Expected Problem Drinker Possible Self: Predictor of Alcohol Problems and Tobacco Use in Adolescents

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Abstract

Background—Alcohol and tobacco use commonly co-occur in adolescents. According to the cross-substance facilitation of information processing hypothesis, cognitive structures related to one substance increase use of another related substance through enhanced cognitive processing. In this study, we test this hypothesis by determining whether a problem drinker "possible self" in 8th grade predicts alcohol and tobacco use in 9th grade.

Methods—A secondary data analysis of a 12-month longitudinal dataset was conducted. The outcome variables were alcohol consumption, alcohol problems, and tobacco use in 9th grade. The main predictor of interest was presence of an expected problem drinker possible self in 8th grade. Zero-inflated gamma regression, zero-inflated negative binomial regression, and logistic regression were used.

Results—Among 137 adolescents, controlling for known family, parent, and peer determinants, and corresponding 8th grade behavior, having an expected problem drinker possible self in 8th grade predicted alcohol problems, but not level of alcohol consumption in 9th grade. Moreover, the expected problem drinker possible self in 8th grade predicted tobacco use in 9th grade controlling for known determinants and concurrent alcohol problems.

Conclusions—Findings provide support for the cross-substance facilitation hypothesis, suggesting that interventions designed to modify the expected problem drinker possible self may reduce not only adolescent alcohol use, but also tobacco use. Further studies are needed to determine whether smoking content is embedded in a drinking cognition or two separate but related drinking and smoking cognitions account for the association between alcohol and tobacco use.

Keywords

Substance use; self-cognition; drinking; smoking; identity development; cross-substance

INTRODUCTION

Cross-substance facilitation of information processing may account for the correlation between alcohol and tobacco use behaviors. According to this hypothesis, a cognitive structure in one domain (e.g., alcohol use) facilitates encoding of information related to a second substance (e.g., tobacco). This more complex cognitive structure, in turn motivates and regulates not only behaviors related to the original substance but also the "crossover" substance. Although preliminary evidence shows that adults who engaged in either heavy drinking or smoking had more positive evaluations and enhanced memory of the prototypical attributes associated with the other (not used or seldom used) substance,[1] the linkage between the knowledge structure and behavior has not been explored.

In this study, we further investigate the phenomenon of cross-substance facilitation by determining whether availability of a self-cognition related to problem drinking predicts smoking. Abundant evidence shows that substance-specific self-cognitions predict alcohol and tobacco use. Some investigators have focused on current self-cognitions, called self-schemas. Studies have shown that a drinker schema predicts high quantity and frequency of alcohol use in college students and young adults.[2-4] Similarly, a smoker self-schema contributes to heavy smoking in adults[5] and escalation of smoking over time in adolescents, even controlling for nicotine dependence, smoking motives, smoking expectancies, and novelty seeking.[6] Other studies have focused on future-oriented self-cognitions, called possible selves. Preadolescents who had an expected possible self as a problem drinker were more likely to report ever drinking alcohol than youth who did not have an expected possible self as a problem drinker,[7] and college students who expected to possess the attributes of a binge drinker two years after college were more likely to engage in binge drinking in the past 30 days than those who did not.[8] Similarly, college student smokers who viewed themselves as smokers 10–20 years in the future (long-term smoker possible self) had more defensive reactions to anti-smoking messages than those who did not believe they would be smoking 10-20 years in the future.[9]

We test the cross-substance facilitation hypothesis by determining whether availability in memory of a "problem drinker possible self" predicts tobacco use in a sample of adolescents during the transition from middle school to high school. We begin by confirming that the problem drinker possible self predicts alcohol consumption and alcohol problems in this age group. Specifically, we determine the effects of a problem drinker possible self in 8th grade on alcohol consumption, alcohol problems, and tobacco use in 9th grade. Given the age of our sample, we decided to focus on an emerging, future-oriented self-cognition (possible self) as a "problem drinker" rather than a current, well-developed "problem drinker" self-schema.

