Brief Report

Nicotine dependence severity as a cross-sectional predictor of alcohol-related problems in a sample of adolescent smokers

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Abstract

Introduction: Given the prevalence of alcohol use among adolescents and its negative consequences, it is important to learn more about correlates of alcohol-related problems in this population. Cigarette smoking appears to be associated with alcohol-related problems in adolescents. The purpose of this study was to assess cigarettes smoked per day and nicotine dependence (ND) severity as predictors of alcohol-related problems in cross-sectional models, using data from a smoking cessation clinical trial for adolescents.

Method: Data obtained at intake were used to assess smoking-related variables as cross-sectional predictors of alcohol-related problems in models along with drinks per week and key demographics, using hierarchical multiple regression.

Results: ND severity, as measured using the modified Fagerström Tolerance Questionnaire, significantly predicted alcohol-related problems, both when this score included and did not include an item concerning cigarettes smoked per day. A separate continuous item capturing cigarettes per day did not predict alcohol-related problems.

Discussion: ND severity predicted alcohol-related problems in cross-sectional regression models, holding constant alcohol consumption and key demographics. This suggests that ND severity may be a clinical indicator of alcohol-related problems among adolescent smokers. To our knowledge, this is the first analysis of associations between smoking and alcohol involvement in a sample of adolescent smokers participating in a clinical trial.

Introduction

Alcohol use is widespread among adolescents. According to the Monitoring the Future study, as of 2007, 38.9% of 8th graders, 61.7% of 10th graders, and 72.2% of 12 graders had consumed

alcohol at least once. In the same survey, students at these grade levels also reported having been intoxicated from alcohol in the prior 30 days at rates of 5.5%, 18.1%, and 28.7%, respectively (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Frequent, heavy alcohol use in adolescents has been associated with an increased likelihood of various risky behaviors (e.g., illicit drug use) and negative consequences, such as poor academic performance (Grunbaum et al., 2004). Given the prevalence of alcohol use among adolescents and its negative consequences, it is important to learn more about correlates of problem drinking in this population.

In national community samples of adolescents, cigarette smokers have been found to be more likely than nonsmokers to drink and to drink in larger quantities (Gruza & Bierut, 2006; Jackson, Sher, Cooper, & Wood, 2002). Similarly, in an analysis of 8 years of follow-up data from adolescents who received inpatient alcohol or drug abuse treatment, Myers, Doran, and Brown (2007) found that frequent drinkers were more likely than abstainers to have smoked continuously during follow-up and reported heavier smoking at each follow-up point.

Epidemiological evidence also suggests that concurrent smoking and alcohol use increase risk of various alcohol-related problems. Gruza and Bierut (2006) reported that among 12–20 year olds in a national survey who reported past month alcohol consumption, smokers were 4.5 times more likely than lifetime nonsmokers to have an alcohol use disorder (AUD; i.e., abuse or dependence).

Although most findings linking smoking with alcohol-related problems have involved cigarette use, there are also reports tying alcohol-related problems to nicotine dependence (ND). In a sample of 18-year-old Austrian men, higher levels of ND were associated with a greater likelihood of alcohol abuse or dependence (Kapusta et al., 2007).

Myers and Kelly (2006) concluded that “smoking is a reliable marker of adolescent alcohol use” (p. 222). The goal of this

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study was to determine whether smoking is also a marker of alcohol-related problems in adolescent smokers. An analogous point—that smoking is a clinical indicator of alcohol misuse—was made for adults based on findings from the National Epidemiologic Survey of Alcohol and Related Conditions (McKee, Falba, O'Malley, Sindelar, & O'Connor, 2007). We attempted to address two gaps in the adolescent literature: (a) an absence of models in which both cigarette use and ND severity are tested as predictors of alcohol-related problems and (b) a lack of findings from samples of smokers, specifically those presenting for smoking cessation treatment.

Three separate cross-sectional hierarchical regression models were used to test the utility of cigarettes per day (CPD) and ND severity as predictors of alcohol-related problems. This approach enabled us to assess the extent to which the aforementioned findings concerning links between alcohol-related problems and both cigarette use and ND apply to adolescents in a smoking cessation study. It also allowed us to compare the utility of these two variables as predictors of alcohol-related problems. It is important to learn more about adolescents presenting for smoking cessation treatment, given that this subgroup is relatively amenable to behavior change. Included in all models were family history of problem drinking, which increases risk of AUDs (Deas & Thomas, 2002), and two demographic variables found to be associated with alcohol involvement in adolescents: gender (e.g., men have reported higher levels of alcohol-related problems; White & Labouvie, 1989) and age (concurrent smoking and alcohol use tend to increase with age; Hoffman et al., 2001).

