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The Effect of Strain, Affect, and Personal/Social Resources on Problem Substance Use among Incarcerated and Non-Incarcerated Youth

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ABSTRACT

We explore the applicability of General Strain Theory to juvenile substance use. In doing so, we offer three advances over prior work. First, we put forward the concept of “problem substance use” to move beyond frequency-based and more medicalized conceptions of the phenomenon toward a conceptualization that views substance use as problematic when it disrupts social relationships and expectations and when it reflects a loss of self-control. Second, we employ a dataset that permits us to explore how strains originating in different life domains influence problem substance use as well as how negative emotions and personal coping resources mediate the relationship between strain and problem substance use. Third, we move beyond prior work by comparing how strain and strain mediators operate differently in schools, alternative learning centers, and juvenile correctional facilities. We find strong effects of the strain variables and strain mediators indicated by General Strain Theory and evidence that alternative learning centers and juvenile correction facilities are associated with especially high odds of problem substance use even when strain and other variables are controlled. We conclude by discussing the limitations of current work and the implications for next steps in the strain-substance use research literature.

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Introduction

General Strain Theory (GST) holds that many types of behavior defined as deviant in society are fundamentally coping reactions by individuals to stressors that emerge from negative relationships and traumatic life experiences, which are, in turn, often associated with social inequality and disadvantage. The theory points not just to the impact of different types of strain, but also to the affective states within individuals that mediate the relationship between strain and involvement in deviance, and the availability of various kinds of resources to moderate the effect of strain. In this paper, we provide a test of the applicability of GST to substance use by unpacking the relationships between negative life events, affective states, and resources for coping with strain. In doing so, we provide three contributions. First, most existing work on substance use and abuse relies on self-reported use or frequency of substances used. Instead, we rely on a conception of “problem substance use” which is meant to identify individuals for whom substance use has become socially problematic in terms of self- and relational difficulties, rather than a conception that focuses solely on the frequency of substance use. In particular, we gauge problem substance use by considering whether the individual feels that the use of substance disrupts their ability to fulfill major role obligations at work, school, or how; when continued substance use is associated with a loss of self-control such that use continues in situations in which it is physically hazardous; when it results in legal problems; or when use is continued even when doing so results social

and interpersonal problems. Second, to add depth to our application of GST to substance abuse we consider factors that have been theorized to mediate the effects of strain on deviance. The dataset we use provides a range of measures to examine how strain is conceptualized as originating from particular life domains, mediated by emotional states, namely anger and depression, as well as moderating factors relating to individuals' bonds to religion, school, and the family.

Third, nearly all of the prior research on strain and juvenile substance use relies upon samples drawn from mainstream schools. Such data does not include juveniles in alternative schools or juvenile correctional institutions. It is important to include these latter segments of the population because these institutions are comprised of individuals who are likely to have experienced high to extremely high levels of strains. Moreover, the placement of individuals in alternative learning centers and juvenile correctional institutions may itself contribute to strains as these placements sever the individual from peer and school relations and, in the case of correctional placement, from family and community. Studies that focus only on school students effectively omit individuals from the higher tail of the strain distribution. Here we leverage a dataset that contains samples drawn from alternative high schools and juvenile correctional facilities as well as mainstream schools.

Key elements of strain theory

Agnew's General Strain Theory (GST) argues that deviance can result from a variety of different kinds of stressful life experiences (1992). These "strains" come in three generic forms: 1) failure to reach socially valued goals, such as flunking out of school or getting fired from a job; 2) loss of positively valued stimuli, like breaking up with romantic partner or the death of parent; and 3) presence of negative stimuli, such as being victimized or sexually abused (Zweig et al. 2014). These experiences can directly affect crime, delinquency, and other expressions of social deviance. However, strain can also generate negative emotions, namely anger and depression, that elicit coping strategies which can take the form of substance abuse or delinquency (Drapela 2006). Agnew identified five life domains that are typically sources of strain: self, family, peers, school, and work (Ngo and Paternoster 2014; Ngo et al. 2011). However, strains from these different domains vary in salience and impact, depending on age, with family, schools, and peers being particularly powerful influences for adolescents.

GST also posits that even when strains and negative emotions are present, deviant adaptations might not become manifest. Effective coping mechanisms may help some people manage the strains they experience (Black and Brown 2016). Self-esteem, intellect, problem solving skills, financial assets, and religious faith all may serve as personal and social resources to help individuals who experience life strain, cope with the resulting negative emotions (Agnew 1992).

Support for GST applications to substance use

To date, support for GST as an explanation for substance use has been mixed. Mazerolle et al. (2000) found that exposure to strain was not directly related to drug use but was conditional on weak social bonds and deviant peer affiliations. They also found no evidence for anger as a mediator of effect of strain on drug use. Hollist, Hughes, and Schaible (2009) found support for the idea that specifically family-based strain was mediated by negative emotions in its impact on several forms of deviance, including the frequency of substance use. Using a sample of college students Moon et al. (2009) focused on the mediating effects of emotion states as conditioning factors of strain effects. They focused on deviance scales that included substance use. Moon et al. (2009) also found support for a measure of strain that combined eight different types, however, not for each and every type. They also found support for both mediating effect of anger and other conditioning factors. Drapela (2006) found that strain affected an index of substance use but that it did not mediate the relationship between strain and deviance, as strain theory would suggest.

