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Reciprocal effects of alcohol and nicotine in smoking cessation treatment studies☆

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HIGHLIGHTS

- Two smoking cessation trials samples were examined.
- Time series analysis used to examine relationship between smoking and alcohol use.
- High number of positive cross-correlations between substances.
- Alcohol plays a significant role in relapse in smoking cessation attempts.

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ABSTRACT

Objective: Smoking and alcohol use are highly related; as such the present study investigated whether alcohol use is associated with failure in tobacco cessation attempts. We first examined the self-reported drinking behavior and smoking over the course of a year at a basic level. Next, we addressed two hypotheses to characterize this relationship at a deeper level: (Hypothesis 1) Alcohol use would be lower for those who attempted to quit smoking (quit for one or more days) during the year compared to those who never quit, and (Hypothesis 2) for those who relapsed to smoking after a quit increases in alcohol consumption would be positively associated with increases in smoking.

Method: Subjects were participants in two smoking cessation programs. One group of participants ($N = 139$) was part of a smoking cessation study in alcohol dependent smokers in early recovery and the other group of participants ($N = 163$) was drawn from a smoking cessation study for HIV positive smokers.

H1 was tested using t-tests. For H2, a time series analysis examined relationships between smoking and alcohol use within person over a one year period. For H1 and for H2, the analyses utilized bivariate time series procedures. Timeline follow-back data allowed for detailed daily reports of both tobacco and alcohol use.

Results: In the overall sample, there was no difference in alcohol use between those who stopped smoking and those who never stopped. However, when broken up by study, a difference was found in the alcohol dependent sample such that mean drinks were higher for those who stopped compared to those who never stopped smoking (H1). The results indicated a high number of positive significant cross-correlations between tobacco and alcohol use such that one substance predicted current, as well as past and future use of the alternate substance. Same-day cross-correlations were the most common, and dissipated with time (H2).

Conclusions: This analysis provided insights into the proximal influence of one substance on the other. Alcohol is related to relapse in smoking cessation attempts. It is important that smoking cessation efforts in alcohol using populations consider alcohol use in treatment.

1. Introduction

Alcohol and tobacco use are both associated with increased health risks, and there is a high level of co-morbidity for tobacco and alcohol use (Bien & Burge, 1990; Falk, Yi, & Hiller-Sturmhofel, 2006). Cigarette smokers are more likely to drink alcohol at greater rates than non-smokers (Chiolero, Wietlisbach, Ruffieux, Paccaud, & Cornuz, 2006; Dawson, 2000; Falk et al., 2006) and smokers are at a greater risk for dangerous levels of drinking (McKee, Falba, O'Malley, Sindelar, & O'Connor, 2007). In spite of the clear risks associated with these behaviors, a large proportion of the United States population continues to use these substances; over 19% describe themselves as smokers (Warner & Méndez, 2012) and 8.5% meet the diagnostic criteria for an alcohol use disorder (Falk, Yi, & Hiller-Sturmhöfel, 2008).

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Both epidemiological and laboratory studies demonstrate a significant relationship between cigarette smoking and alcohol use (Batel, Pessione, Maitre, & Rueff, 1995), past year drinking frequency is related to smoking initiation (Reed, Wang, Shillington, Clapp, & Lange, 2007) and, among adolescents, some findings suggest that while it is common to drink without smoking, it is very unusual for smokers not to drink (Orlando, Tucker, Ellickson, & Klein, 2005). The National Epidemiological Survey of Alcohol and Related Conditions (NESARC) data show that, even at light and moderate levels of use, alcohol is associated with increased daily tobacco use and dependence in comparison to alcohol abstainers (Falk et al., 2008). Cigarette smoking is also related to alcohol use disorders (AUD), such that for those who were nicotine dependent, the 12-month co-morbidity for an AUD was 22.8% compared with the general population at 8.5%. In addition, for those with an AUD, the 12-month comorbidity for nicotine dependence is 34.5% compared to only 12.8% in the general population (Hasin & Grant, 2004).

Several theories might explain the relationship between smoking and alcohol dependence (Cooney et al., 2007): *cross-substance coping response hypothesis* (Monti, Rohsenow, Colby, & Abrams, 1995), suggests that smoking might be used to suppress alcohol cravings, just as drinking might be used to suppress cigarette cravings. Another theory, *cross substance cue reactivity* (Rohsenow et al., 1997), suggests associative learning as well as cognitive or semantic associations between alcohol and cigarette use. It is possible that the two substances are often used in conjunction and that over time each substance becomes a prime for the other substance. This might help to elucidate why alcohol is an obstacle in smoking cessation and might be a cue for relapse (Sayette, Martin, Wertz, Perrott, & Peters, 2005). Lastly, the *limited strength model* hypothesizes that self-control is a resource that is limited and using this resource consumes strength (Muraven & Baumeister, 2000). As such, it is possible that if an individual "uses up" their self-control for one behavior (e.g. not smoking) it reduces the amount of strength available for subsequent self-control (e.g. abstaining from drinking).

