



Parental involvement protects against self-medication behaviors during the high school transition

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ABSTRACT

We examined how drinking patterns change as adolescents transition to high school, particularly as a function of parental involvement. Stress associated with the transition to high school may deplete psychological resources for coping with negative daily emotions in an environment when opportunities to drink are more common. A cohort of elevated-risk middle school students completed daily negative affect (sadness, worry, anger, and stress) and alcohol use assessments before and after the transition to high school, resulting in a measurement burst design. Adolescents who reported less parental involvement were at higher risk for drinking on any given day. After (but not before) the transition to high school, daily within-person fluctuations of sadness predicted an increased probability of same-day alcohol use for adolescents who reported that their parents were minimally involved in their lives. The other negative affect indicators were not predictive of use. Our results suggest that the transition to high school may represent an important intervention leverage point, particularly for adolescents who lack adequate parental support to help them cope with day-to-day changes in sadness.

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1. Introduction

Research and theory of substance use indicates that some individuals may use alcohol in order to improve or change their negative affective state (Kassel et al., 2010). The repeated use of alcohol becomes reinforced to the extent that alcohol use successfully reduces negative affect. As a result, negative affect serves as a cue for future alcohol use. This self-medication model hypothesizes a within-person effect such that, controlling for baseline affective state, individuals will be more likely to use alcohol during periods of heightened negative affect.

Experience Sampling Methodology (ESM; Larson & Csikszentmihalyi, 1983; Bolger, Davis, & Rafaeli, 2003) is a helpful paradigm for studying self-medicating behaviors. ESM involves assessing participants daily or multiple times per day over the span of days or weeks, resulting in an intensive set of repeated measures within individuals. This research design is useful for understanding self-medication because it captures frequent changes in affect, it enables analysis of within-person processes, and it permits pairing of negative affect and drinking within a short time frame. For alcohol to be effectively paired with reductions in negative affect through negative reinforcement, drinking behavior should quickly follow experiences of negative affect. Thus, ESM is well-suited to testing the self-medication hypothesis.

Nonetheless, results from studies that have used ESM to test the self-medication model are mixed. In a 60-day study of 88 adults who are regular drinkers, Armeli, Carney, Tennen, Affleck, and O'Neil (2000) found evidence that men (but not women) drink more on stressful days, but only if they anticipate positive outcomes from drinking. Hussong, Hicks, Levy, and Curran (2001) collected 21 days of data from 74 college student dyads and found that only individuals reporting less intimate and supportive friendships were more likely to use alcohol on days of heightened sadness or hostility. Finally, in a 28-day study of 137 college students, Park, Armeli, and Tennen (2004) found evidence for both positive- and negative-affective pathways to alcohol use. In general, ESM studies have found support for the presence of self-medicating behaviors, but only for a subset of individuals.

ESM studies rarely examine adolescents younger than college-aged or consider potential vulnerability factors that might help to explain the development of self-medicating behaviors in a younger sample. The High School Transition Study (HSTS) was designed to address this gap in the literature. The purpose of the present study is to investigate the role of parental support in self-medication during a particularly stressful transition point in adolescent development, the transition from middle school to high school.

1.1. The development of self-medication in adolescents

Individuals who begin drinking at an early age are more likely to develop substance use problems as adults (Hu, Davies, & Kandel, 2006; Simkin, 2002) and most adults who abuse substances initiate use during adolescence (Kassel et al., 2010). Compared with adults,