Method

Participants and procedures

Participants were treatment-seeking high school-aged adolescents taking part in an ongoing clinical trial examining the efficacy of contingency management and cognitive-behavioral smoking cessation treatments. Participants were eligible if they reported smoking at least 10 CPD for the past 6 months and had baseline urine cotinine levels above 500 ng/ml. They were excluded if they met current criteria for dependence on another psychoactive substance or had a current diagnosis of psychosis, major depression, or panic disorder. Adolescent smokers were recruited from participating high schools in Southern Connecticut. Interested participants were prescreened by telephone and then scheduled for an intake appointment to determine final eligibility. The present analyses involve data collected at this appointment. After informed consent or assent was obtained, participants completed an eligibility interview and self-reports. Active parental permission was not required. Instead, parents were notified of the study through informational mailings from the participating schools and were asked to call the school if they did not wish for their child to participate. All study procedures were approved by the Yale University School of Medicine's Human Investigation Committee. See Cavallo et al. (2007) or Krishnan-Sarin et al. (2006) for further information about the larger treatment study.

Measures

Alcohol and cigarette use over the 30 days prior to the intake appointment were assessed using a timeline followback (TLFB; Sobell & Sobell, 2003) interview. The TLFB is a reliable and

valid structured interview involving a calendar with memory prompts (e.g., holidays) to help participants recall their substance use each day. Responses on the TLFB were used to derive estimates of weekly alcohol consumption and CPD.

Alcohol-related problems were assessed using the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989), which was validated initially and deemed reliable in a sample of adolescents. The RAPI is a unidirectional scale on which participants report the frequency with which they have experienced 23 adverse alcohol-related events (e.g., "not able to do your homework or study for a test"). Events reported to have occurred at least once in the past 3 months were scored "1" and summed to yield an overall score ($\alpha = .93$). The RAPI was added to this trial after recruitment began; thus, the present study includes only participants who completed the RAPI and the alcohol portion of the TLFB interview.

ND was assessed using the modified Fagerström Tolerance Questionnaire (mFTQ; Prokhorov, Pallonen, Fava, Ding, & Niaura, 1996), a seven-item measure developed expressly for use with adolescent smokers that is based on the Fagerström Tolerance Questionnaire (Fagerström, 1978). Items are coded "0" or "1" with the exception of an item concerning cigarettes smoked per day and another item, which were scored "0" through "2" and then summed with higher scores indicating more severe dependence. Both the entire measure ($\alpha = .51$) and the measure excluding the CPD item ($\alpha = .58$) were analyzed.

Family history of alcohol problems was assessed using a single item. Participants were asked whether any of their first-order blood relatives "EVER had what you would call a significant drinking problem?"

Results

Sample demographics and descriptives

The sample ($N = 89$) was 51.7% women and primarily White (85.4%), followed by Hispanic/Latin (4.5%), Asian (3.4%), Black (2.2%), and "other"/mixed race (4.5%). Mean age was 16.44 years ($SD = 1.29$, range: 14–19). Two fifths of participants (40.4%) reported that one of their first-order relatives had a problem with alcohol.

Participants reported a mean of 4.72 drinks per week ($SD = 9.12$, range: 0–54) with 31.5% reporting alcohol abstinence in the prior 30 days. Mean RAPI score was 6.82 ($SD = 6.21$, range: 0–23). Mean CPD was 13.68 ($SD = 6.66$, range: 3.71–40), and mean mFTQ score was 5.10 of 9 ($SD = 1.67$, range: 1–8) for the entire measure and 4.68 of 7 ($SD = 1.51$, range 1–7) excluding the CPD item.

Analyses predicting alcohol-related problems cross-sectionally

Preliminary analyses were conducted to assess normality. The drinks per week variable was skewed, necessitating a log transformation (Tabachnick & Fidell, 2005). For descriptive purposes, RAPI scores were compared across three ND levels, determined using mFTQ scores: low (mFTQ score 1–3, 17% of sample, RAPI $M = 6.09$, $SD = 4.71$), medium (4–5, 40.9%, $M = 5.98$, $SD = 5.69$), and high (6–9, 42%, $M = 8.07$, $SD = 7.25$).

