Pharmacology, Biochemistry and Behavior 130 (2015) 34–39

Contents lists available at ScienceDirect

Pharmacology, Biochemistry and Behavior

journal homepage: www.elsevier.com/locate/pharmbiochembeh

The acute effects of tobacco smoking and alcohol consumption on video-lottery terminal gambling

Sean P. Barrett [a,b], Pam Collins [a], Sherry H. Stewart [b,a,*]

[a] Department of Psychology and Neuroscience, Dalhousie University, Halifax, Nova Scotia, Canada
[b] Department of Psychiatry, Dalhousie University, Halifax, Nova Scotia, Canada

ARTICLE INFO

Article history:
Received 18 July 2014
Received in revised form 24 December 2014
Accepted 30 December 2014
Available online 7 January 2015

Keywords:
Alcohol
Nicotine
Gambling
Smoking

ABSTRACT

Rationale: Gamblers often use alcohol and/or tobacco when they gamble but little is known about the extent to which drinking or smoking affects gambling behavior.
Objectives: This study examined the acute effects of alcohol and nicotine-containing tobacco administration on the subjective and behavioral responses to video-lottery terminal (VLT) gambling in 16 regular video-lottery terminal players (11 male) who were also regular consumers of alcohol and tobacco.
Methods: During four double-blind, counterbalanced sessions, participants assessed the subjective effects of nicotine-containing tobacco or denicotinized tobacco following the administration of a moderately intoxicating dose of alcohol or a placebo beverage. They were then given $40 and provided with an opportunity to gamble using an authentic VLT.
Results: Alcohol administration was associated with increased ratings of several subjective descriptors including "intoxicated", "high", "want alcohol", "crave cigarette", and "want to gamble" but did not affect subsequent gambling behavior. In contrast, relative to denicotinized tobacco, the administration of nicotine containing tobacco was associated with increased average wagers, but did not significantly alter subjective state.
Conclusions: Findings suggest that both alcohol and nicotine-containing tobacco may acutely increase the propensity to gamble using VLTs, but they may do so through separate processes.

1. Introduction

Gambling, tobacco smoking and alcohol drinking often co-occur at both the syndrome and event levels. High rates of co-morbidity of gambling-, tobacco-, and alcohol-related disorders have been documented in both clinical and community samples (Grant and Potenza, 2005; Grant et al., 2009; McGrath and Barrett, 2009; Stewart and Kushner, 2003, 2005; Toneatto and Brennan, 2002) and the rates of tobacco dependence and alcohol dependence among pathological gamblers have been estimated to be approximately 60% and 73% respectively (Petry et al., 2005). Moreover gamblers often report drinking and smoking when they gamble, and gamblers who are smokers are more likely to use alcohol when gambling than non-smoking gamblers (McGrath et al., 2012a). However alcohol and tobacco are often co-administered (e.g., Harrison and McKee, 2008; Romberger and Grant, 2004) and little is currently known about their relative impacts on the propensity to gamble.

A number of previous investigations suggest that acute alcohol ingestion may increase the propensity to gamble. For example, Ellery et al. (2005) reported that probable pathological gamblers who received alcohol gambled significantly longer using a video-lottery terminal (VLT) and engaged in more 'risky' wagering behaviors relative to those that received a non-alcoholic control drink. The effect of alcohol on risky wagering was recently replicated in a follow-up study (Ellery and Stewart, 2014). Similarly, Kyngdon and Dickerson (1999) found that gamblers who received alcohol played a computerized card betting game for a longer time and lost more of their original stake than those who received a non-alcoholic beverage. Finally, Cronce and Corbin (2010) found that acute alcohol administration was associated with larger average bets on a simulated slot machine task. While collectively these findings suggest that acute alcohol administration may increase risky gambling behavior, none of these studies appeared to assess or control for recent tobacco use, and the extent to which recent tobacco use may have impacted the results is not clear.

To our knowledge, the effects of acute tobacco use on gambling have never been directly assessed. However there is growing indirect evidence to suggest that smoking might increase gambling related behaviors. For example, gamblers who smoke have been shown to spend more when gambling than their non-smoking counterparts do (McGrath et al., 2012a) and there is evidence of a marked decrease in

* Corresponding author at: Dalhousie University, Department of Psychology and Neuroscience, 1355 Oxford Street, Halifax, Nova Scotia B3H 4R2, Canada. Tel.: +1 902 494 3793; fax: +1 902 494 6585.
E-mail addresses: Sherry.Stewart@dal.ca, sstewart@dal.ca (S.H. Stewart).

http://dx.doi.org/10.1016/j.pbb.2014.12.015
0091-3057/

gambling revenues from electronic gaming machines in jurisdictions that have implemented smoking bans in gaming venues (Lal and Siahpush, 2008; Pakko, 2004; Thalheimer and Ali, 2008). Such findings are consistent with recent evidence that nicotine administered via tobacco smoke may enhance the incentive value of non-smoking reward related stimuli (e.g., Attwood et al., 2012; Perkins and Karelitz, 2013). However, in two recent studies the acute administration of nicotine via inhalers (McGrath et al., 2012b) and lozenges (McGrath et al., 2013) did not impact upon VLT gambling behavior or the desire to gamble. Since the pharmacokinetics of nicotine delivery from inhalers and lozenges differs from nicotine administered through tobacco smoke (Benowitz et al., 2009; Schneider et al., 2008) and since there is growing evidence that nicotine may interact with various non-nicotine tobacco constituents to produce many of the subjective and behavioral effects of smoking (e.g., Barrett, 2010; Barrett and Darredeau, 2012; Clemens et al., 2009; Harris et al., 2010), it remains possible that McGrath et al.'s negative findings may not extend to the acute administration of tobacco smoke per se.