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adolescents experience higher levels of negative affect (e.g., irritability and dysphoria) and emotional instability (Cartensen, Pasupathi, Mayr, & Nesselroade, 2000; Cicchetti & Rogosch, 2002). The adolescent developmental period is characterized by neurological growth and change, particularly in areas of the brain that are related to reward reinforcement systems and emotional cognitions and reactivity (Steinberg, 2010). These changes make adolescents vulnerable to experiencing extreme emotions and to exhibiting strong behavioral reactions to environmental stressor. Alcohol disrupts cognitive ability to appraise stressful events, and it has been linked to subsequent negative affect (Hallfors, Waller, Bauer, Ford, & Halpern, 2005; Kassel et al., 2010). Therefore, adolescents who learn to cope with negative affect by consuming alcohol are at particularly high-risk for self-medication because the deleterious effects of alcohol are combined with the inherently limited capacity of the adolescent brain to accurately and effectively process emotional stimuli. Because adolescents experience higher baseline rates of negative affect, self-medication could become frequent in those who use alcohol as a coping mechanism. In turn, these individuals will be less able to develop adaptive coping strategies to handle subsequent negative emotions.

A potential pivotal point for observing the emergence of self-medication during adolescence is the transition to high school. An individual's behavior during an early life transition point, such as the transition to high school, can have a major influence on lifespan trajectories (Elder, 1998). The transition to high school is a salient, and often stressful, developmental milestone, frequently representing the acquisition of independence and increased responsibility. Strain Theory would suggest that the stress inherent in the transition from middle school to high school, in conjunction with new exposure to deviant, older peers, should lead to an increase in negative affect and alcohol use (Agnew, 1985). Indeed, Newman, Newman, Griffen, O'Connor, and Spas (2007) found that the transition to high school is associated with elevated rates of depression and decreased attachment to school. In addition, substance use changes across this transition from the behavior of a relatively deviant minority to a normative activity engaged in by the majority (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Thus, the increased stress and widespread availability and acceptability of alcohol use may create greater opportunities for youth to engage in self-medication after the transition to high school.

1.2. Social support and the buffering hypothesis

According to Social Learning Theory (SLT; see Sher & Gerkin, 2007), individuals may utilize a variety of potential learned coping mechanisms when confronted with a stressful situation, including enlisting social support or self-medication. Individual expectancies about the effectiveness of each coping strategy for achieving the desired outcome impact decisions about coping behavior. As a consequence, people with fewer social supports should be more likely to self-medicate because of lower expectancies about alternative methods of coping (such as talking to a friend; Abrahms & Niaura, 1987; Cooper, Russell, & George, 1988). Consistent with this prediction, Peirce, Frone, Cooper, and Russell (1996) found that individuals with more support from social networks tend to have less alcohol involvement. Less social support has also been related to increased risk for self-medication more specifically. Using an ESM study design, Hussong et al. (2001) found that college students with less intimate and supportive friendships showed stronger short-term associations between negative affect and drinking.

For young adolescents, one important source of support that may serve to buffer risk for self-medication is parents. In line with the buffering hypothesis (Cohen & Wills, 1985), inadequate support should exacerbate the effect of negative affect on drinking behavior, while adequate support should provide a buffer against these effects.

Two previous ESM studies (using the same data as the current study) report buffering effects of parenting behavior on adolescent self medication prior to the high school transition. Focusing on parent emotion socialization, Hersh and Hussong (2009) showed that adolescents are more likely to self-medicate if their parents show an over-involved pattern of responding to their child's distress (i.e., are both dismissive of the importance of their adolescent's emotions and are directive or highly coaching of their adolescent's emotional responses). More directly testing the buffering effects of parental support prior to the high school transition, Reimuller, Shadur, and Hussong (2010) found that adolescent reports of high-quality (i.e., high openness with low conflict) family communication predicted less drinking but that parent reports of high-quality family communication predicted higher levels of adolescent alcohol use on days when negative affect was high. Parental involvement was not predictive of drinking outcomes, including self-medication. The authors suggested that their cross-sectional results might indicate that parents increase efforts to communicate with adolescents after observing troublesome behavioral patterns in their adolescents. The current study extends these findings by examining changes in these buffering effects over the transition to high school.

