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Emotional Health Predictors of Substance Use Initiation during Middle School

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Abstract

This study aimed to evaluate whether emotional health factors, including anxiety and depression, stress, and social support are associated with earlier youth initiation of alcohol and illicit substances during middle school (from the 6th to the 8th grade). Data for this study were from the Developmental Pathways Project, a longitudinal study of 521 youth sampled from the Seattle Public Schools. Discrete time survival analyses were used to assess the effects of depression, anxiety, stress, and support on initiation of substance use, measured every 6 months at five time points between 6th and 8th grade. Youth who had initiated prior to 6th grade had significantly higher levels of depressive symptoms. In multivariate survival analyses controlling for child race/ethnicity, gender, and socioeconomic status and accounting for conduct problems, youth who reported higher levels of separation anxiety/panic symptoms were at decreased risk for early alcohol initiation. Children with higher levels of perceived teacher support had a significantly lower risk of alcohol initiation during early follow-up periods. Recent stressful life events in Grade 6 were associated with significantly greater risk of initiating an illicit substance by Grade 8. The current findings highlight the role of stress in the initiation of illicit substance use and suggest that teacher support is associated with lower risk for very early alcohol use. Future research examining anxiety as a predictor of substance use should distinguish between subtypes of anxiety.

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Keywords

alcohol initiation; depression; anxiety; stress; support; emotional health

Initiation of substance use during the middle school years is considered to be early, and understanding more about risks for use during this critical window of time can provide insight into the etiology of substance use disorders and inform prevention efforts. Early initiation (<14 years of age) of substance use has been found to be a robust predictor of later problems including heavier substance use throughout adolescence and emerging adulthood, more serious long-term substance use problems, and adult substance dependence (DeWit, Adlaf, Offord, & Ogborne, 2000; K. M. King & Chassin, 2007; Maggs & Schulenberg, 2006; Sung, Erkanli, Angold, & Costello, 2004).

Emotional health and related factors such as stress and support may play a role in amplifying tendencies for earlier substance use. There is a robust literature already documenting the prospective association between conduct problems and substance use among youth (Costello, Erkanli, Federman, & Angold, 1999; Fergusson, Horwood, & Ridder, 2007; K. M. King & Chassin, 2008; S. M. King, Iacono, & McGue, 2004; Loeber, Stouthamer-Loeber, & White, 1999; Mason & Windle, 2002), and the role of internalizing problems is now receiving increasing attention as a possible contributor to risk. There is variability in findings regarding an association between early depressive symptoms and substance use onset (Hussong & Hicks, 2003; S. M. King, et al., 2004; Pardini, Lochman, & Wells, 2004).

The literature on the role of anxiety in substance initiation and use is somewhat mixed. While many studies have suggested a positive association (Kushner, Abrams, & Borchardt, 2000; Marmorstein, White, Loeber, & Stouthamer-Loeber, 2010), others have shown that fearful affect and anxiety is associated with decreased risk of initiation and use (Pardini, et al., 2004; Pardini, White, & Stouthamer-Loeber, 2007). To some degree, these mixed findings may be a result of variability in whether specific dimensions or subtypes of anxiety are distinguished. Certain types of anxiety, such as harm avoidance and separation anxiety, may be protective from substance use during adolescence in part because they may inhibit risk-taking behaviors and affiliation with deviant peers (Kaplow, Curran, Angold, & Costello, 2001; Wills, Sandy, & Shinar, 1999) whereas other aspects of anxiety such as social anxiety could enhance risk-taking (Kashdan, Collins, & Elhai, 2006).

Other factors related to emotional health, including life stress and low social support, may increase youths' vulnerability to initiate substance use earlier than most of their peers. Stressful life events have significant effects on both frequency and intensity of alcohol use from adolescence to early adulthood (Aseltine & Gore, 2000; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). High parental support is negatively associated with alcohol use and abuse in adolescence (Duncan, Duncan, & Strycker, 2000) and predicts lower risk of future substance abuse (Measelle, Stice, & Springer, 2006).

