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## Smoking's effect on hangover symptoms

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## Abstract

Epidemiological, laboratory, and clinical research consistently suggest that drinking and smoking are highly comorbid, with significant public health outcomes. However, the more proximal consequences of co-occurring drinking and smoking, such as hangover, have seldom been studied. The current study sought to examine the unique effect of smoking on hangover, and to determine if there is an interaction between drinking and smoking in predicting hangover. Smokers ( $n=115$ , reporting 100 lifetime cigarettes and past-month smoking; age 18-19; 57% female; 96% Caucasian) completed a daily web-based survey for 8 weeks to assess history of prior-day alcohol and tobacco use as well as current day hangover symptoms. Prior day number of drinks ( $M=2.55$ ,  $SD=4.74$ ) and number of cigarettes ( $M=7.16$ ,  $SD=6.67$ ) were assessed. We also created a variable reflecting percent smoked above usual, computed by dividing current day smoking quantity by the mean of smoking quantity across the 56 days ( $M=1.00$ ,  $SD=0.75$ ). Current day hangover was constructed by taking a mean across 5 items: tired, headache, nauseated, weak, and difficulty concentrating on things, each ranging from (1) not at all to (7) extremely ( $\alpha=0.92$ ). Data were analyzed using multilevel models with periodicity (weekday vs. weekend) and sex controlled. Both smoking quantity and percent smoked above usual univariately predicted hangover (standardized  $\beta=0.62$ ; std.  $\beta=0.37$ ;  $p's < .001$ ) with nearly as strong of magnitude as did drinking quantity (std.  $\beta=0.68$ ,  $p < .001$ ). When drinking quantity was controlled, both smoking quantity and percent smoked above usual uniquely and strongly predicted hangover (std.  $\beta=0.12$ ; std.  $\beta=0.07$ ;  $p's < .001$ ). Most noteworthy was the finding that percent smoked above usual and drinking quantity interacted in a synergistic fashion to predict hangover ( $\beta=0.04$ ,  $p < .001$ ). Several interpretations of the observed effects are possible. One possibility is that nicotine and other aspects of smoking make a direct pharmacologic contribution to hangover expression. An alternate possibility is that tobacco use and hangover are behavioral markers of an underlying genetic liability for sensitivity to drug effects.

## Introduction

- Drinking and smoking are highly comorbid.
  - Epidemiological work shows that alcoholics are more likely to smoke than non-alcoholics and social drinkers are more likely to smoke than non-drinkers (Bien & Burge, 1990; Gulliver et al., 1995; Istvan & Matarazzo, 1984).
  - Field research indicates that drinking and smoking often occur together (Shiffman et al., 1994).
  - Research demonstrates a dose-dependent association between smoking and drinking (Madden, Bucholz, Martin, & Heath, 2000).
- There are significant public health outcomes of conjoint use (e.g., esophageal, laryngeal, and oral cancers).
- However, the more proximal consequences of co-occurring drinking and smoking, such as hangover, have seldom been studied.

## Introduction (cont.)

### Moderation by risk factors

- At a given level of drinking, women are more susceptible to the effects of hangover (Verster et al., 2003).
- Individuals at high risk for alcohol use disorders by virtue of a positive family history of alcoholism are more likely to experience frequent hangovers (Piasecki, Sher, Slutske, & Jackson, 2005) and are more likely to smoke (Jackson, Sher, & Wood, 2000).

### Overview

- What effect, if any, does smoking have on hangover?
- Is there a synergistic association between drinking and smoking in predicting hangover?
- We also looked at headache, which is frequently used as a rough indicator of hangover.

## Methods

### Participants (N=115)

- Smokers over-sampled (100 lifetime cigarettes/smoke past-month)
  - 57% female
  - 96% Caucasian
  - 90% were age 18 or 19

### Procedure

- Baseline assessment
  - Assessed substance use, motivations for substance use, family history of substance use, personality, mood
- Daily web-based 26-item survey
  - 8 weeks
  - Assessed history of prior-day alcohol and tobacco use, mood, and stress, as well as current-day hangover

### Measures

- Drinking (prior day)
  - Number of drinks ( $M=2.55$ ,  $SD=4.74$ )
- Smoking (prior day)
  - Number of cigarettes ( $M=7.16$ ,  $SD=6.67$ )
  - Percent smoked above usual
    - computed by dividing current day smoking quantity by the mean of smoking quantity across the 56 days ( $M=1.00$ ,  $SD=0.75$ )
- Hangover (current day) (Slutske, Piasecki, & Hunt-Carter, 2003)
  - Computed a mean across 5 items
    - tired
    - headache
    - nauseated
    - weak
    - difficulty concentrating on things
  - Items ranged from (1) not at all to (7) extremely ( $\alpha=0.92$ )
- Moderating variables (from baseline survey)
  - Sex
  - Family history of alcoholism: The respondent indicated whether the following biological relatives ever had a drinking problem: mother, father, maternal/paternal grandmother, maternal/ paternal grandfather, sisters, brothers

