Deviant Behavior

Academic Strain and Non-Medical Use of Prescription Stimulants among College Students

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Recent research indicates that the prevalence of non-medical prescription drug use is now greater than the prevalence of other illicit drug use, with the exception of marijuana. Existing research focuses on demographic characteristics of users, risk factors and motivations for use, and sources of diversion. A significant gap in the extant literature is an examination of theoretical predictors of use. Using data from the Harvard School of Public Health's College Alcohol Study, the current research addressed this limitation by applying Agnew's general strain theory to the study of non-medical prescription drug use. Specifically, we examine whether academic strain is associated with the non-medical use of prescription stimulants. Findings are supportive of general strain theory, as students who experience academic strain report higher levels of depression, our measure of negative affect, and students who report

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higher levels of depression are more likely to report
the non-medical use of prescription stimulants.

In recent years, there has been a substantial increase in the
prevalence of non-medical prescription drug use among ado-
lescents and young adults. Non-medical prescription drug
use is generally defined as the use of prescription medica-
tions without a prescription or use solely for the feeling or
experience caused by the drug. Between 1992 and 2003
the number of adolescents ages 12 to 17 in the general popu-
lation reporting non-medical prescription drug use increased
212% (National Center on Addiction and Substance Abuse
at Columbia University 2005). Recent research has identified
demographic characteristics and other risk factors for
non-medical prescription drug use (Herman-Stahl et al.
2007; Johnston et al. 2006a; Kroutil et al. 2006; McCabe
et al. 2007; McCabe et al. 2006; McCabe et al. 2005a;
McCabe et al. 2005b; McCabe et al. 2004; SAMHSA 2006;
Simoni-Wastila et al. 2004; Sung et al. 2005). However, very
little research to date has applied criminological theories to
the study of this emerging form of substance use. In this arti-
cle, we apply concepts from Agnew's (1992) general strain
theory to non-medical use of prescription drugs in a national
sample of college students.

LITERATURE REVIEW

Non-Medical Prescription Drug Use and College Life

The non-medical use of prescription drugs has become cause
for great concern over the past 20 years. According to find-
ings from the National Survey on Drug Use and Health,
approximately 21% of the U.S. population ages 12 and older
report using any type of prescription drug non-medically in
their lifetime, 16% report use of opiate-type pain killers,
8% report tranquilizer use, 8% report stimulant use, and
2% report sedative use (SAMHSA 2006). Similarly, the
National Institute on Drug Abuse (2001) estimated that
approximately 4 million people used prescription drugs non-
medically in 1999, and trends point to an increasing preva-
lence in non-medical prescription drug use. The current

trends in use are especially problematic given the public health concern over the misuse potential of prescription drugs (Hurwitz 2005; Johnston et al. 2006b; Kollins et al. 2001; Poulin 2001; SAMHSA 2005).

Non-medical prescription drug use is especially problematic among adolescents and young adults. Among a sample of middle and high school students from a public school district in Detroit, Michigan, for example, McCabe et al. (2007) reported that the lifetime prevalence of non-medical prescription drug use was 20.9% and national surveys show higher lifetime prevalence rates of non-medical prescription stimulant use among high school students (see Johnson et al. 2006c; McCabe et al. 2004). This high prevalence of non-medical prescription drug use among adolescents and young adults is disturbing, especially considering the trend of increasing use in recent years. This trend is particularly pronounced among the college-aged population. Data from the 2002 National Survey on Drug Use and Health show that the lifetime prevalence rate of non-medical prescription pain reliever use among youth aged 12 to 17 increased from 1% in 1989 to 11% in 2002 (SAMHSA 2003), while the lifetime prevalence rate among young adults aged 18 to 25 increased from 7% to 22% over the same period. There has been little evidence presented that the increasing trends in non-medical prescription drug use among adolescents and young adults will slow or reverse any time in the near future.

College students have historically been at the forefront of changes in substance use that later materialize within the general population (Johnston et al. 2006b). Using data from The College Alcohol Study, Mohler-Kuo et al. (2003) reported significant increases in the prevalence of non-medical prescription drug use between 1993 and 2001 across several classes of prescription medication. The National Survey on Drug Use and Health estimates that an average of 14.2% of full-time college students age 18−22 used prescription drugs for non-medical purposes at least once between 2002 and 2004, although the same survey indicated that young adults in the same age range not enrolled in college misused the medication at a significantly higher rate (SAMHSA 2006). College students, however, showed higher past year prevalence rates of stimulant use, the topic addressed in the current research, than their counterparts

in the same age range not enrolled in college (4.3% and 4.1%, respectively), but the difference is not significant (SAMHSA 2006).

