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The effect of snus on alcohol-related cigarette administration in dependent a non-dependent smokers

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ABSTRACT

Introduction: Alcohol has been found to increase tobacco smoking in both dependent daily smokers (DDS) and nondependent nondaily smokers (NNS), yet little attention has been directed toward examining how different treatments/products modify drinking-related smoking behavior.
Methods: This study examined the acute effects of snus (4 mg of nicotine) on alcohol-related smoking responses in 18 DDS and 17 NNS. During each double-blind session, participants were randomly assigned to receive one of the following combinations: alcohol and snus, alcohol and placebo snus, placebo alcohol and snus, or placebo alcohol and placebo snus. Participants consumed their assigned beverage before absorbing their session's product, and after 30 min participants could self-administer puffs of their preferred brand of cigarette over a 60-minute period using a progressive ratio task.
Results: Alcohol significantly increased tobacco craving ($p < .001$) and tended to decrease latency to start smoking ($p = .021$) but only among NNS. In contrast, snus tended to decrease the number of puffs earned and how hard DDS worked for puffs in both beverage conditions ($ps \leq .019$) but it did not alter the smoking behavior of NNS. Craving was not significantly impacted by snus in either type of smoker.
Discussion: These findings raise the possibility that different processes mediate alcohol and cigarette co-use in NNS and DDS and suggest that snus may be effective in reducing alcohol-related cigarette use in DDS specifically.

1. Introduction

It is well established that alcohol consumption is linked with increased cigarette use among those who smoke (e.g. Falk et al., 2006). This increased use is seen in both dependent and non-dependent smokers (e.g. Shiffman and Paty, 2006). Alcohol also plays a major role in smoking initiation (e.g. O'Loughlin et al., 2009), smoking maintenance (Glautier et al., 1996; Kahler et al., 2010), and relapse to cigarette use among smokers trying to quit (Shiffman, 1986). Few – if any – treatments are known to affect alcohol-related smoking. Kouri et al. (2004) found that a nicotine patch decreased smokers' subjective tobacco craving; however, this effect diminished when smokers consumed alcohol. Alcohol consumption is typically not restricted in smoking cessation trials and most smokers intending to quit smoking do not simultaneously abstain from alcohol (e.g. Bobo et al., 1998). It is possible that drinking may affect individuals' efforts to quit smoking either by altering smokers' motivation to quit (Burton and Tiffany, 1997) or by reducing the effectiveness of nicotine replacement therapy (NRT) (Kouri et al., 2004).

One product that may hold promise for reducing alcohol-related smoking is snus. Snus is a moist pasteurized oral tobacco product that has been proposed as a smoking cessation aid (Gilljam and Galanti, 2003b; Lindström, 2007; Lund et al., 2010; Fagerstrom et al., 2012). Although the use of snus is not risk-free and it has been associated with the development of dependence, it has a higher margin of safety relative to cigarettes (Rodu and Cole 2002; Boffetta and Straif 2009), and it may be an appropriate smoking cessation option, for those that do not respond favorably to NRT (e.g. Fagerström and Schildt 2003; Gilljam and Galanti, 2003; Caldwell et al. 2010). In Norway, snus use has been reported to be a common self-selected smoking cessation strategy (Lund et al., 2010) and it has been argued that the relatively low rates of smoking in Sweden may be in part attributable to snus use (Norberg et al., 2011). Rates of alcohol use among snus users are high (Lund et al., 2008; Engström et al., 2010; Loukas et al., 2012; Larsen et al., 2013) suggesting that snus may be well tolerated when co-administered with alcohol. In addition, unlike NRT, snus contains several

Abbreviations: BAC, Blood alcohol content; B-BAES, Brief Biphasic Alcohol Effects Scale; CO, Carbon monoxide; DDS, dependent daily smokers; FTCD, Fagerström test for Cigarette Dependence; NNS, nondependent nondaily smokers; NRT, nicotine replacement therapy; QSU-Brief, Questionnaire of Smoking Urges-Brief; SMAST, Short version of the Michigan Alcoholism Screening Test; SRS, Subjective Rating Scales; PR, Progressive Ratio; USP, United States Pharmacopeia.

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tobacco constituents beyond nicotine such as anatabine, nornicotine, and acetaldehyde (ENVIRON International Corporation, 2010) and there is evidence that the replacement of non-nicotine tobacco constituents may help reduce alcohol-related cigarette craving (Barrett et al., 2013; King et al., 2009). Snus has been demonstrated to acutely reduce cigarette craving in laboratory settings (Barrett et al., 2011; Barrett and Wagner, 2011), although the extent to which such findings extend to alcohol-related smoking remains unknown.

The purpose of the present study is to examine the effects of snus on alcohol-related cigarette craving and smoking behavior in both nondependent nondaily smokers (NNS) and dependent daily smokers (DDS).