1.3. Current study

The HSTS utilized a ubiquitous stressful transition to understand how self-medication processes may develop within individuals transitioning from early- to mid-adolescence. On two occasions, once before the transition to high school and once after the transition to high school, adolescents were asked to keep track of their daily negative affect and alcohol use for 21 consecutive days, resulting in a measurement burst design. Prevalence of alcohol use increases as students transition from middle school to high school, so it was expected that self-medicating behaviors would begin to form at this time. This study tested the hypothesis that self-medicating behaviors would be acquired within individuals after they transitioned to high school, particularly for individuals reporting that they receive little support from their parents. In this study, self-medication is operationalized as the empirical (i.e., observable) relationship between self-reported daily negative affect and alcohol use.

2. Methods

2.1. Participants and procedure

The study was conducted in three waves. In the first wave, 8th graders were recruited from seven middle schools located in a Southern, rural county. Of $n = 436$ enrolled 8th grade students in the study catchment area in Spring 2002, $n = 365$ completed and provided valid data for the school-based surveys, $n = 34$ students reported that they did not respond to survey questions honestly, $n = 15$ students' parents refused to provide consent, $n = 8$ moved prior to the assessment, $n = 6$ did not assent to participate, $n = 4$ were absent during the school assessment dates, and $n = 4$ had a language barrier that prevented them from filling out the survey.

For Wave 2, students were rank-ordered with respect to a risk index based on their Wave 1 report of current substance use, initiation by 8th grade, or affiliation with substance-using peers. Students were recruited, beginning with those showing highest risk, to participate in the first daily diary measurement burst at Wave 2. Contact was attempted with $n = 196$ participants within the two month summer recruitment window (including all $n = 169$ participants who listed any level of risk as well as $n = 27$ who indicated no risk), with $n = 81$ completing the study (i.e., 41% of the 196 students targeted for recruitment). Primary reasons for non-participation were inability establish contact ($n = 33$), ineligibility ($n = 21$, language barrier, moving, did not pass grade, child death), limited availability ($n = 17$),

discomfort with the sampling paradigm ($n = 5$), and privacy concerns ($n = 11$). 28 individuals who did not participate provided no reason. The adolescents in Wave 2 are representative of the original elevated-risk targets initially contacted for recruitment (see Hussong, Gould, & Hersh, 2008, for a detailed sample description and recruitment analysis from Wave 1 to Wave 2).

The goal of recruiting an elevated risk sample of early adolescents was achieved. Participants who were selected for and agreed to participate in Wave 2 daily assessments differed from the Wave 1 students in the following ways: they were more likely to be an ethnic minority ($n = 32$; 40%) and female ($n = 44$; 54%), they reported more frequent alcohol use, they had more friends who used substances, they reported higher levels of depression, delinquency, physical aggression, and non-physical conduct problems.

Participants from the wave two measurement burst were re-contacted for the final wave of data collection, the second daily diary measurement burst, in Summer 2003. Students had completed the first year of high school by this time. Of $n = 81$ who agreed to participate in Wave 2, $n = 56$ students agreed to participate in the second measurement burst. The $n = 25$ students who provided daily diary information in the first measurement burst but who did not participate in the second measurement burst either refused ($n = 18$) or HSTS was unable to locate ($n = 3$) or contact ($n = 4$) them within the two month recruitment window. The current analyses are based on a sample of $n = 79$ participants who provided at least some daily diary data for the pre-high school transition measurement burst. 54% of participants in this wave were female and 46% were ethnic minorities. There were no significant differences between Wave 2 and Wave 3 participants with respect to race, gender, alcohol use, depression, physical aggression, non-physical aggression, or friend substance use on Wave 2 measures.