Using longitudinal data from a community-based sample of young adolescents, this study aims to prospectively evaluate the association between emotional health factors measured in 6th graders who have not initiated use and risk for subsequent initiation of alcohol and illicit substance use over the middle school years. To advance the literature in this area, we investigate various indices of emotional health, including depression, and specific constellations of anxiety symptoms simultaneously, while including conduct problems in our model. In addition, since relatively few studies have examined support from nonfamily members of the adolescent's social support network, we investigated stress and support from peers, teachers, and family as predictors of early initiation. We hypothesized that depressive

symptoms, conduct problems, and stress would be associated with earlier initiation, whereas some components of anxiety (separation anxiety and harm avoidance) and support from parents and teachers would be associated with later initiation.

Method

Sample

The Institutional Review Board of the University of Washington approved the study. Data for this study were from the Developmental Pathways Project (DPP), a community-based prospective cohort study of students recruited in sixth grade from four Seattle-area public schools whose combined enrollment is representative of the Seattle public middle school population. A two stage sampling approach was used for DPP. First, universal emotional health screening was carried out with sixth grade students at these schools in four consecutive years (2001-2004) using the Mood and Feelings Questionnaire (MFQ) for depression (Angold & Costello, 1987) and Youth Self Report (YSR) externalizing scale for conduct problems (T. M. Achenbach, 2001). Of the 2920 eligible students, 2187 (74.9%) were screened. The second sampling stage, students who had been screened, who had at least one parent who could speak English, and who were still residing in the district were eligible for recruitment into the longitudinal study. A stratified random sample of 807 students was selected for longitudinal follow-up with students scoring high on depressive and/or conduct problem scores over-sampled, as described elsewhere (Vander Stoep, et al.) Of those selected, 521 (64.6%) students and their parents/guardians consented to participate. Among students who declined participation, there was a greater percentage of Asian American and a smaller percentage of non-Hispanic White children compared to overall school district enrollment. However, the enrolled and non-enrolled students were similar in gender composition (proportion of males: 52.1% vs. 47.9%; p=0.49), mean YSR externalizing scores (10.1 vs. 10.6, p=0.44), and mean MFQ scores (5.9 vs. 6.1, p=0.68) at screening. Demographic characteristics of study participants are given in Table 1. Hollingshead SES scores ranged from 6 to 66, indicating a diversity of social economic backgrounds.

In-home interviews were administered to participating students and parents/guardians by two trained research interviewers. Baseline interviews were conducted in the spring of the participant's 6th grade year. In-person follow-up interviews were conducted at 6, 12, 18, and 24 months after the baseline interview. Of the participants originally enrolled in DPP, between 86% and 90% were retained in each of the first four follow-up interviews.

Measures

Substance Use—The Customary Drinking and Drug Use Record (CDDR) (Brown, et al., 1998) was administered at each wave to assess age of onset and frequency of use during the prior six months of alcohol, marijuana, cocaine or crack, heroin, amphetamines, and hallucinogens. Alcohol questions were worded to ask about standard proportions (e.g., 1 can of beer; 1 shot of liquor) and specifically excluded having only "a sip or taste." The latter 5 substances were collapsed to form an "illicit substance use" variable, due to low frequencies of individual types of substances. The CDDR was originally validated in a community sample of adolescents, demonstrating high test-retest reliability (e.g., r = .83 over 1 week), and strong convergent validity (r = .68) (Brown, et al., 1998). For analyses, binary variables for the use of any alcohol and illicit drug at each time period were created.

Anxiety Symptoms—Anxiety was assessed by the Multidimensional Anxiety Scale for Children (MASC) (March, Parker, Sullivan, Stallings, & Conners, 1997), a self-report

instrument that includes scales measuring "recent" physical symptoms of anxiety (α= .84), social anxiety (α= .85), harm avoidance (α= .73), and separation anxiety (α= .70),

Depressive Symptoms—The 33-item child report version of the Mood and Feelings Questionnaire (MFQ) was used to assess depressive symptoms in the past two weeks (Costello & Angold, 1988). Internal consistency is .91 in the current sample. The MFQ correlates highly with depression diagnoses and the Child Depression Inventory (Kovacs, 1992).

