed specific behaviors. Future research regarding conduct problems is imperative as intervention strategies may be designed for individuals who present with conduct problems and are also diagnosed with ADHD or prescribed a stimulant medication. Lastly, those who misuse and divert their medications may be less likely to participate in a longitudinal study regarding their experiences with their medication.

Implications

This research could help inform interventions for individuals who present with conduct problems in their adolescence. Especially if they are diagnosed with ADHD or prescribed a stimulant medication, then prescribers and counselors could make sure to educate them on the legal, physical and disciplinary risks. Prescribers and clinicians should take into account other risk factors and potential problems that may arise from the prescription of a stimulant medication. The perceptions of physical and disciplinary risk were lower than legal risks, so raising awareness about these is crucial. It is still imperative to educate about legal risks since those might be the most compelling way to change behavior among students with pre-existing conduct problems. For example, those who present with conduct problems in adolescence could be provided with an intervention prior to integrating into a college environment. This intervention could provide these students with information regarding the legal, physical and disciplinary risks associated with medical misuse and diversion, as well as techniques for avoiding these behaviors. By attempting to shape these perceptions of risks, those who are at risk for medical misuse and diversion may have more protective factors to prevent these behaviors.

Conclusion

The current study adds to the previous literature regarding prevalence rates of prescription stimulant misuse and diversion. Furthermore, we sought to understand more about predictors of these behaviors. Previous literature is not focused as heavily on conduct problems and perceptions of risk in comparison to other predictors, but this research establishes an association between conduct problems, perceived risk, and medical misuse and diversion of prescription stimulants.

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Table 1

Demographic Characteristics

Study Variable	Sample (N=91)
Age (M, SD)	20.31 (1.74)
Socioeconomic status (M, SD)	4.98 (1.81)
Sex assigned at birth	
Male	21%
Female	79%
Gender	
Man	21%
Woman	67%
Genderqueer	1%
Gender Variant, Gender Non-conforming	7%
Transgender Man	1%
Other (nonbinary)	2%
Decline to answer	1%
Race/Ethnicity	
Asian or Asian American	1%
Black or African American	2%
White	87%
Other or Multicultural	10%
College/University	
Texas State University	37%
Trinity College	43%
University of Wyoming	20%
Undergraduate Student	99%
Graduate Student	1%
Class Year	
Freshman	21%
Sophomore	26%
Junior	25%
Senior, 5th, or 6th year	26%
Member of a Greek organization	20%
Not a member of a Greek organization	80%
Type of High School	
Public	71%
Private	25%
Parochial (religious)	1%
Homeschool	2%

Table 2

Model Coefficients for Hypothesized Mediation Model Predicting Diversion

Independent	Dependent					
	M (perceptions of risk)			Y (diversion)		
	Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>
X (conduct problems)	-.0785	.0310	.0132	.1134	.1546	.4633
M (perceptions of risk)	—	—	—	-1.4718	.5411	.0065
Sex	.4568	.1280	.0006**	.7982	.7346	.2772
Class year	-.0015	.0480	.9745	.7111	.2603	.0063*
	$R^2 = .1829$ $F(3, 86) = 6.417, p < .001$			Nagelkerke $R^2 = .2438$ $-2LL = 91.3776, p < .01$		