The primary motivations for non-medical prescription drug use among college students include relieving pain, experimentation, getting high, and relaxation (Low and Gendaszek 2002; McCabe et al. 2007; Quintero et al. 2006; Teter et al. 2005) as well as an aid to sleep, pain control, and weight loss (Quintero et al. 2006). Most importantly to the current research, college students report misusing prescription medication, specifically stimulants, to help meet academic demands by improving intellectual performance and increasing concentration/alertness (Babcock and Byrne 2000; Low and Gendaszek 2002; Quintero et al. 2006; Teter et al. 2005).

Anecdotal evidence points to the widespread use of prescription stimulants such as Adderall, Ritalin, and Dexedrine without a prescription by both high school and college students. These so-called homework drugs help students focus on course material and study for longer periods of time, and use is more common at schools with more competitive admission standards and generally peaks during finals week. There are a number of possible explanations for the widespread use of these ''homework drugs.'' First, students may feel compelled to use these drugs as a way to manage a hectic schedule including a full-time course load, part-time employment, extracurricular activities, and social activities. Second, these drugs are widely available and their use as a ''study aide'' is socially acceptable. Students may feel that using prescription stimulants is a way to achieve a socially approved goal, good grades, and is therefore more acceptable than using other drugs simply to get high.

College life has traditionally been associated with experimentation, including high rates of substance use (Baer 2002; Kett 1977; Horowitz 1987). The growing trend of non-medical prescription drug use among young adults generally, and among college students specifically, is cause for concern given the addictive potential of such medication and the health consequences that misuse of these substances can cause. An especially troubling aspect of the prevalence and growing popularity of misusing prescription medication is the putative advantages of using prescription drugs

compared to ''street'' drugs. Cicero et al. (2005) argued that prescription drugs are easier to obtain, there is less likelihood of arrest, use is more socially accepted, and there is a perception that prescription drugs are safer. Prescription drugs then are ideal candidates for misuse in a college environment. Prescription medications are ''pure,'' having a known chemical composition and predicable dose-dependent effects, and are widely available on college campuses (Quintero et al. 2006). Using prescription medication for recreational and instrumental purposes has become normalized among certain social groups on college campuses.

The misuse of prescription medication is clearly a growing problem among youth in our society, particularly college students and college-aged young adults, but to the best of our knowledge no research to date has applied criminological theories to the study of this emerging and troubling form of substance use. Forging a theoretical understanding of the processes contributing to non-medical prescription drug use is essential to developing programs and policies to curb this growing trend. Understanding the theoretical processes involved in the misuse of prescription medication is an essential first step in slowing the spread of this unique form of substance use on college campuses.

General Strain Theory and Substance Use

Given the academic demands placed on today's college students, the immense pressures to succeed that college students face on a regular basis, and the instrumental coping capabilities of prescription stimulants specifically to help meet these demands, general strain theory is a particularly useful framework to foster a theoretical grasp on the processes leading to prescription medication misuse among college students. To the degree that colleges and universities are subcultures with a distinct set of values and norms within the dominant culture, academic achievement is a particularly salient goal unique to academic settings.

Agnew's (1992) general strain theory outlines three non-mutually exclusive sources of strain. The first source follows Merton's (1938) conceptualization of strain—the failure to achieve positively valued goals. Within the college culture, as indicated earlier, academic success is one particularly salient goal that students are expected to strive for and

achieve. Due to many factors, academic success is not always possible for some students; even students who are committed to their studies and utilize the appropriate channels to increase the chances of success will sometimes encounter individuals and situations that block progress toward achieving this important goal. Strain results from the failure to achieve this culturally defined goal. Prior research highlights poor grades as a form of strain from this perspective (Agnew 1992; Agnew and White 1992; Sharp et al. 2001; Vowell and Chen 2004). The second source of strain is the removal of positively valued stimuli. The loss of a boyfriend/girlfriend, the death of a loved-one, and the divorce of one's parents are generally considered straining events broadly construed as the loss of positively valued stimuli. In the context of college life, the removal of positively valued stimuli might include receiving poor grades, loss of scholarship money, negative encounters with faculty, and perceived discrimination. The third source of strain according to general strain theory is the presence of noxious stimuli. Agnew (1992) refers to residing in an unpleasant neighborhood, experiencing child abuse and neglect, and criminal victimization as examples of noxious stimuli likely to cause strain. In academic settings, noxious stimuli might include decrepit physical infrastructural conditions, physical and verbal abuse by peers, and faculty who are overly harsh in interactions with students. For the purposes of the current article, we also maintain that poor grades, in certain circumstances, can be interpreted as an example of the presences of noxious stimuli.