Conduct Problems—The Child Behavior Checklist (CBCL) externalizing scale was used as a measure of conduct problems (α= .90). The CBCL is a well-standardized parent-report measure with excellent reliability and validity (T.M. Achenbach & Rescorla, 2001).

Stressful Life Events—The Life Events Checklist administered at baseline asks parents to identify stressful life events that have occurred over the child's lifetime, and a separate child-report version was used to assess events that have occurred in the past six months using yes/no questions. Both were used in analyses. Various types of stressful events are tapped and summed using 30 predetermined stressors, including losses, transitions, and traumas, and space for up to 2 additional stressors (Johnson, 1986).

Social Support—The Social Support Scale for Children and Adolescents was used to assess the child's perception of support received from parents, teachers, and friends, with subscales for each source of support (Harter, 1985). Subscale reliabilities as indicated by Cronbach's alpha ranged from .54 (Teacher Support) to .83 (Friend Support) in the current study.

Covariates—Socioeconomic status (Hollingshead, 1975), child sex, and race were used as covariates in the current analyses.

Results

Analytic Overview

Data analysis was conducted using Stata 10.1. To account for over-sampling of students who screened high for depression and conduct problems and to make the sample demographically similar to the Seattle public middle school population, two-component weights were derived and applied to analyses. The first component was a sampling fraction weight that was equivalent to the inverse probability of being enrolled based on the four psychopathology screening groups. The second component was a post-stratification weight that accounted for differences in gender, race/ethnicity, and educational program (e.g., regular, gifted, special education, English Language Learner), between the screening and longitudinal study samples. These two weights were multiplied to produce the final weight for each individual.

Multivariate discrete time survival analysis models (Singer & Willett, 1993) were used to examine associations between emotional factors measured at baseline and the outcomes, initiation of alcohol and illicit substance use during middle school, after controlling covariates. Time was modeled as study visit (0 to 4, where baseline is 0 and 4 is the final follow-up visit) and, for parsimony, was included in models as a continuous variable. Because this survival analysis was intended to examine risk for later initiation associated with baseline characteristics, participants reporting substance use prior to baseline were excluded from respective analyses (n = 22 for alcohol; n = 11 for illicit drugs). Thus, 499 youth were included in analyses of alcohol use initiation, and 510 were included in analyses

of illicit drug use initiation. Among those who were excluded from the study on the basis of having used alcohol or other illicit drugs *prior* to the baseline assessment in Grade 6, baseline depressive symptoms were highly elevated, with mean MFQ scores over twice as high among users (alcohol $M = 20.0$; illicit drug $M = 22.5$), compared to nonusers ($M = 9.1$ and 9.2 respectively), both ps <.001. Likewise, the weighted mean conduct problems score was higher among users (alcohol $M = 10.6$; illicit drug $M = 13.2$) compared to nonusers ($M = 7.3$ for both), ps = .03 and .06, respectively.

Using logistic regression, odds ratios (*OR*s) and their 95% confidence intervals (*CI*s) and *p*-values were estimated to describe the incremental risk of substance use initiation associated with one unit of change in predictor variables for any given study period conditional on individuals not already initiating use of the drug of interest. There was minimal between-school variance (ICC<.0001) for the substance use outcomes, thus, school was not included as a random effect or as indicator variables in the statistical model. Interactions between time on study and each of the independent variables were also examined in separate models to assess the proportionality of odds over time. Because of earlier literature suggesting a particularly strong effect of co-occurring problems (e.g. conduct problems and depressive disorders) on substance use initiation (Gallerani, Garber, & Martin, 2010; Henry, et al., 1993), we also examined interactions between conduct problems, depressive symptoms, and anxiety scores.