Cullen et al. (2008) examined the effect of victimization via bullying on subsequent deviance using a delinquency scale that includes substance use. They found support for the GST hypothesis that bullying affects higher level involvement in deviance and that weak school bonds and high levels of aggressiveness also influence deviance. Slocum (2010) focused on how well GST theory does in predicting continuity of substance use into adulthood. She found evidence of both direct and moderating effects of negative emotions and low constraint on substance use in adolescence, but less evidence of the persistence of these effects into adulthood. She also found that stressors in adolescence and adolescent substance use are associated with stressors in adulthood, which in turn affect adult substance use. However, she found little support for a number of other hypotheses about how strains experienced in adolescence relate to strains, negative emotions, and substance use in adulthood.

The literature applying GST to drug use employs highly varied measures of strain. Hollist, Hughes, and Schaible (2009), Piquero and Sealock (2000), and Drapela (2006) focus on a single dimension of strain (i.e., family-based strain). Others use a combined strain measure, which lumps several different types together. More recently, Ngo and Paternoster (2014) have sought to delineate strain measures into different life domains (as specified by Agnew's theory), namely, self, family, school, peers, and work. Some, but not all, of the strains experienced in these domains are associated with contemporaneous and later drug and alcohol use. In the present study, we follow this latter development by measuring strains in different domains to gain a more precise understanding of ways particular strains can influence substance abuse. Like Ngo and Paternoster (2014), we also consider whether some strains matter more than others and whether different types of strain are moderated by whether the individual is in school, an alternative learning center, or a juvenile correctional facility.

School samples

Much of the research applying GST to juvenile substance use follows the tradition of the wider juvenile delinquency literature by focusing on samples drawn from mainstream schools. For example, Cullen et al. (2008) use a sample of middle school students from Virginia. Ngo and Paternoster's (2014) sample is drawn from elementary and secondary schools included in the National Educational Longitudinal Survey. Moon et al. (2009) used samples drawn from freshman college students from a western university. A criticism of these studies is that by focusing on individuals in schools, this work omits individuals who are outside of the mainstream context and thus likely to have experienced quantitatively and, perhaps, qualitatively different types of strain.¹

A few studies are based upon non-school samples, including juvenile correctional populations. These studies show relatively mixed and, at times, weak support for strain theory. Drapela's (2006) study used data from high school dropouts and found strain effects on substance use for young women but not young men. Cooper et al. (2009) examined substance use among a sample of incarcerated youth and found little support for a composite strain measure. Ngo et al. (2011) applied the theory to a small sample of young people in Maryland Boot Camp experiment and the control group of juveniles held in traditional facilities and found weak support for effects of strains experienced in different life domains on substance use. However, these studies lack comparisons with young people in more conventional settings and are therefore limited, in the opposite way the studies using school samples are, by focusing on individuals that are likely on the high end of the strain distribution. In the present study, we propose to provide a fuller comparison of youths in mainstream high schools with those in alternative learning centers and juvenile correctional facilities.

¹This point echoes Hagan and McCarthy's (1997) critique of the "school criminology" approach to studying juvenile delinquency, which relies on samples drawn from schools rather than the non-school environments that many young people find themselves. Hagan and McCarthy use this argument to highlight the importance of studying the involvement of homeless youth in delinquency and deviance.

Measurement of substance use/abuse

Most studies of juvenile substance abuse rely on binary or frequency measures of substance use. For example, Grindal (2017) uses the “number of times in the last month” a respondent used various types of drugs and alcohol. Slocum asked respondents about whether they used marijuana, cocaine, and heroin five or more times in the last year. Cooper et al. (2009) relied upon the sum of four binary measures of whether or not a respondent “ever used” marijuana, amphetamines, hallucinogens, or barbiturates. Drapela (2006) used an index of self-reported use that included daily cigarette use, binge drinking within the previous two weeks, and frequency of marijuana and alcohol use in the last year. The problem with frequency-based measures is that they do not really delineate between substance use that is prosocial, which may enhance an individual’s social status, and use that results in negative personal and social consequences.

A smaller number of studies rely on medicalized definitions of substance abuse. For example, Akins et al. (2010) constructed a dichotomous measure based upon whether a respondent’s answers met **each** of the following criteria: 1) they have a diagnosis of lifetime alcohol dependence or abuse; 2) they have used alcohol in the past 18-month period; 3) a DSM III-R symptom of abuse or dependence has been experienced in the past 18 months. In addition, Black and Brown (2016) use the DSM IV measure of abuse and dependence, in which respondents were coded as substance abusers if they met one of four criteria. The criteria included (1) recurrent use resulting in failure to fulfill major role obligations; (2) recurrent use in physically hazardous situations; (3) recurrent substance related legal problems; (4) continued use despite persistent or recurrent social or interpersonal problems caused by or exacerbated by substance.