Taken together, the failure to achieve academic success and the inability to meet the academic demands at colleges and universities fit nicely within the three sources of strain identified by the general strain theory and academic strain is therefore likely to lead to deviance and crime. The general strain theory, however, does not postulate a direct relationship between strain and criminal activities. Rather, strain increases the probability that an individual will endure negative affective states, such as anger, anxiety, fear, or depression (Agnew 1992; Agnew and White 1992). College is an excessively stressful period for many young adults caused by heavy academic workloads, fear of failure, and competition for the highest grades (Cottrell 1992; Patrick et al.

1992), and this stress contributes to many of the problems common among college student populations, including depression (Cottrell 1992; Patrick et al. 1992).

The negative affective states caused by strain cause pressure for corrective action (Agnew 1992). Deviance and crime is one possible method of alleviating strain and the negative emotionality associated with strain, as deviance can aid in achieving desired goals, protect valued stimuli, or help escape from noxious situations (Agnew 1992; Agnew and White 1992). More importantly to the current research, adolescents who experience strain may try to manage the negative affect through substance use. Crime and violence are unlikely to be instrumental methods of achieving desired academic goals or avoid losing positively valued stimuli within academic settings, but the negative affect of academic strain can be easily remedied through the use of illicit drugs or even heavy alcohol use.

Prior research has indicated that college students often turn to illicit drugs (Eitle 2002; Garfinkel et al. 1982; Sax 1997) and/or alcohol (Baker et al. 1985; Leeman and Wapner 2001; Perkins 1999) in response to stress in academic settings. Outside of academic settings, other research has also shown a clear link between stress and strain and substance use (Hartnagel and Krahn 1989; Menard 1995; O'Hare and Sherrer 2000; Preston 2006), especially among young adults. Depression that results from strain is the negative affective state most strongly associated with ''passive'' crimes like illegal drug use (Jang and Johnson 2003; Piquero and Sealock 2000).

Tests of general strain theory have shown support for the theory in explaining juvenile delinquency and violent crime (Agnew and White 1992; Aseltine et al. 2000; Hoffmann and Cerbone 1999; Paternoster and Mazerolle 1994; Piquero and Sealock 2004), but tests have not always supported the theoretical connection between strain and substance use (Agnew and White 1992; Aseltine et al. 2000). One possible reason for these mixed findings is that most of the prior research on the general strain theory and substance use has focused primarily on marijuana use or more general substance use scales that are unable to distinguish between the types of illicit substances used. Furthermore, prior research has focused almost exclusively on general measures

of strain, primarily among adolescent samples, or specifically on economic strain among adult samples. It is possible that substance use is an effective method of emotional coping or escape from noxious stimuli for many individuals, but there are very little instrumental uses for drugs to solve the problems that cause strain. The non-medical use of prescription stimulants, however, provides individuals experiencing strain within academic settings instrumental (more alert, staying up late to study, increased focus) as well as emotional coping strategies (escape, fun, socializing). By shifting the focus of research to a specific stressor among a specific subgroup, academic strain among college students, and a specific class of substance use that has both instrumental and emotional coping qualities, prescription stimulants, we hope to elucidate the general strain theory processes that link strain to substance use.

Based on the prior research and the theoretical processes postulated by the general strain theory, we hypothesize that academic strain will be associated with depression among college students, which will then be associated with the non-medical use of prescription stimulants. The same process, however, will not explain the use of other drugs, because of the perceived harmfulness and stigma of such illicit drugs among college students as well as the lack of clear academic benefits of such substances in college settings.

METHOD

The data for this study are the Harvard School of Public Health's College Alcohol Study (Wechsler 2003), which examines substance use, primarily alcohol, and other health risk behaviors of college students. The initial wave of data (1993) was collected using a nested random sampling design, and follow-up surveys were conducted using the same sample of schools in 1997, 1999, and 2001. For additional information on the sampling design and data collection of the College Alcohol Study see the work of Henry Wechsler (e.g., Wechsler et al. 1994; Wechsler et al. 2000). The current research study uses data from the 1999 study; although the 2001 study is more recent we are not able to operationalize negative affect, an important causal

mechanism according to general strain theory, with the 2001 study. The final sample for the 1999 study has information on over 14,000 students at 119 four-year schools in 39 states. The sample is representative of students enrolled full-time at four-year colleges/universities in the United States, including students from private and public schools; non-religiously and religiously affiliated schools; large, medium, and small schools; schools located in urban, suburban, and rural settings; all female schools; and historically black institutions.