For one or more assessments during the longitudinal study, there were 126 youth missing alcohol use and 104 missing illicit drug use data. There was no statistically significant difference when any alcohol use at available visits is compared between those who were not missing and those who missed alcohol data for one or more visits. For those participants who were missing substance use data at an earlier assessment, had not reported any substance use prior to that missing data time point, and returned for a later assessment reporting never using any substance, missing values for substance use were coded as 'no use' at the time point(s) since the previous assessment. For remaining participants' missing substance use and other data, multiple imputation was used to substitute non-missing values for missing values (Raghunathan, 2004). Imputed data were estimated based on models that including all covariates used in analysis models, as well as drug use in prior and subsequent visits. Ten imputed datasets were created using the Imputation Chained Equation procedure for Stata (Royston, 2005). A summary OR estimate was calculated for each of the independent variables across the 10 imputed datasets, and standard errors and corresponding 95% confidence intervals were estimated according to Rubin's rules to account for the uncertainty of the imputed values using the 'mim' procedure (Carlin, Galati, & Royston, 2008). As sensitivity analyses, we re-ran the logistic regression models among only complete cases and found similar results to those using the multiply imputed data. Mean scores at baseline and correlations between predictor variables are presented in Table 2, with moderate correlations (rs =~ .50) observed between depressive symptoms and physical anxiety, and between anxiety subscales.

Table 3 presents the survival probabilities for the initiation of substance use at each time point across the sample: 21.5% of the sample initiated alcohol and 13.2% initiated illicit substances prior to the final study visit in the fall of 8th grade. Marijuana use initiation accounted for a large majority of the illicit drug use initiation (71.4%). Among those who reported neither alcohol nor illicit substances at baseline, 8.4% reported both alcohol and illicit substance use over the course of the study, 12.8% reported alcohol use only, 4.6% reported illicit drug use only, and 74.2% reported no use of alcohol or illicit drugs.

Table 4 shows the results of a discrete time survival model on initiation of alcohol use with emotional health related factors as predictors and adjustment for covariates. No significant

association was found between incidence of substance use initiation and race/ethnicity, SES, or gender. In regards to predictors of alcohol use initiation, a significantly lower risk for earlier initiation was observed among children with higher separation anxiety/panic symptoms (*OR* = 0.92; 95% *CI*: 0.84 - 0.99). Further, there was no association between conduct problems, depressive symptoms or other types of anxiety and alcohol initiation. In addition, there were no statistically significant interactions between depression symptoms and conduct problems, depression and anxiety subscales, or anxiety subscales and conduct problems. There was an effect of teacher support that varied across study time (teacher support × continuous time interaction, $p < 0.05$). At the earliest follow-up visit, youth reporting higher levels of teacher support were at significantly lower risk for alcohol initiation (*OR* = 0.78; 95% *CI* = 0.61-0.95). This association became weaker over time since baseline and was no longer statistically significant by the final assessment. Neither parent nor peer support at baseline was associated with alcohol initiation, and there were no significant interactions between time and any of the other covariates.

In regards to predictors of illicit drug use initiation (Table 5), a significantly higher risk for earlier initiation was observed among children with reports of more stressful life events (*OR* = 1.12; 95% *CI*: 1.00-1.26). None of the other emotional health predictors nor indicators of social support were significantly associated with earlier illicit substance use.

Sensitivity analyses excluding conduct problem scores from the model suggested no changes in the effects of the emotional health predictors on either alcohol or illicit drug use.

Discussion

Our findings suggested that some forms of anxiety were related to delays in initiation of alcohol. In particular, higher levels of separation/panic symptoms emerged as significantly inhibiting early alcohol initiation, consistent with (Kaplow, et al., 2001). Youth with separation anxiety symptoms may be protected by virtue of their intense connection to their parents, making them less likely to be in settings where initiation is possible or to engage in risk-taking behaviors with deviant peers. Other types of anxiety, including physical symptoms, harm avoidance and social anxiety were unrelated to early initiation.