Procedures for both measurement bursts were identical. Prior to initiating the measurement burst, adolescents and their parents separately completed in-home interviews about a variety of topics including substance use behaviors, mood symptomatology, and family processes. At the end of this interview, adolescents were instructed in the ESM design. The ESM portion of the study lasted for 21 days. Adolescents wore a pre-programmed wristwatch, which prompted participants to rate their affect levels when the alarm sounded three times per day. The first alarm rang between 10 AM and 2 PM, the second alarm rang between 2 PM and 6 PM, and the last alarm rang between 6 PM and 10 PM. A fourth alarm prompted adolescents to record their substance use for the entire day. In order to protect privacy, these records were kept in a hidden, locked box in the adolescent's home and response codes were uninterpretable to parents and other people outside of the study. HSTS staff called participants once per week to assess how well the process was working and to answer any questions that the adolescent had about data collection. Participants were encouraged to call the project office at the end of each day to record their answers on an answering machine (leaving only their ID numbers), and they were entered into a lottery drawing each time that they phoned in their data. Adolescents received \$.25 for each assessment recorded on paper. Both parents and adolescents received \$12 for completing the initial interview.

2.2. Measures

2.2.1. Negative affect

Four measures of negative affect were collected during each assessment occasion (three times per day). The negative affect items were based on the revised Multiple Affect Adjective Checklist (Lubin, Denman, & Van Whitlock, 1998) and included self-reports of feeling sad, mad, worried, and stressed. Adolescents were asked to rate how they were feeling on a scale ranging from (1) "not at all" to (5) "very." We considered combining negative affect scores to create a single

negative affect scale. However, although a factor analysis suggested that the items do represent a single factor, the items did not load very highly on the negative affect scale, suggesting a high degree of unique variance within each item. Thus, we analyzed the effects of each negative affect variable independently from the others. Separate self-medication models were used for each affective measure to avoid problems with multicollinearity.

The proportion of missing ESM data on affect increased over the course of each measurement burst. We addressed this issue through missing data estimation procedures. Rates of missingness ranged from 5% on the first day of the pre-high school measurement burst to 23% on the last full day of the post-high school measurement burst. It is improbable that the affect measures would be missing completely at random. Thus, to avoid potential bias in parameter estimates and to avoid efficiency loss, we used a linear imputation model in SAS version 9.2 with individual background characteristic (gender, school level, parental involvement, parental education, race/ethnicity) and mean (i.e., person-level) negative affect scores as predictors in the imputation model. Although affect measures were assessed on an ordinal scale, the current best practice in multiple imputation is to impute ordinal data with a linear model without rounding to the nearest integer value (Graham & Schafer, 1999). We were able to use this technique because multi-level models are estimated using a conditional likelihood function, so distributional assumptions are not required for exogenous variables. Results were aggregated across 40 replicated models based on 40 imputation samples as recommended by Graham, Olchowski, and Gilreath (2007).

Affect was assessed three times for each individual on every day of the daily diary study but only one measure of alcohol use was collected per day. Therefore, it was necessary to average across the three daily occasions of measurement to characterize average daily sad, mad, worry, and stress levels. Each individual's average affect rating was computed across measurement burst to create a stable measure of sadness, anger, worry, and stress for each burst period (pre-high school transition and post-high school transition). This score was subtracted from individual's daily affect scores to create person/burst-mean centered daily affect scores. We used both the between-person/burst and within-person/burst measures of affect in our models to aid interpretation (Enders & Tofighi, 2007). The between person/burst effect represents a relatively stable relationship between affective *trait* and propensity to use alcohol; the within person/burst effect represents a dynamically fluctuating relationship between daily changes in mood and alcohol use *on that day*. The average person/burst-level "mad" score was .24 ($SD = .22$), the average "sad" score was .20 ($SD = .22$), the average "worry" score was .31 ($SD = .26$), and the average "stress" score was .40 ($SD = .28$). Person/burst-centered daily affect measures were centered on zero and had standard deviations ranging from .23 to .29.