The dependent variable is non-medical use of prescription stimulants, and we examine use in the past year and the past 30 days. Respondents are asked, ''How often, if ever, have you used any of the drugs listed below?'' One option is prescription-type stimulants and respondents are instructed to not include anything used under a doctor's orders. We operationalized non-medical use of prescription stimulants as a dichotomous variable (0 = non-user, 1 = user).

Our measure of academic strain is operationalized as a disjunction between academic aspirations and outcomes, and is a combination of two items: importance of academic work and grade point average (GPA). Importance of academic work is assessed using one survey item, ''How important is academic work?'' (0 = somewhat or not at all important, 1 = important or very important). GPA is operationalized to distinguish below average students (0 = GPA under 3.0) from above average students (1 = GPA of 3.0 or higher). Using these items, we construct a four-category academic strain measure, conceptualized as a disjunction between academic goals and outcomes. The variable is coded 1−4 with higher values indicating greater levels of academic strain. First, *determined achievers* believe their academic work is important/very important and have a GPA above 3.0, and therefore would experience little academic strain (coded 1). Second, *apathetic achievers* believe their academic work is somewhat/not at all important but have a GPA above a 3.0 (coded 2). Third, *apathetic underachievers* believe their academic work is somewhat/not at all important and have a GPA below a 3.0 (coded 3). Fourth, *determined under-achievers* believe their academic work is important/very important but have a GPA below a 3.0, which suggests that

these students experience a high level of academic strain (coded 4).

General strain theory contends that strain leads to negative affect states that increase the likelihood of deviance and crime. Tests of general strain theory often model anger and/or depression as the negative affect states most likely to be associated with deviance or crime (Agnew 1992; Aseltine et al. 2000; Ostrowsky and Messner 2005; Piquero and Sealock 2000). We are not able to operationalize anger with the data, but we do have a measure of depression. The measure of *depression*, past 30 days, includes the following nine items: feel full of pep; been very nervous; felt so down that nothing could cheer you up; felt calm and peaceful; have a lot of energy; felt downhearted and blue; feel worn out; been a happy person; feel tired. Each item is coded 1−6, with a higher score indicating a higher level of depression. Tests of general strain theory generally indicate that strain is associated with violence and aggression through anger as the key intermediate affective state, but anger is not strongly related to less serious offending, such as minor property violations or juvenile delinquency (Aseltine et al. 2000; Piquero and Sealock 2004; Mazerolle and Piquero 1997). On the other hand, prior research has shown that depression is more relevant to the study of substance use (Dembo et al. 1992; Galaif et al. 1998; Henry et al. 1993; Kandel et al. 1997; Newcomb and Felix-Ortiz 1992).

Several controls, measured as dichotomous variables, are included in the analyses: gender (male = 1), race (white = 1), 1), ethnicity (Hispanic = 1). Age is also included as a control, respondents range in age from 15 years old to 25 years and older. Because past research indicates that other forms of substance use are significantly associated with non-medical prescription drug use (Herman-Stahl et al. 2007; McCabe et al. 2006; McCabe et al. 2005a; Simoni-Wastila et al. 2004; Sung et al. 2005), three measures of substance use are also included as controls. Alcohol use is measured as binge drinking (yes = 1). A male is a binge drinker if he had ''five or more drinks in a row in the past two weeks'' and a female is a binge drinker if she had ''four or more drinks in a row in the past two weeks'' (Wechsler et al. 1995). One drink equals one 12 oz can/bottle of beer, a 4 oz glass of wine, a 12 oz wine cooler, or a 1.25 oz shot of

liquor (Wechsler et al. 1995). The use of marijuana (user = 1) and ''hard'' drugs (user = 1) in the past month and past year are also included as controls. The use of ''hard'' drugs includes the use of any of the following drugs: crack cocaine, other cocaine, heroin, LSD, psychedelics or hallucinogens, and ecstasy.