Although medicalized conceptions of substance use and abuse rely partly on the frequency of use as a criterion, they also tend to emphasize physiological dimensions (e.g., withdrawal, cravings, tolerance) and the psychological loss of self-control. However, the DSM IV definition, which inspired Black and Brown (2016), also includes criteria that pertains to how the use of substances interferes with social relations – with work, school, family obligations as well as relations with the criminal justice system. We follow Black and Brown’s (2016) conceptualization not because its basis lies in the authority of the DSM IV, but because it encompasses the social and relational consequences of substance use as well as the loss of self-control, which makes it more compatible with sociological understandings of deviance and social control (Weinberg 2011).² To reflect this more sociological conception of substance use as well as the interactionist tradition in the sociological study of deviance and social problems, we use the “problem substance use” to characterize when substance use becomes a problem for the individual and for the social relations and institutions within which they are situated. The measurement of problem substance use is provided below.

Hypotheses

We start with defining the three key hypotheses of General Strain Theory.

*H*₁: Problem substance use is more likely among individuals experiencing strain resulting from negative events resulting from school, family, and non-family life domains.

*H*₂: The effect of strain on problem substance use is mediated by negative emotions like anger and depression.

*H*₃: The effect of strain on problem substance use is moderated by personal and social resources such as attachment to religion, school, or parents.

²The DSM V, adopted in 2013, changed the definition for “substance use disorder” to include 11 diagnostic criteria that span the factors discussed above from physiological indications to inability to control impulses to consequences for social relations (Fisher et al. 2017).

In addition, we are interested how different institutional settings school, alternative learning centers, and juvenile correctional facilities shape the way strain affects problem substance use. There are two potential pathways through which such effects might be manifest. On the one hand, placement into either an alternative learning center or a juvenile correctional facility might itself produce strains by operating to sever relationships with conventional society and therefore result in problem substance use. Alternative learning centers tend to offer one kind of strain, which severs an individual's relationship with school and their school peers. However, the opposite may be true. That is, if mainstream school failure is a source of strain, a student may actually want to separate from that environment and may find more commonalities with their peers and more support from teachers in the alternative learning center. If the latter is true we would expect that placement in an alternative learning center moderates or offsets the effect of strain. Juvenile correction facility placement, on the other hand, likely introduces strains both because it likely results from a fairly serious negative life event (an arrest) and it severs relationships with both the family and school.

*H*₄: Controlling for other kinds of strain, placement in alternative learning centers and juvenile correctional facilities are negative life events that operate as strains that increase substance use.

*H*₅: Placement in juvenile correctional facilities or alternative centers might amplify or lessen the effect of strain on substance use.

Data & methods

The present study analyzes data from the 2010 Minnesota Student Survey. The Minnesota Student Survey (MSS) is a 127-item questionnaire administered by Minnesota's Department of Education and Department of Health every three years to 6th, 9th and 12th graders in Minnesota public schools, Alternative Learning Centers (ALCs) and Juvenile Correctional Facilities (JCF). Minnesota state law (Minnesota Statutes section 123A.05) allows districts to establish an ALC for students who are unsuccessful in traditional schools and are at risk for educational failure due to poor grades, truancy, disruptive behavior, pregnancy, or other factors that impede a student's ability to attend school (Minnesota Department of Education 2016). ALCs may be located on the campus of an existing school or at another location and must provide comprehensive education. All students in an ALC have a Continual Learning Plan, which sets out the steps they need to complete high school. Students agree to these plans in order to enter the ALC program.

In Minnesota, JCFs are detention centers run by counties or contracted service providers encompassing particular regions of the state. JCFs range from secure facilities to non-secure residential treatment centers. Individuals can be housed for short or long-term stays and are placed in the facility by court-order or, in the case of short-term placements, by law enforcement for pre-trial detention or assessment. The survey includes a wide variety of questions related to the attitudes, beliefs and behaviors of the youth. Questions reflect a range of protective factors including connectedness to school, family and community, as well as risk factors such as drug and alcohol use, violence and victimization.

The survey was first administered in 1989, with 2016 being the most recent edition.³ During the 2010 MSS 88 percent of school districts in Minnesota participated (~295 public school districts). In total, 71 percent of 6th, 9th and 12th graders (~131,000 students) completed the 2010 survey. Twenty-five of Minnesota's 29 JCFs participated in the survey, and 103 of the state's 251 ALCs participated. The survey administrators report that approximately 3 percent of completed surveys were eliminated because

³Although the 2010 dataset is not the most contemporary, it was selected for analysis because the relatively more racially diverse Minneapolis metropolitan public schools are included in the 2010 survey, but excluded from the 2013 survey, making the 2010 MSS survey the most representative of the broader population.

reported gender was missing, responses were highly inconsistent, or there was a pattern of likely exaggeration. School students in 6th, 9th, and 12th grader were eligible to participate, but a shortened survey was administered to 6th graders. Given that the shortened survey excluded essential questions pertaining to our analysis, public school 6th graders were excluded from this study. Students enrolled in Alternative Learnings Centers and Juvenile Correction Facilities for 6th, 9th, and 12th grade were all eligible to participate in the full-length survey.