Youth who were excluded from survival analyses based on having used alcohol or other illicit drugs prior to the baseline assessment in Grade 6 had highly elevated depressive symptom scores. Above and beyond these earlier users, depressive symptoms did not contribute to earlier time to use during the middle school period. These results suggest that depression may be a consequence of very early use or a risk factor for initiation of use prior to the middle school years. Conduct problems were only associated with very early alcohol use and alcohol initiation prior to adjusting for other emotional health risk factors[1]. Thus, some of the variance in alcohol use accounted for by conduct problems was shared with other emotional health factors, including low teacher support and low separation anxiety/ panic. Moreover, youth with very early use (prior to 6th grade) had high levels of conduct problems.

Another important finding is that middle school students who perceived more emotional support from teachers reported somewhat later alcohol substance initiation, with relationships with teachers early in the transition to middle school particularly important. Prior research suggests that teacher supportiveness and high teacher expectations are related

[1]Post-hoc analyses indicated there was an association between conduct and alcohol initiation when adjusting for individual demographic factors, but no other emotional health factors (e.g. depression, anxiety, stress, support) OR = 1.04, $p = .012$. However, there was no association between conduct problems and illicit drug use initiation.

to lower use of substances (Lifrak, McKay, Rostain, Alterman, & O'Brien, 1997), and that these effects may be mediated through reduced affiliation with deviant peers (Suldo, Mihalas, Powell, & French, 2008). Teacher, but not parent support, predicting delayed initiation may indicate either a broad protective effect of being "bonded" to school and the academic environment (Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004), or perhaps reflects an increasingly important influence of nonparental adults in early adolescence (Beam, Chen, & Greenberger, 2002).

Our study identified recent stressful life events as a unique predictor of early illicit substance use. In our sample, higher levels of child-reported stressful events in the past six months were associated with an increased risk for illicit substance use initiation, while parent-reported stressful events experienced over the youth's lifetime did not. Thus, it could be either that recent stress is more salient than distal stress, or that youth reported stress is more related to their substance use than stress noted by parents. Our study suggests that stress is predictive of initiation of illicit substances building on prior studies showing its relation to levels of use.

The strengths of this study include the frequent tracking of substance use before most youth had initiated, the ability to examine several emotional health indicators in a multivariate model, and the use of a community-based sample who generally presented with subthreshold symptoms. Nonetheless, limitations include that substance use was assessed via self-report, the generalizability of the findings beyond the urban Northwest, and the inclusion of predictors from the baseline assessment only, and the exclusion of other important predictors of substance use (e.g., perceptions of peer use, access to substances). The prevalence estimates for alcohol and marijuana use by the eighth grade (2003-2006) are somewhat lower than estimates provided by the Monitoring the Future (MTF: 2003-2006) (Johnston, O'Malley, Bachman, & Schulenberg, 2007). For example, approximately 26% of DPP eighth graders had used alcohol compared to 39% in MTF, and 11% in DPP had tried marijuana compared to 14% in MTF. Finally, a limitation, as well as a possible strength, is that the study focuses on one specific developmental window.

From a prevention standpoint, then, awareness and monitoring of early adolescent stress levels and very early depressive symptoms can potentially inform the identification of high-risk youth. Stress reduction and stress management techniques should maintain a prominent place within preventive interventions to decrease susceptibility to early substance use. Additionally, increasing positive relationships with teachers and promoting school bonding and connectedness may have the potential to stave off some of the very earliest alcohol initiation among young adolescents. Addressing these emotional health factors will be an important step in reducing the problems associated with adolescent and lifelong substance use and abuse.

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Table 1

Participant Demographic Characteristics

Characteristic	N = 521
	n (weighted %) or weighted mean (SD)
Female sex, weighted %	249 (48.3)
Race/ethnicity, weighted %	
White, non-Hispanic	232 (39.5)
White, Hispanic	53 (10.1)
Black	143 (24.9)
Asian or Pacific Islander	88 (24.1)
Native American	5 (1.4)
Age at baseline	12.0 (.4)
Hollingshead Household Socioeconomic status score	39.0[a] (14.2)

[a]This mean SES level indicates “middle class”.