Table 1. Hierarchical multiple regressions predicting alcohol-related problems cross-sectionally in adolescents in a smoking cessation study

Variable	First entry into model			Final model: Entire mFTQ			Final model: mFTQ ^a and CPD		
	B	SE B	β	B	SE B	β	B	SE B	β
Step 1 in all models ($R^2 = .20^{**}$)									
Gender	-0.15	1.29	-.01	-0.02	1.26	.00	0.14	1.26	.01
Age (years)	-0.97	0.49	-.20	-0.93	0.48	-.19	-1.04	0.49	-.22*
Family history of alcohol problems	2.66	1.28	.21*	2.69	1.25	.21*	3.00	1.27	.24*
Drinks per week	5.46	1.43	.40**	5.83	1.41	.42**	6.00	1.41	.44**
Model 1									
Step 2—Entire mFTQ ($\Delta R^2 = .05^*$)		n/a		0.80	0.37	.21*			
Model 2									
Step 2—mFTQ ^a ($\Delta R^2 = .05^*$)	0.90	0.41	.22*				0.99	0.42	.24*
Step 3—CPD ($\Delta R^2 = .01$)		n/a					-0.09	0.10	-.09

Note. Gender coded 1 (*male*) and 0 (*female*). Family history of alcohol problems coded 1 (*positive*) and 0 (*negative*). Drinks per week was log transformed. CPD = cigarettes per day; mFTQ = modified Fagerström Tolerance Questionnaire; n/a = not applicable.

^aCPD item omitted.

* $p < .05$; ** $p < .001$.

Three separate hierarchical multiple regression models were used to predict alcohol-related problems cross-sectionally. Demographic variables, family history status, and drinks per week were entered at the first step in all models. In Model 1, the entire mFTQ was entered at the second step. In Model 2, the mFTQ without the CPD item was entered, followed by entry of a separate continuous CPD variable in the third step. In Model 3, the order of entry of the mFTQ without CPD and the separate continuous CPD variable was reversed.

Results of the first two regression models are presented in Table 1. In Model 1, mFTQ score was a significant predictor of alcohol-related problems, accounting for about the same variance as family history of alcohol problems. Drinks per week was the best predictor. In Model 2, mFTQ score was still a significant predictor without the CPD item. The separate continuous CPD item was not a significant predictor. In Model 2, regression coefficients for the other variables were similar to Model 1, although age became a significant predictor at the final step. In Model 3 (not shown in Table 1), the separate continuous CPD item remained nonsignificant when entered at Step 2 before mFTQ.

Discussion

In a sample of adolescent smokers presenting for smoking cessation treatment, ND severity, both with and without a CPD item, predicted alcohol-related problems in cross-sectional regression models holding constant alcohol consumption and key demographics. Adolescent smokers with more severe ND may also be at risk for experiencing a greater number of alcohol-related problems. These results are in accordance with findings that adolescents with more severe ND were at greater risk for alcohol abuse and dependence (Kapusta et al., 2007).

Cigarettes smoked per day did not predict alcohol-related problems in this study, which differs from prior results (Grucza & Bierut, 2006; Hoffman et al., 2001; Myers et al., 2007). These

prior studies were either epidemiological or from inpatient substance abuse treatment samples, while a community sample in a smoking cessation clinical trial was used in the current study. Given that all participants in the present study were smokers, this restricted the range of smoking involvement somewhat; however, there was a broad range of smoking and ND severity represented in the present sample. Also, the small sample size in the present study suggests that this negative finding should be interpreted with caution.

Epidemiological evidence suggests the relationship between level of cigarette use and ND severity is not as strong or linear in adolescents as in adults, which may help to explain the diverging relationships between these constructs and alcohol-related problems in the present study. Adolescents smoke fewer cigarettes than adults but are more likely to reach ND at equivalent levels of use (Kandel & Chen, 2000). In a multisite study of 1st-year undergraduates, there were sizable subgroups of light, non-daily smokers who met dependence criteria and heavy/daily smokers who did not (Dierker et al., 2007). Another, potentially relevant factor is that adolescence is a period of elevated vulnerability to addiction (Chambers, Taylor, & Potenza, 2003). With their stronger relation to addiction, it is possible that ND and alcohol-related problems relate more closely to this underlying vulnerability than number of cigarettes smoked per day does.

Limitations of this study included small sample size, cross-sectional data, possible limited generalizability to adolescent smokers at large and relatively weak internal consistency reliability for the mFTQ. While the sample size was small, these results are valuable given the importance of associations between smoking and alcohol involvement and the lack of studies assessing samples of adolescent smokers and specifically those presenting for smoking cessation treatment. The goal was to identify associations among baseline variables rather than prediction of subsequent alcohol-related problems, which is another worthy topic for study. Though the present findings may not generalize to all adolescent smokers, a broad range of smoking severity and ND severity was represented. Also, it is important to learn more

about adolescent smokers presenting for treatment as this subgroup is potentially the most amenable to behavior change.

To our knowledge, this study is the first to examine associations between smoking and problem drinking in a community sample of adolescents in a clinical trial and also the first study in adolescent smokers to test cigarette use and ND variables in the same model to predict problem drinking. These findings suggest that ND may act as a clinical indicator of alcohol-related problems in adolescent smokers in a manner analogous to adults in a national sample (McKee et al., 2007).

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Declaration of Interests

None declared.

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