Recent research has examined the effect of alcohol use on smoking treatment failure in smokers (Leeman et al., 2008). Leeman et al. (2008) found that the probability of smoking on heavy drinking days was higher than the probability of smoking on moderate or abstinent drinking days. This study also found that moderate drinkers were less likely than hazardous alcohol users to have relapsed into smoking at 12-weeks post-quit.

We first describe the self-reported drinking behavior of all study participants and smoking relapsers over the course of a year. In addition we characterized the relationship between the amount of alcohol consumed and the mean number of cigarettes smoked per day and investigated differences in the mean cigarettes per day for those who a) drink alcohol compared to those who do not drink alcohol, b) drink daily versus those who do not drink daily, and c) drink heavily versus those who do not drink heavily. Two hypotheses were brought forth: (H1) Alcohol use would be lower for those who attempted to quit smoking (quit for one or more days) during the year compared to those who never quit, and (H2) for those who relapsed to smoking after a quit increases in alcohol consumption would be positively associated with increases in smoking.

2. Method

In an effort to help understand these issues, this study examined the temporal relationship between smoking and drinking in two samples seeking smoking cessation treatment: an HIV-positive group and an alcohol dependent group. Both studies used the timeline follow-back method (Sobell & Sobell, 1996) to obtain self-reports of tobacco and alcohol use covering 90-day periods at 3, 6, 9, and 12 months (Carney, Tennen, Affleck, Del Boca, & Kranzler, 1998). This is a secondary analysis of data from two clinical trials of smoking cessation treatment. Here we provide a brief description of those two trials. Of the 371 total subjects, 26 participants attended only the baseline interview, and 43 did not have TLFB (Timeline Follow-Back) data. Participant flow for this work is displayed in Fig. 1.

2.1. Study 1. Intensive intervention for cigarette smokers in alcohol treatment

The Carmody et al. study (2011) is a two-arm randomized clinical trial, comparing intensive intervention for smoking cessation with usual care among alcohol-dependent smokers in early recovery. The intensive intervention consisted of combination nicotine replacement therapy (i.e., nicotine patches combined with adjuvant nicotine lozenges, gum, inhaler, or nasal spray) and extended cognitive–behavioral counseling conducted over a period of 26 weeks. Usual care involved a referral to a free-standing smoking cessation program. Patients ($N = 162$) came from the Drug and Alcohol Treatment programs at two Northern California VA Medical Centers and were veterans. Patients were eligible for the study if they were at least 18 years of age, reported alcohol as their primary drug of abuse, were currently smoking at least 5 cigarettes per day, were abstinent from alcohol for at least 7 days and not more than 6 months, and reported an interest in quitting smoking. Exclusion criteria included: any contraindications for nicotine patches or adjuvant nicotine medications (e.g., unstable angina or recent myocardial infarction, skin allergy to the patch, severe cardiovascular disease, lactation, pregnancy by self-report or by positive serum pregnancy test in pre-menopausal women), unstable psychiatric disorder, and severe cognitive impairment. This intensive intervention yielded a higher short-term smoking quit rate compared to the usual care group. Data were collected by trained research assistants using pen and paper surveys.

2.2. Study 2. Smoking treatments in HIV clinical care settings

This study (Humfleet et al., 2009) was a three-arm randomized clinical trial, comparing two targeted smoking treatments to a control: a) HIV-targeted traditional counseling, a six-session individual counseling treatment based on a cognitive–behavioral treatment model, b) Computer-based intervention which adapted the HIV-targeted counseling condition provided via computer and the Internet, and c) Minimal Contact Control Condition where each participant met with a research staff member who recommended establishing a quit date during week 2. Patients ($N = 209$) from two outpatient clinics serving HIV positive persons in San Francisco, California participated in the study. Patients were considered eligible if they were 18 years or older, smoked at least most days of the month, and were registered patients at one of the facilities. Exclusion criteria included: already enrolled in other smoking cessation treatment, or were experiencing significant or severe cognitive impairment or dementia. Baseline data were collected by having participants complete the Composite International Interview (CIDI) and by self-report questionnaires. TLFB data were collected through interview methods. The study found no differences in abstinence rates across groups, but smoking abstinence rates were comparable to those found in other similar treatment studies.

2.3. Measures

Baseline data assessed demographic information: age, years of education, sex, marital status, living situation, ethnicity, employment status, highest degree of education, and sexual orientation. Smoking variables included age at first cigarette, age smoked regularly, prior quit attempts, cigarettes smoked past 24 h and past 7 days, usual number of cigarettes in the last 24 h, and breath CO. Alcohol variables included number of days using alcohol in the last 30 days, number of years drinking alcohol, number of days intoxicated in the last 30 days, and number of years with intoxication.