2. Methods

2.1. Participants

Non-treatment seeking DDS (i.e., daily tobacco use for a minimum of one year; score ≥ 3 on the Fagerström test for Cigarette Dependence (FTCD); Fagerström, 2012) and NNS (i.e., tobacco use on fewer than 25 days in the previous month; FTCD = 0) were recruited from the Halifax, Nova Scotia community. All were regular consumers of alcohol, having consumed a minimum of 4 drinks for women (5 drinks for men) at least once/week during the previous month, and non-problem drinkers, scoring 2 or less on the short version of the Michigan Alcoholism Screening Test (SMAST; Selzer et al., 1975). Potential participants were told that the study would consist of an initial session to complete screening measures and collect a non-abstinent breath carbon monoxide (CO) sample, and four experimental sessions that would involve the administration of beverages that may vary in alcohol content, followed by the administration of substances that may vary according to ingredients normally found in cigarettes (e.g., tar, ammonia, menthol, nicotine, sucrose). Women who reported pregnancy, nursing, intention to become pregnant, or who screened positive on an elective urine pregnancy test were not permitted to participate. All participants reported that they were medically healthy, all had reached the minimum age to legally consume alcohol and tobacco in Nova Scotia, and none intended to quit smoking over the subsequent 30 days or were using NRT products. All were naïve to snus. Participants were compensated CDN$10 per hour. The study was conducted in accordance with the Declaration of Helsinki and was approved by a local research ethics board.

2.2. Design

The protocol consisted of four double-blind, randomized sessions with a 2(beverage condition: alcohol or placebo) × 2(product condition: snus or placebo) within-subject design. All sessions were identical in procedure except that participants received a different beverage–product combination during each session.

2.3. Beverages

In the alcohol conditions, participants received 2.28 ml 50% USP units of alcohol per kilogram of body weight for women and 2.73 ml 50% USP units of alcohol per kilogram of body weight for men (MacDonald et al., 2000) to target a peak blood alcohol concentration (BAC) of 0.06%. Drinks were mixed 1:4 parts vodka to cranberry juice. The placebo beverage was made up of 5 parts cranberry juice with a small amount of alcohol applied to the rim of the glasses and on the drink tray to ensure the odor and taste of alcohol (Kushner et al., 1996).

2.4. Products

In the snus condition, participants received a Phantom brand Swedish-style snus mini portion containing 4 mg of nicotine and a manufacturer reported pH of 8.5 (V2 Tobacco; Silkeborg, Denmark). Snus has a nicotine loading time peaking at 30 min (Foulds et al., 2003; Lunell and Lunell, 2005). In the placebo condition, participants received a BaccOff brand nontobacco placebo portion (V2 Tobacco; Silkeborg, Denmark), which mimics the sensory properties of portion snus (Coffey and Lombardo, 1998).

2.5. Blinding

Participants were blind to the contents of the beverages and products received during each session. Participants were informed that the products might vary between sessions in their content of ingredients, but not in their nicotine content specifically. Similarly, participants were informed that the alcohol content of the beverages might vary, but not that the doses were selected to produce either mild or no intoxication. To maintain integrity of the blind, research personnel not otherwise involved with data collection prepared all beverages, administered the oral product, and recorded all breath alcohol measurements.

2.6. Subjective assessment

2.6.1. Subjective Rating Scales

An author-compiled Subjective Rating Scale (SRS) were used to assess subjective state (i.e., relaxed, pleasant, head rush, stimulated, jittery, dizzy, irritable, trouble concentrating, anxious, frustrated, intoxicated, and crave cigarette). Each item was rated on a 10-cm horizontal line labeled with integers 1–10 and anchored with the endpoints “Not at all” and “Extremely.” Similar scales have been widely used to assess subjective drug effects, and this method of assessment has been shown to be both reliable (e.g. Wewers and Lowe, 1990) and sensitive to the acute effects of alcohol and tobacco (e.g. Barrett et al., 2006, 2013).

2.6.2. Questionnaire of Smoking Urges-Brief

The Questionnaire of Smoking Urges-Brief (QSU-Brief; Cox et al., 2001) is a 10-item self-report measure used to assess tobacco craving across 2 dimensions (factor 1: intention to smoke; factor 2: withdrawal/negative affect relief).

2.6.3. Brief Biphasic Alcohol Effects Scale

The Brief Biphasic Alcohol Effects Scale (B-BAES; Martin, Earleywine, and Musty, 1993) is a 6-item self-report measure used to assess the subjective stimulant effects of alcohol associated with a rising BAC (factor 1), as well as the subjective depressant effects associated with a descending BAC (factor 2) (Rueger et al., 2009).

2.7. Behavioral measures

2.7.1. Progressive ratio task

Participants were allowed to earn puffs of their preferred brand of cigarette (supplied by the lab) using a computerized progressive ratio (PR) task over 60 min. Ten key presses were required to earn the initial puff, and the requirement increased at a ratio of 1.3 for each subsequent puff. Participants were not required to earn any puffs but were required to remain seated in front of the cigarette until the end of the session. The latency to start smoking, the total number of puffs earned, and the breakpoint – the number of key presses completed to earn their last puff – were recorded for each session. The PR task has been demonstrated to be sensitive to pharmacological manipulations in human tobacco self-administration studies (e.g., Barrett and Darredeau, 2012).

2.8. Procedure

Participants arrived for each testing session having abstained from smoking and alcohol for a minimum of 12 h and from food and caffeine for a minimum of 2 h. Abstinence from smoking was confirmed with a breath CO reading of 15 ppm or less or a 50% reduction in CO from the non-abstinent baseline (Vitalograph; Lenexa, KS), and abstinence