In addition to the controls already discussed it is useful to include controls for theoretical predictors of deviance and crime. Although the College Alcohol Study does not include a measure of criminal behavior, thereby limiting the potential theoretical predictors we can include in our analytical models, we are able to operationalize elements of Hirschi's social control theory (1969) and Akers' social learning theory (1985). We include four social bonding measures based on Hirschi's social control theory. First, a measure of attachment to conventional individuals in an academic stetting is based on the following survey item, ''Do you know a member of the faculty or administration with whom you could discuss a personal problem?'' (0 = no, 1 = yes). Second, a measure of commitment to conventional activities is based on the following survey item, ''In the past thirty days, how many hours per day on average have you spent…studying outside of class?'' (0 = 0 hours to 5 = 5 or more hours). Third, a measure of involvement in conventional activities includes participation in student organizations, intercollegiate sports, volunteer work, and working for wages. Respondents are asked ''in the past 30 days, how many hours per day on average have you spent on the following activities?'' (0 = 0 hours to 5 = 5 or more hours). Fourth, a measure of belief is based on the importance of religion (1 = not at all important to 5 = very important). We also include two measures of peer behavior based on social learning theory. First, respondents are asked what percentage of their friends are binge drinkers (0 = 0% to 10 = 90−100%). Second, respondents are asked how many hours per day on average (in the past 30 days) did they spend socializing with friends (0 = 0 hours to 5 = 5 or more hours).

ANALYTIC STRATEGY

Structural equation modeling, with both manifest and latent measures, is used to examine the relationship between

academic strain and non-medical prescription stimulant use in the past year and also during the past 30 days. Accordingly, data analyses are conducted in two steps. First, Confirmatory Factor Analysis (CFA) is used to test the measurement portion of the model, a latent measure of depression. CFA examines the acceptability of factor loadings and model fit. The second step is to run the structural model in order to test the research hypotheses, academic strain is significantly associated with non-medical use of prescription stimulants indirectly via depression. For structural equation models, acceptability of model fit is assessed using a chi-square test, with a non-significant chi-square indicating good model fit. A significant chi-square suggests that there may be additional paths, unspecified in the model, that are important. However, given the relatively large sample size of the College Alcohol Study (over 10,000), which increases the likelihood of a significant chi-square value; it is important to examine additional measures of model fit (Bentler 1990). Therefore, several other measures are used to assess model fit: Bentler's Comparative Fit Index (CFI) and Bentler-Bonnett's Non-Normed Fit Index (NNFI), which indicate adequate model fit with values around 0.90 or greater, with values over .95 indicating good fit (Newcomb 1994). In addition, the Residual Mean Squared Error Approximation (RMSEA) is used with values .05 or lower indicating good model fit (Browne and Cudeck 1993). If these measures indicate good model fit and the model seems theoretically plausible, we can have confidence that the data fit the model well.

RESULTS

Sample characteristics are shown in Table 1. Nearly 4% of the sample reports non-medical prescription stimulant use in the past year and about 2% reports use in the past 30 days. The sample is approximately 39% male, 76% white, 7% Hispanic, with an average age of nearly 21. Based on our measure of academic strain roughly 61% of respondents are *determined achievers*, 15% are *apathetic achievers*, 9% are *apathetic underachievers*, and 15% are *determined underachievers*. Roughly 44% of the sample report binge

TABLE 1 Sample Characteristics (n = 11,215)

Measure	Range	Mean (%)	Std. dev.
Non-medical prescription stimulant use			
Stimulant use in past year	0–1	0.036 (3.6%)	0.186
Stimulant use in past 30 days	0–1	0.016 (1.6%)	0.124
Academic strain			
Disjunction measure—Importance/ G.P.A.	1–4	1.786	1.124
Negative affect state (depression)	1–6		
Feel full of pep		3.353	1.131
Been a very nervous person		2.361	1.135
Felt down in dumps nothing could cheer you up		1.845	0.994
Felt calm and peaceful		3.298	1.101
Have a lot of energy		3.208	1.085
Felt downhearted and blue		2.249	0.978
Feel worn out		3.076	1.120
Been a happy person		2.612	1.047
Feel tired		3.418	1.141
Demographic controls			
Gender (male)	0–1	0.387 (38.7%)	0.487
Race (white)	0–1	0.760 (76.0%)	0.427
Ethnicity (Hispanic)	0–1	0.073 (7.3%)	0.260
Age	15–25 +	20.879	2.128
Substance use			
Binge drinker	0–1	0.441 (44.1%)	0.497
Marijuana use in past year	0–1	0.274 (27.4%)	0.446
Marijuana use in past 30 days	0–1	0.157 (15.7%)	0.364
Hard drug use in past year	0–1	0.099 (9.9%)	0.299
Hard drug use in past 30 days	0–1	0.041 (4.1%)	0.198
Theoretical controls			
Know faculty or administrator	0–1	0.568 (56.8%)	0.495
Hours studying	0–5	2.826	1.416
Conventional involvement	0–20	3.823	2.961
Religion important	1–4	2.313	1.134
Percent friends binge drink	0–10	3.106	3.102
Hours socializing with friends	0–5	2.665	1.508