METHODS

Data were drawn from a 12-month longitudinal study designed to examine the effects of self-schemas and possible selves on health promoting and health risk behaviors in adolescents (N = 160) across the transition from middle (8th grade, 1992) to high school (9th

grade, 1993).[10,11] The parent study was approved by the Institutional Review Board at University of Michigan. After obtaining parental consent and adolescent assent, 8th graders from a single suburban public middle school in the Midwest completed self-report measures during the school day using both individual interviews and group administration. Possible selves and perceived friend's influence (control variable) were measured by individual interview three weeks before alcohol- and tobacco-use self-report measures. The data for this secondary analysis was de-identified and deemed exempt by the Institutional Review Board of the University of Illinois at Chicago where the first author completed the study. Adolescents who completed measures in both 8th and 9th grade (N = 137; 50% girls) were included in this secondary analysis.

Have Ever Used Alcohol was measured by a yes/no question "Have you ever had any beer, wine, hard liquor or other drink with alcohol in it (other than a taste)?" Weekly frequency and quantity questions for the last 12 months were used to compute *level of alcohol consumption* (average number of drinks per week in past 12 months).[12] *Degree of Alcohol Problems* was measured by summing six items from the Alcohol Misuse Scale,[12] e.g., "How many times did you get into trouble with the police (parents, friends, teachers/school counselors/principal) because of your drinking in the previous 12 months?" Responses were dichotomized into 0 (never) and 1 (one or more times). Adequate validity and reliability of the measure in 10th and 12th graders have been reported.[15]

Tobacco Use was measured with two questions about frequency of cigarette (0 = never; 1 = used to smoke, but don't anymore; to 6 = more than 2 packs/day) and smokeless tobacco use (0 = never; 1 = used to use smokeless tobacco, but don't anymore; to 4 = more than 10 times a day).[13] Because any tobacco use is risky in middle adolescence, these two questions were combined to form a dichotomous variable used to distinguish those adolescents who ever used tobacco ("used to, but don't any more" to "more than two packs a day") from those who did not (never).

Expected Problem Drinker Possible Self was measured with a single item embedded in a closed-ended possible selves questionnaire.[14] Adolescents indicated the likelihood that "*DRINK TOO MUCH ALCOHOL*" would describe them in the future (not at all, a little, somewhat, quite a bit, or very much). Consistent with Corte and Szalacha,[7] any endorsement was considered evidence of having a possible self related to problem drinking. Responses were dichotomized to reflect presence (a little, somewhat, quite a bit, or very much) or absence (not at all) of an expected problem drinker possible self.

For the control variables, *Family Structure* was a dichotomous variable (two-parent family = 0 and single-parent family = 1). *Family Cohesion* was measured with the Family Adaptability and Cohesion Scales (FACES II).[15] A dichotomous variable was computed with effective family cohesion (0) reflecting midrange cohesion and ineffective family cohesion (1) representing the extremes.[15,16] Adequate reliability and validity of FACES II has been documented.[15,17] *Parental Alcohol Problems* were measured by the short form of Children of Alcoholics Screening Test (CAST).[18] Dichotomous items were summed (0–5) with high scores reflecting more (perceived) parental alcohol problems. Cronbach's alpha coefficient for the CAST was 0.77 in this study. *Perceived Influence of Friends* was

measured with an item ("How important do you think your friends were in making you the way you are now?") (1 = not at all, 5 = very).[19] Higher scores reflected higher perceived social influence from friends.