Table 2

Means, SD, and Pearson Coefficients for Correlations among Baseline Emotional Health Factors[a]

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Conduct problems score	--										
2. MFQ score	.26**	--									
3. Anxiety, physical symptom	.12**	.49**	--								
4. Anxiety, harm avoidance	-.23**	-.21**	.07	--							
5. Anxiety, social	-.004	.41**	.48**	.22**	--						
6. Anxiety, separation panic	-.06	.17**	.50**	.35**	.52**	--					
7. Parent stressful events	.29**	.10**	.08	-.13**	-.0003	-.04	--				
8. Child stressful events	.21**	.46**	.32**	-.18**	.17**	.13**	.12**	--			
9. Parent support	-.21**	-.43**	-.25**	.34**	-.13**	-.06	-.07	-.22**	--		
10. Peer support	-.21**	-.52**	-.36**	.14**	-.44**	-.23**	-.14**	-.23**	.47**	--	
11. Teacher support	-.24**	-.32**	-.21**	.30**	-.16**	-.06	-.13**	-.28**	.49**	.47**	--
M	7.4	9.8	7.2	18.5	9.9	6.9	4.0	3.5	21.6	21.0	17.9
SD	6.6	8.8	5.7	4.7	5.9	4.5	2.6	2.7	2.8	3.3	2.7

[a] N = 521

* p < .05

** p < .01

Table 3

Weighted Survival Probabilities for Substance Use at Each Study Period

Study Time period	Alcohol	Illicit drugs
Grade 7, Fall	.969	.981
Grade 7, Spring	.919	.945
Grade 8, Fall	.855	.907
Grade 8, Spring	.798	.868

Table 4

Odds Ratios for the Risk of Alcohol Use Initiation According to Emotional Health Factors[a]

Characteristic	*OR* (95% *CI*)	*p*
Conduct problems score	1.03 (.99-1.06)	.17
Depressive symptom score	1.02 (.98-1.06)	.39
Anxiety symptom subscale		
Physical symptoms	1.02 (.96-1.08)	.49
Harm avoidance	.98 (.91-1.06)	.58
Social anxiety	1.01 (.96-1.06)	.73
Separation/panic	.92 (.84-.997)	.04
Parent report stressful life events	1.04 (.94-1.15)	.48
Child report stressful life events	1.07 (.97-1.17)	.21
Parent support	.98 (.85-1.09)	.69
Peer support	1.06 (.96-1.18)	.26
Teacher support[b]		
Teacher support, period 1	.78 (.61-.95)	.01
Teacher support × time	1.07 (1.00-1.15)	.046

[a]Factors included altogether in the same model; adjusted for gender, age, race/ethnicity, household socioeconomic status, and conduct problems score

[b]The interaction term for teacher support × time is shown with the coefficient for teacher because of the non-proportional hazard over time.

Table 5

Odds Ratios for the Risk of Illicit Drug Use Initiation According to Emotional Health Factors [a]

Characteristic	*OR* (95% *CI*)	*p*
Conduct problems score	1.01 (.96-1.07)	.74
Depressive symptom score	1.01 (.96-1.06)	.71
Anxiety symptom subscale		
Physical symptoms	.98 (.91-1.07)	.75
Harm avoidance	1.02 (.94-1.12)	.61
Social anxiety	1.03 (.97-1.09)	.41
Separation/panic	.95 (.85-1.05)	.29
Parent report stressful life events	.97 (.84-1.11)	.62
Child report stressful life events	1.12 (1.004-1.26)	.04
Parent support	.95 (.81-1.11)	.50
Peer support	1.00 (.91-1.11)	.96
Teacher support	.93 (.80-1.08)	.34

[a] Factors included altogether in the same model; adjusted for gender, age, race/ethnicity, household socioeconomic status, and conduct problems score