2.2.2. Adolescent perceptions of parental social support

Prior to beginning each measurement burst, adolescents answered questions pertaining to family communication (20 items from Olson et al., 1985) and parental involvement (three items developed by HSTS staff; e.g. "[My] parents are involved in [my] hobbies"). In order to draw conclusions regarding the direct and buffering effects of parental support over the course of the transition to high school, it was necessary to ensure that the construct has equivalent meaning and measurement properties at both time points (Meredith & Horn, 2001). Thus, before using these scales in the analysis, we examined the factor structure for each parental support construct and tested whether the factor structure was invariant for both waves of assessment using Mplus version 5.21, accommodating the ordinal nature of the measures. Only parental involvement had a longitudinally invariant factor structure with high factor loadings for each item. For this reason, and because we believe that adolescent perceptions of parental involvement are an important aspect of support during

adolescence, we chose to use only the parental involvement construct to indicate perceptions of parental social support in future analyses.

Because factor-to-item relationships did not substantially differ across items, we summed the items on the parental involvement scale to obtain a single, continuous measure of parental involvement. Adolescents were asked to rate strength of agreement on a five point Likert-type scale ranging from (1) “Strongly Disagree” to (5) “Strongly Agree.” The average Wave 2 student’s perceived parent involvement rating was 3.92 (SD = .87; indicating agreement; Cronbach’s $\alpha = .77$) and the average Wave 3 student’s perceived parental involvement rating was 3.61 (SD = .96; indicating a score in between neutrality and agreement; Cronbach’s $\alpha = .80$).

2.2.3. Background covariates

We considered whether gender, race/ethnicity, or parental education affected drinking behavior, either directly or indirectly via a moderating effect. Information regarding parent education was provided by parents. We coded parent education as the highest level of education completed by either parent, scored (0) “Less than high school” (2% and 2% in the first and second measurement bursts, respectively), (1) “High school graduate” (14% and 11%), (2) “Some college or technical school” (28% and 31%), (3) “College graduate” (36% and 31%), or (4) “Graduate or professional school” (21% and 26%).

2.2.4. Alcohol use

On a given day, the average participant had a 4.8% probability of reporting alcohol use (Wave 2 students had a 3.2% probability of reporting using alcohol and Wave 3 students had a 7.3% probability of reporting use). Because we were interested in the frequency of any use (rather than quantity, which tends to be low for early adolescents), the outcome variable was measured dichotomously (any reported use or no reported use). Rates of missing alcohol use reports were similar to rates of missing affect data (ranging from about 3% missing for middle school students on the first day of the daily diary study to 27% on the last full day of the middle school daily diary study). We did not impute the missing substance use ratings for two reasons. First, there are currently no reliable methods for imputing binary variables; using a linear imputation model and rounding may introduce substantial parameter bias (Horton, Lipsitz, & Parzen, 2003). Second, we are able to use full information maximum likelihood estimation to obtain parameter estimates, so parameter estimates will be unbiased and efficient as long as the exogenous variables have been imputed and the alcohol use reports can be assumed to be missing at random, conditional on all measured information (including previous reports of alcohol use; Allison, 2001).

3. Results

We were interested in whether self-medicating behaviors differed before and after adolescents transitioned to high school, and whether parental social support buffered the effects of negative affect differently for middle schoolers and high schoolers. Self-medication theory does not specifically differentiate among types of negative affect (i.e., sadness, anger, worry, and stress), but differences have been found in previous research (Hussong et al., 2001; Hussong, Galloway, & Feagans, 2005), so we tested separate self-medication models for each of these types of negative affect.

Multilevel models are appropriate for assessing dynamic, within-person effects in repeated measures designs such as our two-phase ESM study (Schwartz & Stone, 1998). We tested a non-linear multilevel model (i.e., a linear mixed model for the log odds of alcohol use) for each type of negative affect. The form of the model is shown below (*i* references variables that vary across

individuals and *t* references variables that vary over time (day or burst)):

$$\begin{aligned} \text{log odds}(AlcUse_{it}) = & \beta_{0i} + \beta_1 * HS_t + \beta_2 * Involve_{it} + \beta_3 * DayAffect_{it} \\ & + \beta_4 * Involve_{it} * DayAffect + \beta_5 * HS_t * Involve_{it} \\ & + \beta_6 * HS_t * DayAffect + \beta_7 * HS_t * Involve_{it} \\ & * DayAffect_{it} \beta_{0i} = \gamma_{00} + \gamma_{01} * ParentEd_i + \gamma_{01} \\ & * StableAffect_i + u_{0i}, \text{ where } u_{0i} \sim N(0, \tau_{00}). \end{aligned}$$