Problem substance use

The key dependent variable measures whether or not the respondent can be categorized as having *problem substance use* (hereafter *PSU*). Our measurement of PSU is measured by one (or more) of four criteria being met, occurring within a 12-month period. The MSS asks respondents if they've *consciously engaged in socially harmful substance use* ("in the last 12 months, have you continued to use alcohol/drugs even though you knew it was hurting your relationships"), *neglected major responsibilities* because of substance use ("in the last 12 months, how many times have you neglected major responsibilities, such as school or work because of alcohol/drugs"), *engaged in physically hazardous behavior* while under the influence of a substance ("in the last 12 months, how many times have you driven a motor vehicle after using alcohol/drugs"), or *experienced legal problems* because of substance use ("in the last 12 months, how many times have has alcohol or other drug use caused you problems with the law").

Strain

We measure strain emanating from three life domains: *non-family related negative life events*, *family related negative life events*, and *school related negative life events*. Factor analysis was used to identify the survey items that measured these three distinctly different forms of strain. The variable *non-family related negative life events* ($\alpha = .6127$) is a scale composed of three survey items. Those three survey items were questions pertaining to the whether the respondent had been a victim of domestic physical violence, domestic sexual violence, or sexual abuse committed by non-family member during the last 12 months. The variable *family related negative life events* ($\alpha = .6042$) is a scale comprised of three survey items. Those three survey items were questions pertaining to the degree to which the respondents had ever witnessed physical abuse by an adult in their home or been a victim of physical or sexual abuse during the last 12 months. The variable *school related negative life events* ($\alpha = .7358$) is a scale that contains six survey items. Those six survey items were questions pertaining to whether or not the respondents reported being threatened, pushed, kicked, stabbed, inappropriately touched sexually, or harassed with lewd jokes. Higher values on all of these scales signify that the individual has been exposed to higher levels of deleterious strain.

Personal affect

Two measures of personal affect were included in this present study: *anger* and *depression*. These variables represent negative affective states that mediate the hypothesized strain, PSU relationship. *Anger* was measured using a single survey item asking the respondent whether or not they we agreed or disagreed that they were "often irritable and/or angry." *Depression* was measured using a single survey item as well, an item asking the respondent whether they agreed or disagreed that they were "often unhappy, depressed, or tearful."

Personal and social resources

Five measures of personal and social resources were included in this study's examination of GST's utility in explaining PSU: *religiosity*, *parental care*, *school attachment*, *school commitment*, and *educational goals*. These measures moderate the hypothesized strain, PSU relationship. *Religiosity* was also taken from a lone survey question that inquired as to how often the respondent "attends religious or faith-based activities." Greater values for this variable are emblematic of a stronger connection to religion or faith for that individual. The variable *Parental attachment* is a variable from a single survey question that asked the respondent how much they feel that their "parents care" about them. More positive values on this variable indicate greater levels of parental attachment. *School attachment* ($\alpha = .7069$) is also a scale that is comprised of three survey questions that asked the adolescents if their teachers were "interested in them as people," "show them respect," and "care about them." Larger values for this scale represent greater reported attachment and bond strength with the adults and leadership at an individuals' school. *School commitment* is a variable that measures the relative commitment of the respondent to school and is derived from a survey question that asks the respondent "how many hours a week they take to complete their homework each week." *Educational goals* is a measure that captures the educational aspirations of the respondents and is calculated from a survey question that asks the individual to "select the option which best describes their school plans." Higher values on this variable represent higher values of commitment to school and greater educational aspirations. It is worth noting that previous researchers have called these variables slightly different things in their own respective tests of GST, however the underlying concepts are the same throughout. Personal and social resources are included in the regression given that they have a hypothesized moderation role in the strain-substance use relationship.

Controls

Four variables were employed to control for some observable differences between the groups, including age, race, gender, socio-economic status. The variable *age* is measured continuously with a minimum value of 11 and a maximum value of 21. *Gender* (i.e., "male" = 1 and "female" = 0) is measured dichotomously from a survey question that asked the respondents what gender they identify most closely with. A common proxy measure for socio-economic standing is free-lunch. The variable *free-lunch* (i.e., "yes" = 1 and "no" = 0) is measured dichotomously from a survey question that asked the respondents whether or not they receive free-lunch. The variable *race* (i.e., "white" = 1 and "black" = 0) is binary. Race, class, and gender are worthy of further investigation in relation to how strain works and what predicts PSU but are outside the scope of the current investigation.