Regressions were used to evaluate the relationship between 8th grade expected problem drinker possible self and 9th grade alcohol consumption/alcohol problems/tobacco use respectively after controlling for the corresponding 8th grade behavior. Second, family structure, family cohesion, parental alcohol problems, perceived social influence of friends, and gender were added into the models. Finally, for tobacco use as the dependent variable, 9th grade alcohol problems was added as a predictor to determine whether the effect of an expected problem drinker possible self persisted even after taking concurrent alcohol problems into account. Zero-inflated gamma regression was used to predict alcohol consumption because the level of alcohol consumption variable was highly skewed and included many zeros.[20] For alcohol problems as the dependent variable, we included only those adolescents who reported ever drinking. Zero-inflated negative binomial regression was used because the degree of alcohol problems was a count variable with overdispersion and excess zero values.[21,22] For tobacco use, logistic regression was used.

RESULTS

The majority of adolescents in the analytic sample were Caucasian (84.4%). The average age in 8th grade was 13.5 (SD = 0.6) years. Table 1 shows descriptive statistics for adolescent alcohol and tobacco use in 9th grade. All adolescents who were current or ever tobacco users reported ever drinking. More than one third of the sample (36%) lived in single parent families and half the sample (50%) reported poor family cohesion (predominantly low levels of cohesion). The mean parental alcohol problems score was 0.86 (SD = 1.3) and the mean perceived influence of friends was 3.62 (SD = 1.2).

Eleven percent (n = 15) of the adolescents had an expected problem drinker possible self available in memory. Most of these adolescents (13 of the 15) responded "a little" to the item, how likely will DRINK TOO MUCH ALCOHOL describe you in the future? The other 122 adolescents (89%) reported "not at all" and thus, were considered not to have an expected problem drinker possible self. Among adolescents who had an expected problem drinker possible self in the 8th grade, 100% reported having ever used alcohol, 93% (n = 14) reported alcohol use in the past 12 months, and 79% (n = 11) reported having ever used tobacco by 9th grade.

Having an expected problem drinker possible self in 8th grade did not predict *whether or not adolescents had consumed alcohol* in 9th grade (see Table 2, step 1, models 1-2), but it did predict a higher *level of alcohol consumption* in 9th grade after controlling for 8th grade alcohol consumption (Table 2, step 2, model 1). However, this effect did not persist after controlling for other known determinants.

Having an expected problem drinker possible self in 8th grade did not predict *whether or not adolescents had alcohol problems* in 9th grade (Table 3, step 1, models 1-2), but it was a significant predictor of the *degree of alcohol problems* in 9th grade (Table 3, step 2, models

1-2). The incidence of alcohol problems was 4.5 times higher in adolescents who had an expected problem drinker possible self compared to those who did not, controlling for other known determinants.

Having an expected problem drinker possible self in 8th grade was a significant predictor of having ever used tobacco by 9th grade (Table 4). Adolescents who had an expected problem drinker possible self in 8th grade were 18.9 times more likely to report having ever used tobacco in 9th grade than those who did not have an expected problem drinker possible self, even after controlling for other known determinants, and this influence persisted even after controlling for concurrent (9th grade) alcohol problems.

DISCUSSION

The primary purpose of this study was to determine whether a self-cognition related to problem drinking in 8th grade predicted tobacco use in 9th grade. Results confirmed the linkage between future self-cognitions and related behaviors in adolescents. Availability of an expected possible self as a problem drinker in 8th grade predicted level of alcohol consumption and degree of alcohol problem in 9th grade, though the effect on level of consumption was attenuated when other known determinants were included in the model. Consistent with the emerging idea that self-cognitions play a role in the cross-substance facilitation between alcohol and tobacco use, our results also showed that the 8th grade expected problem drinker possible self predicted tobacco use in 9th grade.

Only a small proportion of our sample had an expected problem drinker possible self. These results are consistent with the Corte and Szalacha study of pre-adolescents where 19% of the sample had an expected problem drinker possible self.[7] Despite the low prevalence, the predictive power of an expected problem drinker possible self suggests that it may not only distinguish those adolescents who are at the highest risk of alcohol use/problems (e.g., problematic drinker), but also those adolescents who are inclined to use tobacco. The fact that participants' endorsements of "problem drinker in the future" were generally weak (slightly to moderately likely) suggests that drinking-related future-oriented self-cognitions do not need to be robust, well-elaborated structures, to predict future experience with alcohol and tobacco in adolescence.