Intra-burst/individual predictors of use included mean-centered daily negative affect, wave-specific parental involvement, a binary indicator of wave (to index the high school transition), the interaction between wave-specific parental involvement and mean-centered daily negative affect (i.e., the buffering effect of parental involvement during middle school), the interaction between wave and negative affect (i.e., the degree to which high school students are more or less likely to self medicate than they were before they transitioned to high school), the interaction between parental involvement and wave (i.e., the degree to which the effect of parent involvement on overall drinking behavior changes after students transition to high school), and a three-way interaction between daily fluctuation in negative affect, parental involvement, and wave (i.e., the change in the buffering effect of parents after students transition to high school). Gender and ethnicity were initially included in these models, but were found to be non-significantly related to drinking behavior (either directly or via a moderating effect) for any measure of negative affect so they were excluded from the final models to improve precision of the estimates.

Individually-varying propensity to use alcohol (i.e., the individually-varying intercept) was predicted by parental education and average negative affect. The intercept was also predicted by a person-level random effect that represented individual differences in baseline drinking rates not accounted for by the measured variables in the model. Random effects of the intra-individual predictors were tested but were found not to be significantly different from zero.

Each model was run 40 times, once with each of 40 different sets of random imputation values for the missing negative affect measures that were generated using SAS Proc MI. Overall parameter point estimates and standard errors were computed using SAS Proc MIANALYZE. Of the four measures of daily negative affect, only sadness was related to alcohol use (either directly or via a moderated effect). Results for each of the sadness models are presented in Table 1.

More parental education was associated with increased risk for alcohol use (OR = 2.10; $p < .01$), a well-replicated finding that children from families in higher socio-economic strata consume greater amounts of alcohol (e.g., Keyes & Hasin, 2008). As expected, adolescents were much more likely to drink after transitioning to high school (OR = 441.42; $p < .001$). In pre-high school transition measures (Wave 2), adolescent-reported parental involvement (OR = .96; $p = .86$), daily fluctuations in sadness (OR = .13; $p = .41$),

Table 1
Results from self medication models for sad affect.

	β	(SE)	Odds Ratio
Intercept	-5.49***	(1.30)	<.01
Daily sadness	-2.25	(2.56)	.11
Parental involvement	-.04	(.25)	.96
High school	6.09***	(1.29)	441.42
Daily sadness parental involvement	.52	(.68)	1.68
Daily sadness high school	7.75*	(3.89)	2321.57
Parental involvement high school	-1.57***	(.36)	.21
Daily sadness parental involvement high school	-2.26*	(1.13)	.10
Parent education	.74**	(.24)	2.10
Stable sadness	1.6	(.97)	4.95

* $p < .05$.

** $p < .01$.

*** $p < .001$.

and the interaction of parental involvement and daily sadness (OR = 1.68; $p = .44$) were not related to alcohol consumption. However, after the high school transition, parental involvement was directly related to reduced drinking behavior after high school (OR = .21; $p < .001$); higher daily sadness was related to much higher drinking risk for high school students (OR = 2,321.57; $p = .05$); and adolescent-reported parental involvement buffered the effects of daily sadness for high school students (OR = .10; $p = .05$).