Results

Descriptive statistics for all of the studies' central variables are reported in [Table 1](#). Just over one-fourth (27 percent) of all the respondents in our combined sample report behavior that matches our criteria for PSU. Demographically, the combined sample consists of 69 percent white youth and 31 percent non-white youth. In addition, 51 percent of the full sample is male and 49 percent female. Roughly 33 percent of our sample described themselves as recipients of free lunch. The youths' ages range from 11 to 21 across the various institutional settings, while the mean age is approximately 16 years. In comparison to school youth, the individuals in the ALC and JCF settings are more likely (compared to school students) to be non-white, male, older, and receive free-lunch. Moreover, the ALC and JCF youth are worse off in terms of their negative emotions and their resources for coping with life strain.⁴

⁴The variable measuring "school attachment" is the only variable where the ALC and JCF groups do not have a significantly lower mean, in comparison to the school group.

Table 1. Summary statistics – school, ALC, & JCF groups.

	Pooled		School		Alternative Learning Center		Juvenile Correctional Facility	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Problem Substance Use (Yes = 1, No = 0)	0.27	(0.44)	0.17	(0.37)	0.47	(0.50)	0.61	(0.49)
Gender (Male = 1, Female = 0)	0.51	(0.50)	0.48	(0.50)	0.53	(0.50)	0.80	(0.40)
Age	16.29	(1.56)	16.05	(1.57)	16.89	(1.38)	16.12	(1.44)
Race (White = 1, Non-white = 0)	0.71	(0.45)	0.80	(0.40)	0.55	(0.50)	0.41	(0.49)
Free Lunch Recipient	0.32	(0.47)	0.22	(0.42)	0.51	(0.50)	0.69	(0.46)
Non-Family Related Strain	0.30	(0.67)	0.20	(0.56)	0.51	(0.84)	0.47	(0.79)
Family Related Strain	0.30	(0.66)	0.21	(0.56)	0.46	(0.78)	0.71	(0.96)
School Related Strain	1.03	(1.45)	1.04	(1.44)	0.97	(1.44)	1.47	(1.64)
Often Angry	0.31	(0.46)	0.24	(0.43)	0.45	(0.50)	0.51	(0.50)
Often Depressed	0.20	(0.40)	0.15	(0.36)	0.29	(0.45)	0.34	(0.48)
Religiosity Level	0.76	(1.06)	0.94	(1.09)	0.33	(0.85)	0.64	(1.02)
Parents Caring	2.59	(0.78)	2.67	(0.69)	2.38	(0.91)	2.48	(0.90)
School Attachment	5.13	(1.94)	5.12	(1.84)	5.17	(2.10)	5.00	(2.26)
HW/Studying Time	1.66	(1.22)	1.98	(1.15)	0.95	(1.05)	1.08	(1.08)
Educational Aspirations/Goals	3.00	(0.90)	3.19	(0.77)	2.59	(1.00)	2.46	(1.09)
Observations	10392		7099		2916		377	

Crucially, the three groups in our sample differ in terms of the observed rate of PSU. Roughly 17 percent of school survey respondents report having behavior that aligns with our operationalization of PSU. Approximately 47 percent of respondents in an ALC and 61 percent of individuals in a JCF report behavior congruent with our definition of PSU. Given that there are more than two groups to compare respective means between we have selected to conduct a one-way analysis of variance (ANOVA), instead of repeated t-tests to minimize the inflation of a Type 1 error due to multiple comparisons. Given that our groups have unequal sample sizes and unequal variance, we calculated Welch's adjusted F-ratio for the ANOVA. Welch's $F(2, 964) = 534.37$, $p < .01$. Thus, we conclude that at least two of the groups differ significantly in terms of the average rate of PSU. To determine which specific groups differed from each other, we used the Games-Howell post hoc test.⁵ Every unique group comparison, with respect to the difference in the rate of PSU was statistically significant ($p < .01$). In other words, the share of school students with PSU is significantly lower than the share of individuals with PSU in the ALC or JCF setting. Moreover, we conclude that the share of students in the ALC institutional setting with PSU is significantly lower than the share of youth with observed PSU in the JCFs. PSU is more likely among JCF youth, than ALC or school students.