While our data support the cross-facilitation hypothesis, details about the underlying cognitive structure(s) remain to be defined. Based on Ghosh's view that some cognitive structures have relevant behavioral responses and procedures embedded within them,[23] a drinking self-cognition may include smoking content such that activation of the drinking self-cognition would include a well-learned action sequence associated with smoking. In this case, smoking routines and procedures would be embedded in the drinking cognition, but there would not be a corresponding semantic component, i.e., identification as a smoker. For example, a large proportion of college students who smoke only do so when drinking and they do not identify as smokers.[24,25] The absence of a smoking cognition in these "phantom smokers" suggests that their smoking behavior may be embedded in some other cognition, such as drinking related self-cognition.

Another model that would support cross-facilitation is that of two or more separate cognitive structures that have some overlapping traits. With overlapping content across different self-cognitions, when one of the cognitions gets activated, the pattern of activation spreads to the other cognitions that include the same traits, e.g., spreading activation model.[26,27] From this perspective, a drinking-related cognition and a smoking related cognition would include some unique and some shared traits, and when one of the cognitions got activated, it would in turn activate the other cognition. Studies to elicit traits of the prototypical drinker and prototypical smoker suggest that some traits are shared (e.g., outgoing, friendly, sociable, fun-loving, popular, willing to take risks, easygoing), whereas others are more specific to heavy drinkers (e.g., funny, loud, out-of-control) or smokers (e.g., attractive, smart, anxious).[24,28-32]

The findings should be considered in light of a few limitations. The confidence interval around the odds ratio for the effect of the problem drinker possible self was quite large indicating low precision of our estimate. This is likely due to the fact that a single-item measure was used and only 15 participants had an expected problem drinker possible self. Future studies that use multi-item measures for a domain-specific possible self are needed to enhance the reliability of the findings. Because a smoking cognition was not measured in the parent study, we are unable to determine whether smoking content is embedded in the drinking cognition or two separate but related drinking and smoking cognitions exist. Future studies that measure both alcohol and tobacco-related self-cognitions are needed to determine whether a drinking self-cognition predicts both alcohol and tobacco use, or whether these behaviors are driven by separate drinking and smoking structures that are linked in memory. The relatively small sample size also limited our ability to estimate the influence of different levels of tobacco use, though arguably, any level of tobacco use is maladaptive, particularly in adolescents. Another limitation is that the unique effects of possible selves cannot be determined, because other types of cognitions (e.g., alcohol related expectancies, intentions, and drinking motives) previously linked to adolescent risk behaviors were not measured in this study. Our sample was comprised of primarily of Caucasians from a working-class suburban community, which limits our ability to generalize these findings to other racial and ethnic groups and other social classes. Finally, more contemporary studies could be done to validate the findings, because the original study was completed in the 1990s.

Despite the limitations, our results provide evidence that future-oriented cognitions may play an important role in the cross-substance facilitation between alcohol and tobacco use in adolescents. Given that possible selves are modifiable, particularly in the formative years,[33] preventing the development of an expected problem drinker possible self may prevent both alcohol problems and tobacco use. School and community-based interventions to increase academic success and low- or no-cost opportunities for involvement in a wide variety of extracurricular activities (e.g., sports, music, arts, academic clubs) may create possibilities for adolescents to develop selves in meaningful, culturally valued domains. Programs that facilitate internalization of self-cognitions and behavioral routines related to academic success[33,34] may be one approach to reducing the risk of developing alcohol related self-cogntions. Similarly, parental education about the importance of extracurricular involvements to the development of a healthy self and highlighting the consequences of

drinking on future aspirations may also be beneficial. Further studies are also needed to determine factors that contribute to the development of an expected problem drinker possible self.