For dichotomous measures the mean may also be interpreted as a percentage.

drinking, 27% report the use of marijuana in the past year and 10% report the use of ''hard'' drugs. The sample size for all analyses is 11,215.

In order to determine if the individual depression measures load on a single construct, a confirmatory factor analysis is conducted. In the confirmatory factor model, with the exception of the first measure of the factor, which is constrained at 1.00 (to identify the metric of the latent measure), all factor loadings are allowed to vary freely. The results for the measurement model are shown in Table 2. All factor loadings are significant and in the expected direction. While the chi-square is significant, the other measures of model fit indicate acceptable model fit (RMSEA = .089, CFI = .961, NNFI = .903). Thus, we can be confident that the measurement model is an accurate estimation of depression.

The second step in the data analysis involves the estimation of the structural equation model, findings shown in Table 3, which examines the relationship between academic strain, depression, and non-medical use of prescription stimulants. We will discuss substance use in the past year first. As articulated by strain theorists, there is no direct

TABLE 2 Measurement Model—Negative Affect

Measures of depression	Standardized factor loading
Feel full of pep (r)	.426***
Been a very nervous person	.521***
Felt so down in the dumps that nothing could cheer you up	.727***
Felt calm and peaceful	.505***
Have a lot of energy	.470***
Felt downhearted and blue	.738***
Feel worn out	.544***
Been a happy person	.608***
Feel tired	.520***
Fit indices	
Chi-square	2025.527*** (df-18)
RMSEA	.089
Bentler's C.F.I.	.961
Bentler & Bonnet's N.N.F.I.	.903

(r) = Reference indicator with unstandardized loading fixed at 1 to identify the metric of the factor.

All items used in the latent measure are coded 1−6, with a higher score reflecting a higher level of depression (***$p < .001$).

TABLE 3 Structural Models—Academic Strain and Non-Medical Use of Prescription Stimulants

Measures	Use in the past year		Use in the past 30 days	
	Depression	Stimulant use	Depression	Stimulant use
Academic strain	.070***	.001	.192***	.002
Gender (male)	−.116***	−.003	−.117***	.002
Race (white)	−.094***	.007	−.085***	.001
Ethnicity (Hispanic)	−.051***	−.010	−.043***	−.012
Age	−.031**	.002	−.043***	.002
Binge drinker	−.053***	.005	−.032**	.001
Marijuana user	.095***	.065***	.061***	.078***
Hard drug user	.006	.356***	.001	.252***
Negative affect (depression)		.045***		.032***
Know faculty/Administrator		.010		−.003
Hours studying		−.006		−.010
Conventional involvement		.013		.015
Religion important		−.004		.007
Friends binge drinkers		.035***		.054***
Hours socializing with friends		.027**		.024**
Fit indices				
Chi-Square	4853.862*** (df-144)		4854.618*** (df-144)	
RMSEA	.048		0.048	
Bentler's C.F.I.	.939		0.936	
Bentler & Bonnett's N.N.F.I.	.873		0.867	

Standardized parameter estimates are shown ($^*p < .05$, $^{**}p < .01$, $^{***}p < .001$).

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connection between academic strain and stimulant use, the connection is indirect via negative affect. According to the theory, students who experience higher levels of academic strain should be more likely to report the presence of negative affect states. In the structural model, academic strain is significantly associated with depression (Beta = .070), as students under greater levels of academic strain are more likely to report higher levels of depression than respondents who report lower levels of academic strain. The theory then stipulates that individuals who experience negative affect states are more likely to engage in deviant behavior, in an attempt to cope with strain. In the structural model, depression is significantly associated with non-medical prescription stimulant use (Beta = .045), as students who report higher levels of depression are at an increased risk for non-medical use of prescription stimulants. Although the chi-square for this model is significant, the other measures of model fit indicate that the data fit the model adequately (RMSEA = .048, CFI = .939, NNFI = .873).