Our descriptive analysis also reveals that across the different institutional settings, the average intensity of the reported strains varies considerably. In other words, the respondents from the three contexts differ markedly with respect to the three key independent variables: non-family related strain, family related strain and school-based strain. First, at least two of the groups differ significantly, Welch's $F(2, 1136) = 186.37$ and $p < .01$, with respect to their average level of non-family related strain. The mean adolescent in the school setting reported significantly lower levels of non-family related strain than the average adolescent in either the ALC or JCF setting ($p < .01$). The difference between the mean level of reported non-family related strain among the ALC and JCF group is not statistically significant ($p = .88$). Secondly, the average level of family related strain is significantly different, Welch's $F(2, 1126) = 163.99$ and $p < .01$, between at least two of the groups. The average individual situated in a JCF reported significantly higher levels of family strain than their peers in either public school or ALCs. Moreover, the ALC group reports significantly lower levels of family strain (on average) than the school group. Thirdly, we conclude that the average level

⁵Since the Games-Howell test does not rely on equal variances and sample sizes, it is often recommended over other approaches such as Tukey's test. However, the Games-Howell test will often report looser confidence intervals compared to Tukey's test. In our analysis, the both the Games-Howell and Tukey test provided similar conclusions, but we report the results for the Games-Howell analysis to be conservative.

of school-based strain is significantly different, Welch’s $F(2, 1174) = 19.73$ and $p < .01$, between at least two of the groups. When compared to individuals in both schools and ALCs, the average respondent in a JCF reports higher levels of school-based strain. However, the difference in the level of school-based strain among public school and ALC students is not statistically significant.

To test our central hypotheses, we conducted a logistic regression analysis (see Table 2). We report the coefficients from the nested logistic regressions in Table 2 with odds-ratios. The standard errors are robust to heteroskedasticity and are recorded in parentheses below each coefficient. In Model 1 we regressed a set of control variables against our binary dependent variable – problem substance use. All the coefficients are statistically significant except for the free-lunch indicator. This baseline model reveals that an individuals’ institutional placement in an ALC or a JCF has a strong (i.e., significant) association with PSU, controlling for a set of important demographic and socio-economic characteristics. The difference between the two estimated coefficients for the ALC and JCF dummy variables is statistically significant ($X^2 = 42.7$). Placement in a JCF is more strongly associated with problem substance use than placement in an ALC. Furthermore, the odds of problem substance use are 275 percent greater for individuals in ALC, compared to students enrolled in school, net several other demographic traits. The odds of problem substance use are 720 percent greater for respondents in the JCF setting, compared to school survey respondents all else equal.

In Model 2 we added our three different measures of strain to the regression equation. The likelihood ratio test suggests that adding these three variables results in a statistically significant

Table 2. Logistic regression predicting problem substance use (odds ratios, standard errors in parentheses).

	Model 1	Model 2	Model 3	Model 4
ALC	3.75*** (0.21)	3.46*** (0.20)	3.20*** (0.19)	2.40*** (0.15)
JCF	8.20*** (1.00)	6.69*** (0.88)	6.18*** (0.81)	5.53*** (0.74)
Gender (Male = 1, Female = 0)	1.14*** (0.06)	1.35*** (0.07)	1.42*** (0.08)	1.19*** (0.07)
Age	1.28*** (0.02)	1.32*** (0.02)	1.33*** (0.02)	1.31*** (0.02)
Race (White = 1, Non-white = 0)	1.17*** (0.07)	1.16** (0.07)	1.18*** (0.07)	1.17*** (0.07)
Free Lunch Recipient	1.02 (0.06)	0.90* (0.05)	0.89** (0.05)	0.82*** (0.05)
Non-Family Related Strain		1.49*** (0.06)	1.45*** (0.06)	1.45*** (0.06)
Family Related Strain		1.35*** (0.05)	1.28*** (0.05)	1.26*** (0.05)
School Related Strain		1.27*** (0.02)	1.24*** (0.02)	1.20*** (0.02)
Often Angry			1.48*** (0.09)	1.29*** (0.08)
Often Depressed			1.21*** (0.08)	1.10 (0.08)
Religiosity Level				0.79*** (0.02)
Parents Caring				0.98 (0.03)
School Attachment				0.89*** (0.01)
HW/Studying Time				0.78*** (0.02)
Educational Aspirations/Goals				0.89*** (0.03)
Observations	10392	10392	10392	10392
Pseudo R^2	0.11	0.17	0.17	0.20
Likelihood ratio χ^2	1266.3***	1611.6***	1688.9***	1879.1***

Source: Minnesota Student Survey 2010
 Significance: * 0.10 ** 0.05 *** 0.01

improvement in model fit, in comparison to the baseline model (LR $X^2 = 643.83$).⁶ All the estimated coefficients are statistically significant in this model. The large estimated positive association between both institutional setting indicator variables is slightly diminished when accounting for strain.⁷ All three domains of strain have strong effects on PSU, controlling for institutional location and other various demographic traits. This finding fits with our hypothesis and our conceptual understanding of strain derived from the GST. All three types of strain have a positive effect on the odds of problem substance use.

In Model 3 we added binary indicators for anger or depressive affective states. These variables permitted us to control for the respondents' reported emotional states, which we hypothesized to be vital mediating variables. The addition of this variable pair is a statistically significant improvement in model fit (LR $X^2 = 80.09$), meaning that these measures improve our ability to explain problem substance use within our sample. It does appear, however, that strain is only minimally mediated by negative emotions (e.g., anger and depression). The coefficients for the three central strain variables are barely changed between Models 2 and 3. This finding suggests that our measures of strain have a persistent, direct effect on problem substance use.