ACKNOWLEDGEMENTS

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TABLE 1

Adolescent alcohol and tobacco use in 9th grade

9th grade behaviors	Total	
	N	**%**
Lifetime alcohol use	108	79.4
Current alcohol use	91	68.4
Tobacco use	43	31.8
Past	21	48.8
Current[ab]	22	51.2
	Mean±SD	Range
Level of alcohol consumption[c]	3.78±10.0	0.03–80.63
Degree of alcohol problems[d]	0.73±1.3	0-6

Note.

[a] Seven adolescents reported using less than half a pack a day, seven reported using half to one pack a day, and one reported using more than two packs a day as well as seven reported using now and then, but not everyday.

[b] Twenty of the 22 current tobacco users reported smoking cigarettes only. Of the remaining two, one reported only using smokeless tobacco and another reported using both cigarettes and smokeless tobacco.

[c] Only those who reported drinking 9th grade

[d] Only those who ever drank in 9th grade

TABLE 2

Zero-inflated gamma regression models for an expected problem drinker possible self in 8th grade predicting alcohol consumption in 9th grade

Predictors	9th grade alcohol consumption							
	Model 1				Model 2			
	B	SE	95% CI	*p*	B	SE	95% CI	*p*
Step 1: Predicting NO ALCOHOL CONSUMPTION								
Expected problem drinker possible self	−1.7	1.1	−3.9–0.5	0.127	−1.6	1.1	−3.8–0.6	0.164
Family structure					−0.2	0.5	−1.2–0.7	0.651
(0=Two-parent, 1=Single-parent)								
Family cohesion					0.1	0.5	−0.9–1.0	0.866
(0=Effective, 1=Ineffective)								
Parental alcohol problems					−0.8	0.3	−1.4–−0.2	**0.006**
Perceived friends' influence					0.1	0.2	−0.3–0.5	0.592
Gender (0=Boy, 1=Girl)					−0.6	0.5	−1.6–0.3	0.201
8th grade alcohol consumption in the last 12 months	−2.0	0.4	−2.9–−1.2	**<0.001**	−2.0	0.5	−3.0–−1.0	**<0.001**
Step 2: Predicting LEVEL OF ALCOHOL CONSUMPTION								
Expected problem drinker possible self	1.0	0.5	0.1–2.0	**0.038**	0.5	0.5	−0.5–1.5	0.294
Family structure					1.3	0.4	0.5–2.1	**0.002**
(0=Two-parent, 1=Single-parent)								
Family cohesion					0.2	0.4	−0.5–1.0	0.517
(0=Effective, 1=Ineffective)								
Parental alcohol problems					−0.1	0.1	−0.4–0.1	0.375
Perceived friends' influence					−0.2	0.1	−0.5–0.1	0.268
Gender (0=Boy, 1=Girl)					1.5	0.4	0.7–2.3	**<0.001**
8th grade alcohol consumption in the last 12 months	0.1	0.1	−0.0–0.2	0.067	0.1	0.0	0.0–0.2	**0.027**
−2 Log Likelihood			413.4				378.5	

Note: B = logistic regression coefficient for step 1 and gamma regression coefficient for step 2; SE = standard error; CI = confidence interval

TABLE 3

Zero-inflated negative binomial models for an expected problem drinker possible self in 8th grade predicting alcohol problems in 9th grade