In the current study, we examined the effects of alcohol and nicotine-containing tobacco smoke on gambling behaviors and subjective effects in regular gamblers given access to VLTs under various nicotine tobacco/alcohol/placebo challenge conditions using a double-blind placebo-controlled repeated measures design.

2. Methods

2.1. Participants

Non-treatment seeking male and female gamblers who were regular VLT players, smokers and consumers of alcohol were recruited from the community by advertisements placed in local newspapers. A local research ethics board approved this study and written consent was obtained from all participants prior to study participation. The inclusion criteria for participation were: (i) regular moderate alcohol use, (ii) regular VLT play (i.e., one or more times a month), (iii) current daily smoker; and (iv) having reached the age of majority (19 years) for the province of Nova Scotia. The exclusion criteria were: (i) the presence of a medical contraindication for consuming alcohol, cranberry juice (which was mixed with the alcohol) or tobacco, (ii) current alcohol or illicit drug dependence, (iii) current or past gambling disorder, psychotic disorder, mood disorder, or obsessive compulsive disorder, and (iv) if a woman, pregnant or sexually active and not using birth control. In addition participants were required to refrain from the use of any psychoactive drugs during the duration of the study, with compliance confirmed through a urine screen.

2.2. Beverages

In the active conditions, participants received an alcohol dose of 2.28 ml 50% USP units of alcohol per kg of body weight for women and 2.73 ml 50% USP units of alcohol per kg of body weight for men (MacDonald et al., 2000). Alcohol-containing drinks were mixed 1:4 parts vodka to cranberry juice (MacDonald et al., 2000). The taste-matched placebo was comprised of 5 parts cranberry juice with a small amount of alcohol applied to the rim of the glasses to ensure the odor and taste of alcohol (Kushner et al., 1996).

2.3. Cigarettes

Two types of tobacco that differed in nicotine content (nicotine-containing Quest 1 and denicotinized Quest 3; Vector Tobacco, Mebane, North Carolina, USA) were used. The manufacturer-reported maximum nicotine yield of the denicotinized tobacco was 0.05 mg while the nicotine-containing tobacco had an average reported yield of 0.60 mg. Both types of tobacco had reported tar yields of 10 mg.

2.4. Gambling

Gambling behavior was assessed using a VLT that was identical to those available throughout Nova Scotia at the time of the study. Participants were provided with $40 CAD to gamble. VLT play was limited to a single spinning reels game to ensure a similar gambling experience for all participants across conditions (Ellery et al., 2005). Participants could place any size bet per spin (ranging from 5 cents to $2.50) and could play the VLT for as long as they wished over two consecutive 15 min periods or until they ran out money, whichever came first. Wagers could be made at any time during the VLT sessions, but there was no requirement for participants to make any wagers at all. Any amount won by participants (or remaining from the initial $40) was paid out at the end of the experimental session. The experimenter recorded the amount spent per bet as well as the number of bets and these were the outcomes of interest in the study (Ellery et al., 2005).

2.5. Heart rate

Heart rate (HR) was assessed using a monitor (Polar Electro Canada Inc., Lachine, QC) strapped to the participant's chest. For each HR assessment, the average number of beats was recorded over a 3-min interval. Similar methods have been shown to be sensitive for documenting physiological changes in response to a drug challenge in previous VLT studies (e.g., McGrath et al., 2012a,b; Stewart et al., 2005, 2006).

2.6. Blinding

The nicotine-containing cigarettes and alcohol beverages were prepared to appear identical to the denicotinized cigarettes and placebo beverages, respectively, and both the experimenter and the participants were blind to their contents. Participants were informed that the tobacco may vary in some ingredients, but not according to nicotine content specifically. Similarly, participants were informed that the alcohol content of the assigned beverages may vary, but not that the doses were selected to produce either moderate or no intoxication. To maintain integrity of the blind, research personnel not otherwise involved with the study prepared all beverages and cigarettes and recorded all breath alcohol measurements.

2.7. Subjective measures

2.7.1. Subjective Rating Scale (SRS)

A number of descriptors were used to assess subjective state (i.e., bored, confident, want alcohol, intoxicated, crave cigarette, want to gamble). Each item was rated on a 10 cm horizontal line labeled with the integers 1–10 and anchored with the endpoints 'not at all' and 'extremely'. Similar scales have been widely used to collect data on subjective drug effects and this method has been shown to be reliable, valid, and sensitive to participants' subjective experiences (e.g., Bond and Lader, 1974).

2.7.2. Biphasic Alcohol Effects Scale (BAES)

Subjective stimulation and sedation were assessed using the BAES (Martin et al., 1993), a 14-item 11-point self-rating scale where 0 indicates 'not at all' and 10 represents 'extremely'. The BAES has been shown to possess strong psychometric properties (Earleywine and Erblich, 1996; Martin et al., 1993) and has been widely used to assess the stimulant and sedative effects of alcohol (e.g., Brunelle et al., 2007; King et al., 2002; Rueger et al., 2009).

2.8. Procedure

All participants were tested in a ventilated laboratory that contained a fully functional VLT identical to those found in local casinos and bars at the time of the study. Participants were tested over four sessions spaced