The structural equation model that examines the relationship between academic strain, depression, and non-medical prescription stimulant use in the past 30 days produces similar results. There is no direct connection between academic strain and the non-medical use of prescription stimulants. The connection is indirect, via our measure of negative affect. Students who report higher levels of academic strain are significantly more likely to report higher levels of depression (Beta = .192), and students who report higher levels of depression are more likely to report the non-medical use of prescription stimulants (Beta = .032). As with the previous structural equation models the chi-square for this model is also significant, but the other measures of model fit indicate that the data fit the model well (RMSEA = .048, CFI = .936, NNFI = .867).

These findings provide support for general strain theory, as the impact of academic strain on non-medical prescription stimulant use is completely indirect, via our measure of negative affect. Students who experience academic strain report higher levels of depression, and students who report higher levels of depression are more likely to report non-medical use of prescription stimulants. In order to determine if non-medical prescription stimulant use is a unique form of

coping for college students who experience academic strain, we replicated our structural equation model predicting hard drug use instead of non-medical prescription stimulant use (findings not shown). Unlike the model predicting non-medical prescription stimulant use, the findings of the structural model predicting hard drug use do not support general strain theory. Although academic strain is significantly associated with depression, academic strain is not directly or indirectly associated with hard drug use. Hard drug use, it seems, is not viewed as an effective solution to academic strain or the associated negative affective states among college students. On the other hand, the putative academic benefits of non-medical prescription stimulants seem to be a key factor in the use of such medication to aid in alleviating the negative affect associated with academic strain.

DISCUSSION

In recent years there has been a dramatic increase in non-medical prescription drug use. In addition, several national surveys of substance use indicate that the prevalence of non-medical prescription drug use is now greater than the prevalence of other illicit drug use, not including marijuana. Although there is an abundance of research on substance use, the research on non-medical prescription drug use is relatively sparse in comparison. A significant limitation to the existing research in this area is a complete lack of theoretically based studies. Consequently, we know very little about the theoretical reasons for non-medical prescription drug use. The current research seeks to fill this important gap in the literature by conducting one of the first theoretically based examinations of non-medical prescription drug use. With a national sample of college students we create a measure of academic strain, based on Agnew's general strain theory, to determine if academic strain is significantly associated with non-medical prescription drug use. We believe that academic strain is significantly associated with the non-medical use of prescription stimulants based on the abundance of support for Agnew's strain theory and a limited number of studies that cite academic enhancement as a motivation for the non-medical use of prescription

stimulants (Babcock and Byrne 2000; Low and Gendaszek, 2002; Quintero et al. 2006; Teter et al. 2005).

Findings from the current study provide support for general strain theory. Academic strain is indirectly associated with non-medical use of prescription stimulants. In accordance with general strain theory, academic strain is significantly associated with depression, our measure of negative affect, and depression is significantly associated with non-medical use of prescription stimulants. Previous tests of the general strain theory have not shown convincing support for the relationship between strain and substance use (see Agnew and White 1992) but this research highlights the utility of shifting the focus of general strain theory research away from comprehensive measures of strain and indiscriminate offending outcomes to specific forms of strain (e.g., academic strain) associated with specific deviant outcomes (e.g., non-medical prescription drug use).

Agnew (2001) acknowledged that by broadening the definition of strain beyond Merton's (1938) conceptualization, the general strain theory encompasses too broad a scope of potential sources of strain and prior research examining the theory have focused too often on sources of strain that are unlikely to cause pressure for corrective action. In fact, Jensen (1995) went as far as to claim that because the propositions of the general strain theory are so broad, the theory is essentially unfalsifiable. Because of this criticism of the general strain theory, Agnew (2001) outlined the types of strain that are most likely to lead to crime and deviance, focusing mainly on the subjective interpretations of objective stressful life events. Agnew (2001) specifies that that strains are most likely to lead to crime and deviance when the straining events (1) are seen as unjust or unfair, (2) are seen as being high in magnitude, (3) are associated with low social control, and (4) create some pressure for criminal coping. Negative school experiences, such as achieving low grades, are specific forms of strain that *may* be seen as unjust, are associated with low social control, and are likely to lead to associations with delinquent peers, all of which make deviant coping particularly likely, especially for those students who perceive the negative school experiences as being high in magnitude (Agnew 2001). In sum, our current research is in accord with Agnew's (2001) claim that although the general strain theory

is a general theory of crime and deviance, empirical tests of the theory must focus on specific forms of strain. Our findings further add to the literature on the general strain theory by highlighting that specific straining life events can be tied to unique forms of deviant coping (in this case, non-medical prescription drug use). Future tests of the general strain theory should continue to examine the impact of specific life events on specific deviant outcomes.