| Predictors | 9th grade alcohol problems | | | | | | | |
| | Model 1 | | | | Model 2 | | | |
Step 1: Predicting NO ALCOHOL PROBLEMS	B	SE	95% CI	*p*	B	SE	95% CI	*p*
Expected problem drinker possible self	0.1	0.8	−1.5–1.7	0.879	4.1	2.7	−1.2–9.4	0.128
Family structure					4.8	2.9	−0.9–10.5	0.098
(0=Two-parent, 1=Single-parent)								
Family cohesion					−3.1	1.5	−6.0−−0.2	**0.035**
(0=Effective, 1=Ineffective)								
Parental alcohol problems					−0.1	0.4	−0.8–0.6	0.779
Perceived friends' influence					−0.4	0.6	−1.5–0.7	0.496
Gender (0=Boy, 1=Girl)					3.0	2.2	−1.3–7.3	0.173
8th grade alcohol problems in the last 12 months	−1.2	0.5	−2.1−−0.3	**0.012**	−1.5	0.8	−3.0–0.0	0.053
Step 2: Predicting DEGREE OF ALCOHOL PROBLEMS	IRR	SE	95% CI	*p*	IRR	SE	95% CI	*p*
Expected problem drinker possible self	2.4	0.7	1.4–4.1	**0.002**	4.5	1.4	2.4–8.4	**<0.001**
Family structure					3.1	0.9	1.8–5.4	**<0.001**
(0=Two-parent, 1=Single-parent)								
Family cohesion					0.7	0.3	0.4–1.4	0.354
(0=Effective, 1=Ineffective)								
Parental alcohol problems					1.0	0.1	0.8–1.2	0.871
Perceived friends' influence					1.1	0.2	0.8–1.5	0.724
Gender (0=Boy, 1=Girl)					3.1	1.1	1.5–6.3	**0.002**
8th grade alcohol problems in the last 12 months	1.3	0.1	1.0–1.6	**0.045**	1.3	0.1	1.1–1.7	**0.008**
LR χ^2 (*df*), Prob > χ^2	$\chi^2(2)$ = 12.82, *p* = 0.0016				$\chi^2(7)$ = 28.05, *p* = 0.0002			
Vuong test, Prob > z	z= 5.38, *p* < 0.001				z= 11.01, *p* < 0.001			

Note: B = logistic regression coefficient; IRR = incidence rate ratios; SE = standard error; CI = confidence interval; LR = likelihood ratio test

Table 4

Logistic regression models for an expected problem drinker possible self in 8th grade predicting tobacco use in 9th grade

Predictors	9th grade tobacco use											
	Model 1				Model 2				Model 3			
	OR	SE	95% CI	p	OR	SE	95% CI	p	OR	SE	95% CI	p
Expected problem drinker possible self	9.9	7.5	2.2–44.0	**0.003**	18.9	17.5	3.1–116.0	**0.001**	13.3	13.5	1.8–98.2	**0.011**
Social determinants												
Family structure												
Single-parent family (1)					0.7	0.4	0.2–2.1	0.478	0.6	0.4	0.2–2.0	0.384
Two-parent family (0)					1.0				1.0			
Family cohesion												
Ineffective cohesion (1)					0.5	0.3	0.2–1.8	0.327	0.4	0.3	0.1–1.6	0.198
Effective cohesion (0)					1.0				1.0			
Parental alcohol problems					1.9	0.4	1.3–2.8	**0.002**	1.9	0.4	1.2–2.8	**0.003**
Perceived friends' influence					2.1	0.6	1.2–3.7	**0.014**	2.0	0.6	1.1–3.5	**0.021**
Gender												
Girl (1)					2.2	1.3	0.7–7.0	0.203	1.9	1.2	0.6–6.4	0.287
Boy (0)					1.0				1.0			
8th grade tobacco use	31.1	21.2	8.2–118.1	**<0.001**	56.7	48.9	10.5–306.8	**<0.001**	55.2	49.1	9.7–315.3	**<0.001**
9th grade alcohol problems									2.0	0.7	1.0–4.2	0.060
LR χ^2 (df)	53.09 (2)				75.47 (7)				79.11 (8)			
Prob > χ^2	<0.001				<0.001				<0.001			
Pseudo R^2	0.32				0.47				0.50			

Note: OR = odds ratio; SE = standard error; CI = confidence interval; LR = likelihood ratio test