Note. * $p < .01$, ** $p < .001$

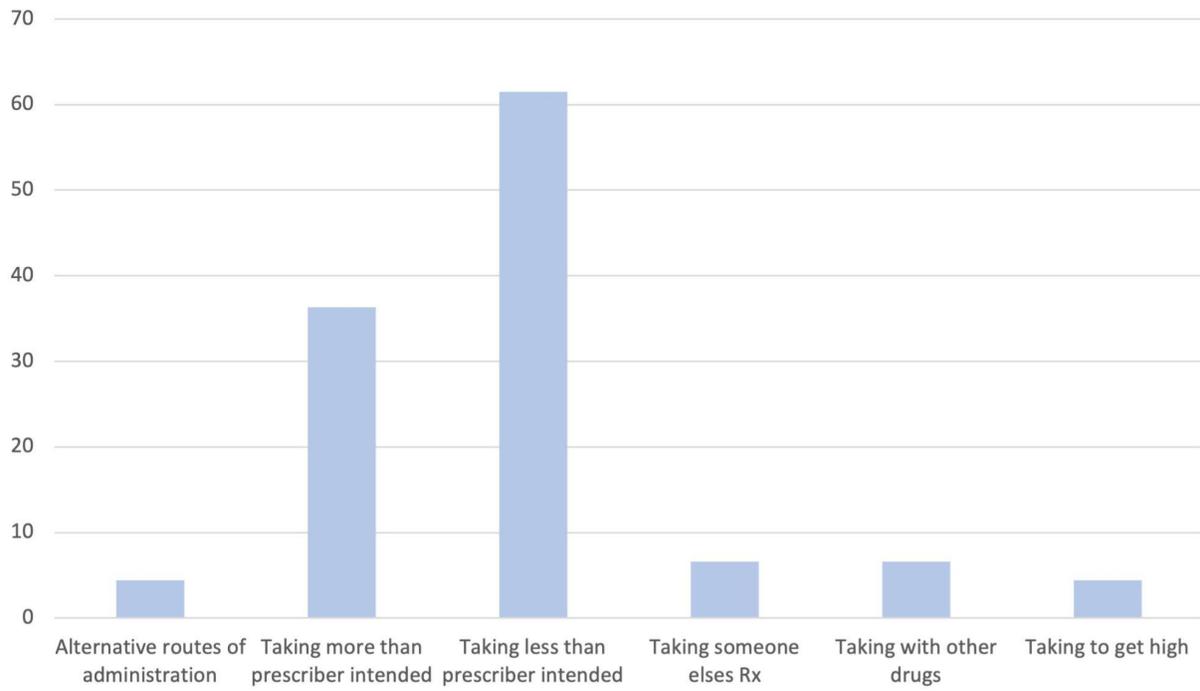


Figure 1. Frequencies of different types of medical misuse of prescription stimulants.

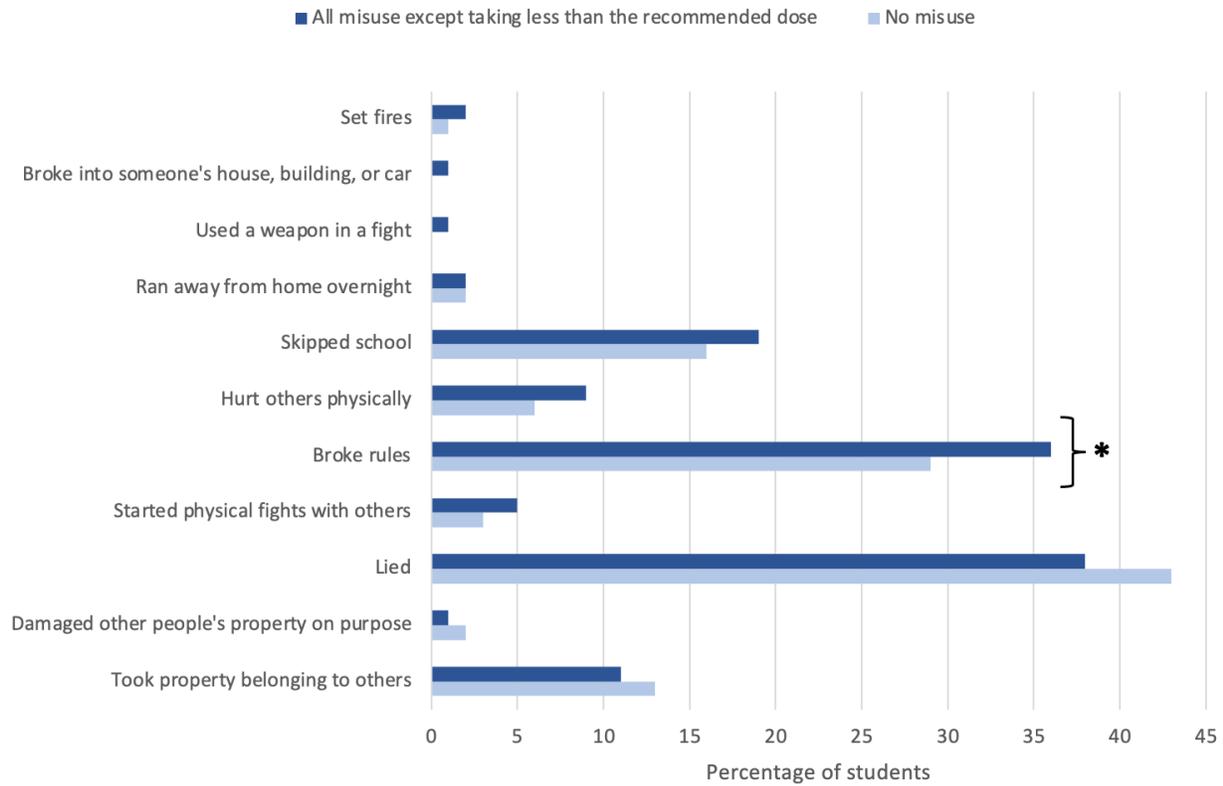


Figure 2. Differences in conduct problems by misuse. Number of participants who reported conduct problem behaviors by group of all misuse (except taking less than the recommended dose) and no misuse. A significantly greater number of participants who misused reported that they broke rules than the number of participants who reported no misuse. * $p < .05$