More importantly, the current findings also indicate that the relationship between academic strain and non-medical use of prescription stimulants is different from the relationship between academic strain and other forms of substance use. We also examined the relationship between academic strain and hard drug use, and the findings do not support general strain theory as academic strain is neither directly or indirectly associated with hard drug use. Strain then appears to have a differential impact on substance use among the college student population depending on the type of substance being used. Future research should investigate the applicability of the general strain theory to more specific forms of offending, as specific forms deviant coping seem more pertinent to the general strain theory processes than others.

There are a few limitations worth noting. First, that data analyzed are self-report, which raises the question of validity. For a long period of time researchers were confident that measures of self-reported substance use were valid (Hindelang et al. 1981; Huizinga and Elliot 1986; Maisto et al. 1990; Midanik 1988; Winters et al. 1990). However, recent research using advanced techniques to test hair and urine for substance use call the validity of self-reported substance use into question (Dembo et al. 1990; Ehrman et al. 1997; Fendrich and Xu 1994; Feucht et al. 1994; Mieczkowski et al. 1998). It is important to note, however, that these studies examine the validity of self-reported substance use in high-risk populations, arrestees, and persons in treatment programs, not persons in the general population.

A second important limitation is the cross-sectional nature of the data set. The current research question is best suited for a longitudinal data set, where academic strain, negative affect, and non-medical prescription stimulant use are measured at three different time periods. This is a potential problem given the co-occurrence of depression and substance

use (Aseltine et al. 1998; Beitchman et al. 2001; Cicchetti and Rogosch 1999; Kandel et al. 1999). Although we argue that depression leads to substance use it is also possible that substance use leads to depression. Although the data does not allow for a longitudinal examination of the process at work in the relationship between academic strain and non-medical prescription stimulant use, our structural model is based on the theoretical propositions of the general strain theory, which has been partially supported by longitudinal studies (Agnew and White 1992; Agnew 1997).

A third limitation is our measure of non-medical prescription drug use, defined as use of prescription drugs without a prescription from a doctor. Therefore, our measure of non-medical use would not include the misuse/abuse of prescription medications by students who have prescriptions for the drug. It would also be helpful if we could identify what prescription stimulants were being used (e.g., Adderall, Concerta, Cylert, Dexedrine, and Ritalin).

Given that the current study provides support for general strain theory, future research should conduct a more complete test of general strain theory. It is important to determine if the different sources of strain outlined by Agnew are significantly associated with non-medical prescription drug use. In addition, future research should also examine other theories of substance use, such as Hirschi's social control theory (1969), Aker's social learning theory (1985), and Gottfredson and Hirschi's general theory of crime (1990) to determine if they explain non-medical prescription drug use.

Our research highlights that academic strain that results in negative affective states is a key process leading to the misuse of prescription medication on college campuses. College and university administrators and health officials, therefore, should use this information to create and implement more effective programs to address the non-medical use of prescription medication among college students. College students hold generally favorable views of illicit prescription drugs (Cicero et al. 2005; Quintero et al. 2006), so administrators should create education programs designed to change these positive perceptions of these drugs. Secondly, stress on college campuses is at an all time high (UCLA Higher Education Research Institute 2000), so specific programs should be developed that identify students who are falling

behind academically and intervene in this process to lessen the negative consequences of this strain. Lastly, because depression is an important mediating factor in the process academic strain leading to the misuse of prescription stimulants, a greater emphasis on college campuses should be placed on identifying and treating students experiencing emotional distress. Most colleges and universities nationwide are reporting a staggering increased demand for counseling services over the past decade and 38% of colleges and universities do not offer any psychiatric services at all (Gallagher 2001). University officials must create programs that meet the demand for increased psychological services on campuses around the country, not only to treat those students who are in search of such help but also to identify those students who are struggling with emotional distress but do not actively seek help. In sum, programs that change attitudes and perceptions of non-medical prescription medication use among college students, identify students experiencing academic strain, and develop counseling services able to meet increasing demands and identify those students in need of psychological help will all be important steps toward curbing the misuse of prescription stimulants on college campuses.

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