Lastly, in Model 4 we added variables that capture the respondents' personal and social coping resources (our hypothesized moderating variables). These five measures also make a significant improvement to overall model fit, over the previous regression (LR $X^2 = 384.95$). All but one on the personal resources' variables (parents care) were statistically significant predictors of PSU. Compared to Models 1 through 3, the coefficients for the ALC and JCF binary variables are diminished in magnitude but are still significant. These personal and social coping resources may be effective for off-setting some of the strain that arises from placement in a non-traditional setting. However, the estimated coefficients for the three different strain variables are not significantly affected by the inclusion of the five coping resource variables. This finding suggests that strain arising from negative life events pertaining to ones' family, friends, significant others, or school are only marginally moderated by an individuals' personal resources for coping.

The full model (i.e., Model 4) contains our preferred specifications. With this extended regression equation, we can control for the central things that, according to the GST, explain problem substance use. In this model the odds of problem substance use are 140 percent greater for individuals in ALC, compared to students enrolled in school, all else steady. Compared to school students and with everything else held constant, the odds of problem substance use are 453 percent greater for respondents in the JCF setting. Even in our full model these institutional location effects are significantly different ($X^2 = 40.29$) from each other. These effect sizes for the ALC and JCF variables are slightly smaller in magnitude than those in Model 1; however, it appears that the institutional setting of the respondent has a persistent and robust effect on the odds of PSU across the models. By our estimates, the odds of problem substance use rises by approximately 20 percent with a one unit increase in strain stemming from school related events, all else equal. Everything else held constant, one unit increases in the level of non-family related strain and family related strain are also associated with enhanced odds of problem substance use equal to approximately 45 and 26 percent, respectively.

⁶The LR test compares the log likelihoods of the two models and tests whether this difference is statistically significant. If the difference is statistically significant, then the less restrictive model (the one with more variables) is said to fit the data significantly better than the more restrictive model. This statistic is distributed chi-squared with degrees of freedom equal to the difference in the number of degrees of freedom between the two models (i.e., the number of variables added to the model).

⁷Winship and Mare (1984) note that direct comparisons of coefficients between nested logistic models are potentially misleading because coefficient estimates can change, not just because the effect of a variable increases or decreases as other variables are controlled, but because the variance of y is changing as new variables are added. After extensive testing, our models and subsequent conclusions do not seem significantly affected by this issue. Adding new independent variables to an equation has the potential to alter the variance of y and thus the remaining coefficients in the model, even if the new independent variables are uncorrelated with the original independent variables. Winship and Mare refer to this issue as "rescaling." They suggest y -standardization as an approach to appropriately rescale the estimated coefficients to a constant variance for the latent dependent variable across equations. We tested our models using the advised y -standardization, but the substantive conclusions did not change. Our supplementary analyses are available upon request from the authors.

Building on our analysis from Table 2 we constructed four additional logistic regression models, in order to test whether the effects of strain on the odds of problem substance use depend upon institutional location. Model 5 through Model 7 control for the potential interaction between the three strain measures and the two institutional dummy variables. We report the estimated coefficients (odds ratio) and robust standard errors for trio of extension models in Table 3. In other words, we analyze both the differential and potential conditional impact of exposure to different types of strain on PSU across the institutional populations. Our results reveal that the precise type of strain and the specific institutional population are important to consider with regards to this topic. We conclude, overall, that the ALC and JCF locations moderate some domains of strain (not all), but in ways that lessen its effect rather than exacerbate its effect on PSU.

Table 3. Logistic regression predicting problem substance use with interaction terms (odds ratios, standard errors in parentheses).

	Model 5	Model 6	Model 7
ALC	4.12*** (0.31)	3.75*** (0.29)	2.64*** (0.22)
JCF	11.41*** (2.04)	10.49*** (1.87)	8.26*** (1.54)
Gender (Male = 1, Female = 0)	1.33*** (0.07)	1.40*** (0.08)	1.19*** (0.07)
Age	1.32*** (0.02)	1.33*** (0.02)	1.31*** (0.02)
Race (White = 1, Non-white = 0)	1.19*** (0.07)	1.21*** (0.07)	1.19*** (0.07)
Free Lunch Recipient	0.90* (0.05)	0.88** (0.05)	0.82*** (0.05)
Non-Family Related Strain	1.76*** (0.10)	1.72*** (0.10)	1.66*** (0.10)
ALC x Non-Family Related Strain	0.72*** (0.06)	0.72*** (0.06)	0.77*** (0.06)
JCF x Non-Family Related Strain	0.72** (0.12)	0.71** (0.12)	0.78 (0.13)
Family Related Strain	1.45*** (0.08)	1.36*** (0.08)	1.27*** (0.08)
ALC x Family Related Strain	0.95 (0.07)	0.98 (0.08)	1.08 (0.09)
JCF x Family Related Strain	0.56*** (0.08)	0.57*** (0.08)	0.64*** (0.09)
School Related Strain	1.27*** (0.03)	1.24*** (0.03)	1.20*** (0.03)
ALC x School Related Strain	0.98 (0.04)	0.99 (0.04)	0.98 (0.04)
JCF x School Related Strain	0.98 (0.08)	0.97 (0.08)	1.00 (0.08)
Often Angry		1.47*** (0.09)	1.29*** (0.08)
Often Depressed		1.21*** (0.08)	1.11 (0.08)
Religiosity Level			0.79*** (0.02)
Parents Caring			0.98 (0.03)
School Attachment			0.89*** (0.01)
HW/Studying Time			0.78*** (0.02)
Educational Aspirations/Goals			0.90*** (0.03)
Observations	10392	10392	10392
Pseudo R ²	0.17	0.18	0.21
Likelihood ratio χ^2	1734.7***	1798.8***	1953.1***