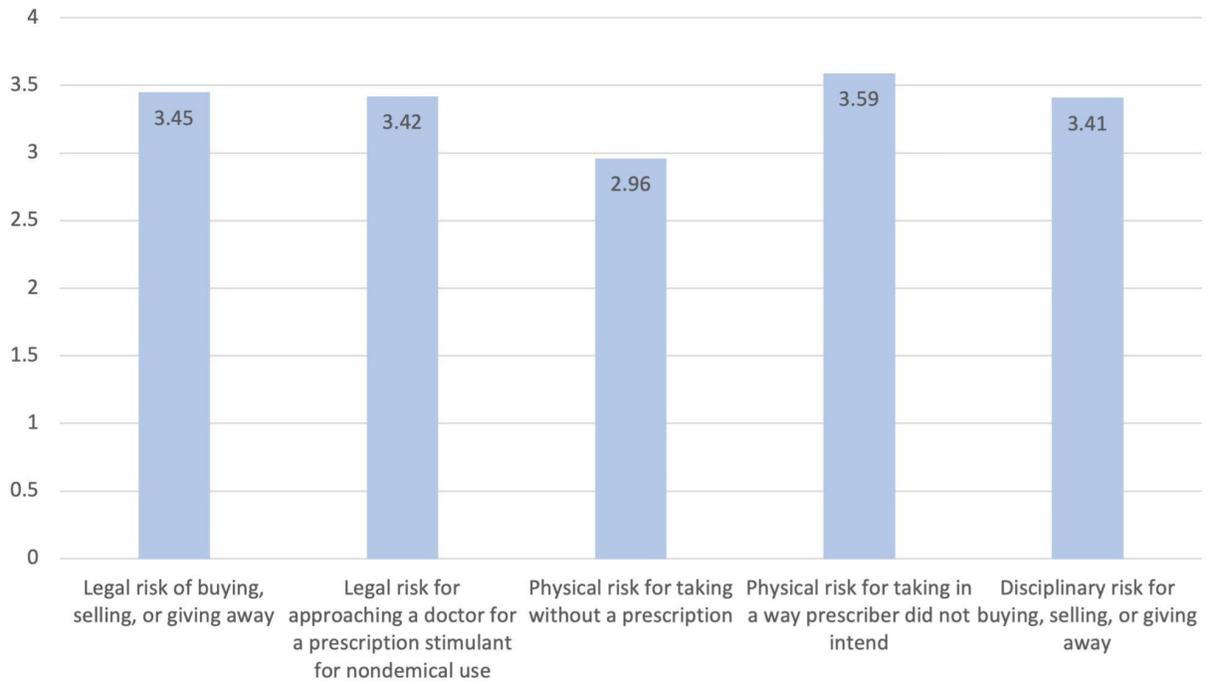


Figure 3. Mean of each item on the risk scale (legal, physical, disciplinary).