### Analytic Method

- Predicted hangover from drinking and smoking
  - Controlled for periodicity (weekday vs. weekend)
  - Examined interactions with sex and family history
- Used multilevel modeling

## Results

### Descriptive Information

- Over the 56-day interval, 29.4% of days were drinking days; 60.6% of days were smoking days, and 33.0% of smoking days included smoking while drinking.
- There were more cigarettes smoked on drinking days ( $M= 8.63$ ,  $SD=7.17$ ) than non-drinking days ( $M= 5.14$ ,  $SD=6.17$ ),  $p < .001$ .
- Participants reported experiencing a hangover on 19% of the days
  - Being male predicted hangover ( $\beta=.11$ ,  $p < .01$ ), controlling for number of drinks.
  - Controlling for number of drinks, there was a non-significant association between family history and hangover ( $\beta=0.01$ ,  $ns$ ), even controlling for sex ( $\beta=0.02$ ,  $p < .001$ ).

### Predicting Hangover from Smoking (see Table 1)

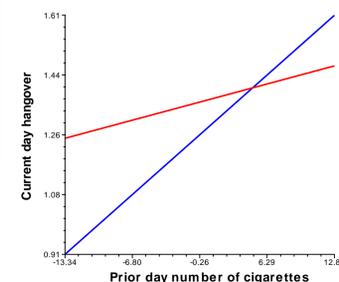
- Both smoking quantity and percent smoked above usual univariately predicted hangover (standardized  $\beta=0.62$ ; std.  $\beta=0.37$ ;  $p's < .001$ ) with nearly as strong of magnitude as did drinking quantity (std.  $\beta=0.68$ ,  $p < .001$ ).
- When drinking quantity was controlled, both smoking quantity and percent smoked above usual uniquely predicted hangover (std.  $\beta=0.12$ ; std.  $\beta=0.07$ ;  $p's < .001$ ).
- Similar effects were observed replacing hangover with headache.
- **Synergistic Association between Drinking and Smoking**
- Most noteworthy was the finding that percent smoked above usual and drinking quantity interacted in a synergistic fashion to predict hangover ( $\beta=0.04$ ,  $p < .001$ ) and headache ( $\beta=0.04$ ,  $p < .001$ ).

## Table 1

Predictor	Hangover		Headache	
	Univariate $\beta$	Multivariate $\beta$	Univariate $\beta$	Multivariate $\beta$
Number of drinks	.68***	.64***	.56***	.53***
Number of cigarettes	.62***	.12***	.52***	.12***
% cigarettes smoked above usual	.37***	.07***	.33**	.09***

Note. Standardized betas from multilevel models are reported. All analyses controlled for periodicity (weekend versus weekday) and sex. \*\*  $p < .01$ ; \*\*\*  $p < .001$

## Figure 1



Illustrative graph of the interaction between smoking and sex in predicting hangover.

Note: This controls for number of drinks and periodicity (weekday versus weekend).

## Results (cont.)

### Moderation by sex and family history

- Cross-level interaction terms were formed between cigarette smoking and the Level-2 variable (sex, FH).

### Sex (see Figure 1)

- Significant interaction between sex and number of cigarettes ( $\beta= -0.02$ ;  $p < .01$ ; standardized  $\beta = -0.13$ ).
- Women showed a stronger association between number of cigarettes and hangover.
- The same pattern was observed for percent smoked above usual ( $\beta= -0.09$ ;  $p < .01$ ; standardized  $\beta = -0.07$ ).
- Replacing hangover with headache showed similar (but slightly larger) effects.

### Family history of alcoholism

- No interactions were observed.

## Conclusion

- Although smoking has never been considered as a potential source of hangover, it explained a good deal of unique variance in hangover and interacted with drinking in predicting hangover.
- Nicotine and other aspects of smoking make a direct pharmacologic contribution to hangover expression.
  - Tobacco smoke is pharmacologically potent in its own right, and may contribute to hangover symptomatology.
  - The acute systemic effects of nicotine and/or tobacco smoke include central nervous system effects such as headache, dizziness, and insomnia, gastrointestinal effects such as nausea, vomiting, diarrhea, and dry mouth, and musculoskeletal effects (Palmer, Buckley & Faulds, 1992).
- Tobacco use and hangover are behavioral markers of an underlying genetic liability for sensitivity to drug effects.
  - That is, smoking has no pharmacological effect on hangover, but is a marker of an underlying risk for substance use problems, including heavy drinking.
- Women were more susceptible to both the effects of smoking and the synergistic effects of drinking and smoking on hangover.
- Nearly identical effects were observed for headache as for hangover, suggesting that headache serves as a proxy for hangover.

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