Source: Minnesota Student Survey 2010
Significance: * 0.10 ** 0.05 *** 0.01

First, the family-based strain and JCF placement interaction effect is negative and significant, which indicates that the family-based strain effect is lower among justice involved youth than school youth. The family-based strain and ALC interaction term is not statistically significant in any of our models. Second, the effects of non-family strain on the odds of problem substance use do not appear to be exacerbated by placement in ALC setting. In fact, ALC placement appears to lessen the effect of non-family strain. That effect remains consistent with the mediators controlled. The non-family related strain and JCF placement is negative, although once the variables measuring personal and social coping resources are added in Model 7 that effect is no longer statistically significant. Third, school-based strain effects on problem substance use do not increase or decrease for either individuals in JCF nor ALCs. The estimated coefficients for the interaction terms between the ALC and JCF binaries are not statistically significant in any of the models.

Conclusions

We find substantial evidence for the effects of different types of strain on PSU, including non-family strains (violent or sexual victimization by a non-family member), family-based strain (violent or sexual victimization at home), and school-based strain (bullying or sexual harassment at school). We did not find that any one type of strain has much greater or lesser impact. They all appear to matter. We also find support for the GST hypothesis that negative emotions, anger and depression, mediate the effect of strains on problem substance use. Moreover, personal resources, in the form of religiosity, school commitment and attachment, and parental attachment, also mediate the effect of strain by lessening its impact on problem substance use.

In addition, we find evidence that placement in an ALC or JCF is associated with increased PSU, even when strain and strain mediators and moderators are controlled. Two interpretations are possible. It could be that placement in ALCs and JCFs represent negative life events that produce additional strains and thus stimulate greater problem substance use. However, it could be that ALC and JCF placement measures capture otherwise unobserved pre-placement strains that are not captured by the other measures of strain included in the analysis. It is difficult to know which it is with only cross-sectional data. Data on strains and strain mediators, as well as problem substance use before and after placement to an ALC or JCF is needed.

In addition, JCF has consistently larger effects on PSU than ALC, even controlling for strain. Again, it could be that these differences result from the unobserved strain that is captured by placement into JCF as opposed to ALC or it could be that the strain of a non-school placement in terms of disrupting relationships with family, school, and peers is more pronounced among JCF placements than it is for ALC placements. This might be expected, as the latter are able to live at home and presumably to socialize with peers that remain in mainstream schools. Data that tracks individuals before and after placement would better enable a disentangling of these relationships as well.

With respect to interactions, our general finding is that how institutional location moderates the effect of strain depends on the particular institutional location considered and the type of strain. Moreover, both JCFs and ALCs did not have the hypothesized moderation effects on strain's effect on PSU. Both of the interaction terms we found statistically significant were negative, rather than positive. The effect of non-family strain on PSU is moderated downward by ALC placement. It might be that an individual is afforded some distance from non-family based strain in ALCs or that the programming of ALCs somehow lessens the influence of non-family based strains on PSU. Or it could be that both dynamics contribute to the negative interaction effect. Similarly, the effect of family-based strain on PSU is lessened by placement in a JCF. Again, it is possible that placement in a JCF provides an individual with some kind of buffer for the lingering effect of family-based strain (via isolation from day-to-day interaction with family members). Or it could be that some aspect of the programming in JCFs helps to ameliorate family-based strains. As above, these are not mutually exclusive, and both could be contributors to the negative interaction effect.

In sum, this work shows that it is useful to consider the variety of institutional contexts within which young people transition to adulthood in studies of substance use and that General Strain Theory provides a promising set of theoretical tools for understanding juvenile substance use in each of those contexts. It also shows that GST applies well to circumstances in which deviant behavior is not defined solely in terms of the frequency of involvement or against a medical definition. We employed a sociological conception of problem substance use that measured substance use relative to its consequences for individual's sense of self-control and for their relationships to social control institutions like the family, school, and the law. We encourage researchers to employ this more sociological conception of substance use in future work.

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