To understand the nature of the buffering effect of parental involvement on self-medication before and after students transition to high school, the interactions were probed at one and two standard deviations below and above the sample mean levels of parental involvement, and at the mean (Curran, Bauer, & Willoughby, 2006; see Fig. 1). This was done separately for students before transitioning to high school and after transitioning to high school. When the results are visualized within the range of the sample data, it is apparent that very few middle school students in our sample ever used alcohol, so neither negative affect nor parental involvement was appreciably related to consumption risk. It is clear that high school students who perceived low or very low levels of parental involvement were at a much greater risk for alcohol use relative to their peers, especially when they were feeling sad relative to their own baseline.

In any longitudinal study in which there is dropout, there is a risk for attrition bias. If participants who dropped out of the study were less likely to drink on days characterized by more sadness, on average, than participants who stayed in the study for the second measurement burst, then the estimate of change in self-medication after the high school transition could be inflated. On the other hand, if participants who dropped out of the study early were more prone to self-medication, then the effect of transitioning to high school would be underestimated. We derive some comfort from attrition analyses showing no significant differences in alcohol use (for individuals or among friends), depression, or any other measures that might be related to our findings. We also conducted a sensitivity analysis in which only data from adolescents who participated in both measurement bursts were analyzed and found an identical pattern of results, confirming that our results are not an artifact of attrition bias.

4. Discussion

After transitioning to high school, adolescents who perceived that their parents were not involved in their lives were at a much greater risk for using alcohol on days when they felt sad than their peers who perceived that their parents are somewhat or highly involved in their lives. It is inferred from this pattern that self-medication behaviors

have been acquired in the group perceiving low parental support. That is, self-medication is defined in this study as the observed relationship between self-reported experiences of daily negative affect and drinking behaviors, regardless of whether adolescents are cognizant of this association. In a study of self-reported motivations for drinking, Hussong et al. (2005) found that individual reports of their own tendency of 'drinking to cope' were not predictive of an observed association between affect and drinking behaviors. Tennen et al. (2000) reported similar findings. Thus, in this study we rely on actual behaviors rather than self-reported coping styles.

Self-medication appeared to be a newly-acquired behavior for select high school students in our sample; students did not generally engage in self-medicating behaviors before entering high school. There are two non-mutually exclusive explanations for this. The first is that the propensity for self-medication may be present before adolescents transition to high school, but alcohol is not as readily available to support this behavior (Johnston et al., 2009). Alcohol may become easily accessible for adolescents whose parents are not involved in their daily routines. The second explanation, which falls within the Strain Theory framework, is that the transition from middle school to high school drains students of coping resources so that those who lack social support from parents will rely on maladaptive coping behaviors to relieve strong negative emotions. Results from this study support both of these conclusions; students who perceived that their parents were less involved were more likely to drink overall, regardless of daily affect (indicating low parental monitoring), and students who perceived little involvement from their parents were more likely to drink on days when they felt particularly sad (indicating a maladaptive coping process). Future research could parse these findings further by determining whether students who report having ready access to alcohol are more likely to self-medicate, and by exploring whether alcohol availability fully or partially mediates the relation between parental involvement and self-medication. Future research might also consider heterogeneity of coping responses for adolescents whose parents are positive role models and for adolescents within dysfunctional families.

We found that daily shifts in sadness were the only measured aspect of negative affect that was related to substance use. This corroborates Hussong et al.'s (2001) finding that college students who reported low social support were more likely to drink after experiencing sadness or hostility, but not after experiencing guilt or fear. In the current study, daily fluctuations in within-person stress, worry, and anger were not related to same-day drinking behavior. In conjunction, these studies suggest that self-medication is not a global response to any type of negative affect; rather, it seems to result from