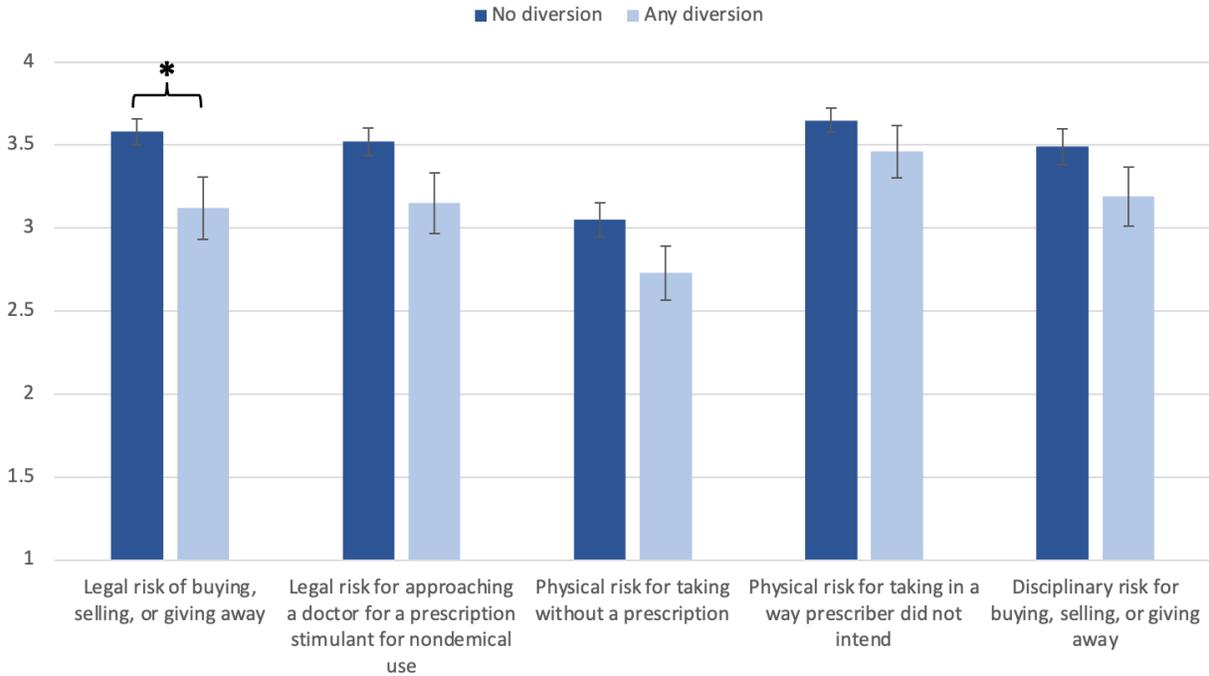


Figure 4. Differences in Perceptions of Risk by Diversion. Differences in perceptions of legal, physical, and disciplinary risk by groups of no diversion and any diversion. There was a significant difference in the perceptions of legal risk regarding buying, selling, or giving away prescription stimulant medications between those who reported no diversion and those who reported any diversion. * $p < .05$

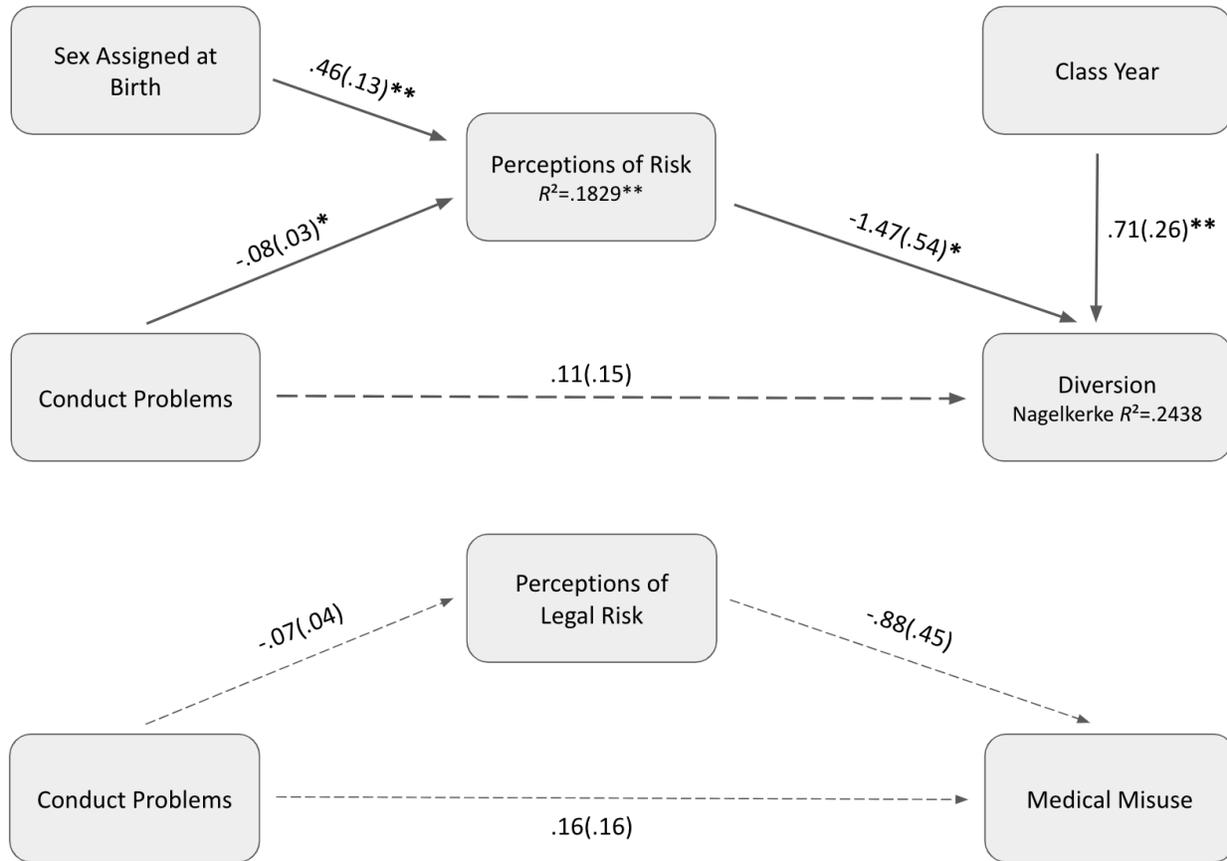


Figure 5. Mediation Model

Note: The path where I tested sex assigned at birth and diversion ($p = .2772$) was not significant nor was the path from class year to perceptions of risk ($p = .9745$).