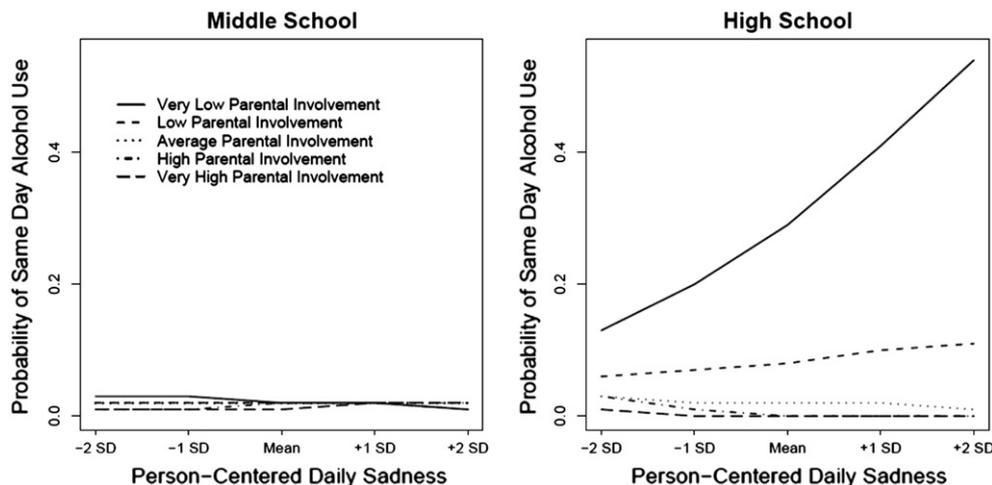


Fig. 1. Buffering effects of parental involvement on self-medicating behaviors in students before and after they transition to high school at very low (–2 SD below mean), low (–1 SD below mean), mean, high (+1 SD above mean), and very high (+2 SD above mean) levels of parental involvement.

sadness most consistently. Strain Theory specifically posits that stress increases *anger* (not sadness). However, there was no support for an increase in drinking behaviors in response to daily or stable feelings of anger across the transition from middle to high school in this sample.

HSTS participants were a selected group of adolescents. In part, this was intended by the HSTS investigators; alcohol use is infrequent among eighth and ninth graders so it was important to recruit an elevated-risk sample. Further, the sample was collected from a single rural county. Findings may differ for students who come from more or less affluent communities, students who live in more urban areas, or students who were raised in different cultural contexts. It is important for future studies to sample from a variety of populations to generalize our preliminary findings. Finally, a number of students who were recruited for the study declined to participate or were ineligible for the study. It is possible that self-medication processes, or the relation between parental support and drinking behavior, may have been different for the students who declined to participate.

Due to the intensive process of implementing two daily diary measurement bursts and the limited data collection period (i.e., summers), the number of participants in the study was not as high as we might have liked. Indeed, although the statistically significant three-way interaction was hypothesized on theoretical grounds, we view this finding as very preliminary and in need of replication. However, the limited number of individuals in the sample was offset somewhat by the large number of intra-individual repeated measures (there were up to 42 total repeated daily mood and alcohol use measures across the two measurement bursts). Care was taken to handle item-level missing data using appropriate methodology in order to maximize efficiency of parameter estimation and minimize bias. Nevertheless, it is important to replicate our findings to rule out the possibility that our findings include false positive results.

Findings from this study indicate that the transition to high school may be a sensitive period for the development of self-medication. Adolescents who perceive adequate levels of parental involvement are unlikely to develop this maladaptive coping style whereas adolescents who do not perceive enough involvement from their parents are at risk. In addition to encouraging parental involvement during this stressful transition period, high schools should encourage strong and supportive student-adult relationships to help buffer the effects of the stressful transition and to model adaptive coping strategies for vulnerable adolescents.

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Contributors

Nisha Gottfredson analyzed data for this manuscript, conducted the literature review, and wrote much of the manuscript. Andrea Hussong is the principal investigator for the High School Transition Study. She designed the study, collected data, and contributed to writing of the manuscript.

Conflict of interest

There were no conflicts of interest involved in crafting this manuscript.

Submission declaration

The work described here has not been published previously, nor is it under consideration for publication elsewhere. Publication of this work has been approved by both authors and the work has been approved through the IRB at the University of North Carolina. If accepted, this manuscript will not be published elsewhere without the consent of the copyright-holder.

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