Short Communication

Does expectancy affect alcohol absorption?

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Abstract

Many factors influence alcohol absorption, yet few studies have addressed the issue of whether or not experimental manipulations themselves may affect alcohol absorption. The current balanced placebo design study comparing the expectancy effects of root beer and non-alcoholic beer vehicles resulted in significantly lower blood alcohol levels in the root beer condition than in the beer condition even though alcohol doses were the same. Two possible explanations are discussed; differences in expectancy may have affected absorption, or fructose in the root beer may have slowed absorption of alcohol relative to the maltose in beer. The literature does not provide strong evidence for either of the hypotheses. The implication of this study’s results is that alcohol absorption rate may be an important source of confounding effects in behavioral research in the laboratory, because it may be affected by beverages or other experimental conditions.

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The absorption of alcohol is affected by numerous physical factors such as congeners, vehicle concentrations, carbonation, or food in the stomach (McKim, 2000), as well as a number of drugs and state of health (Holt, 1981). In addition, psychological factors can also affect alcohol absorption, such as stress (Breslin, Mayward, & Baum, 1994; Minnick & Wehner, 1992) and responses to pain, emotional state, intense mental or physical effort, and body temperature (Holt, 1981). Understanding what impacts absorption is important because the degree of behavioral impairment has been found to be more related...
to the rate of rise in blood alcohol concentration (BAC) than the BAC at the time of behavioral measurement (Fillmore & Vogel-Sprott, 1998).

Given all of the factors that can affect alcohol absorption, surprisingly, few studies have looked at the effects of experimental manipulations on alcohol absorption. Expectancy manipulations appear to have influenced BACs in some studies (Collins, Gollnisch, & Izzo, 1996; Ross & Pihl, 1989), but the phenomenon has not been the primary focus of any research.

Failure to control for BAC variability caused by experimental manipulations could result in serious misinterpretation of results. This report is an analysis of data from a larger research project that focused on expectancies and behavioral responses to alcohol and provides evidence that expectancies may affect the rate of absorption of alcohol.

1. Methods

1.1. Participants

Twenty-five healthy beer drinkers without alcohol problems participated. Their ages ranged from 21 to 47 years, averaging 29.73 years for the 11 men and 29.43 years for the 14 women. Participants’ normal alcohol intake quantity ranged from one to seven drinks per occasion and frequency from 5 to 182 occasions per year.

1.2. Procedures

Participants were asked not to use alcohol or other drugs (with the exception of caffeine and nicotine) for 12 h, fast for at least 1.5 h and abstain from caffeine for 2 h prior to the test sessions. Nicotine use was disallowed only during the test sessions; we did not want to exclude smokers or test them in withdrawal.

A modified balanced placebo design (Rohsenow & Marlatt, 1981) was used in the study by manipulating expectancies with flavor rather than verbal instruction. Alcohol expectancies were assumed to have been conditioned by the repeated pairing of alcohol with the beer through normal drinking. A double-blind within-subjects design was used in order to reduce the variance in the measures. A between-subjects design is normally used in BPD studies because of the verbal deception, but that was not necessary in this research.

Groups of four to six people were tested in the late afternoon in a recreation-room-like environment, with two to four friendly experimenters. Participants came to the laboratory for one short familiarization session and four test sessions. The beverage conditions were as follows: beer-alcohol (expect alcohol-given alcohol), beer-placebo (expect alcohol-given placebo), root beer-alcohol (expect placebo-given alcohol) and root beer-placebo (expect placebo-given placebo), with the order counterbalanced between subjects within sessions and across days. Subjects were told the beverage flavor (root beer or beer), but no further information was provided.

Beverages were beer (non-alcoholic O’Doul’s) and Dad’s Old Fashioned caffeine-free root beer as the alcohol-associated and non-alcohol-associated flavors, respectively. The dose of alcohol was 0.4 g/kg (190 proof Everclear) added to the non-alcoholic beer or root beer at a concentration of 7% v/v. The quantity of the beverage was adjusted for body weight, 7.02 ml/kg. The beverages were prepared from
newly opened bottles (to maintain carbonation) in a separate room immediately after subjects arrived. All participants completed drinking in 25 min.

Participants were served the beverage with one cup of pretzels to avoid drinking on an empty stomach. No other food or drink except water was made available during testing. Smoking was allowed outside between the 60-min and the 120-min rounds of testing. Test sessions lasted about 3 h and subjects were sent home in a taxicab when BACs reached 0.02 g/100 ml.

BAC estimates were measured by a breath analyzer (Lion Alcometer S-D2, Lion Laboratories, plc). Three breath analyzers were used in order to make sure there was one available that was reading zero to measure each participant who had received alcohol. Breath alcohol levels were measured immediately after the participants arrived to confirm a concentration of zero, and then 5, 15, 30, 60, 90 and 120 min after drinks were finished. Behavioral measures were included in the study but are not part of this report.

2. Results

Correlations among participants’ weights, drinking variables, smoking quantity at the 15-min and 30-min BAC readings for both flavor conditions were not significant. There were no gender differences in the BAC estimates for any of the six measurement times (see Fig. 1).

A repeated measures (2 within-subjects factors × time) analysis of variance was used to analyze the effects of the flavor × alcohol dose manipulations. The first breath analyzer readings taken about 5 min after the participants finished drinking were excluded from the analysis because they were thought to be unreliable because of the wide range of BACs. The BAC curve for the beer condition was higher than

Fig. 1. Blood alcohol concentrations over time, comparing men and women, beer and root beer.
that for root beer. The three-way interaction among flavor, alcohol dosage and time was significant \([F(1,24)=9.037, p=0.006]\) with a very large effect size (partial \(\eta^2=0.274\)—see Cohen, 1988). Flavor responses are significantly different for the alcohol condition but not for the placebo condition for all time points: time 15 min: \([F(1,24)=31.58, p<0.001]\); time 30 min: \([F(1,24)=19.56, p<0.001]\); time 60 min: \([F(1,24)=20.81, p<0.001]\); time 90 min: \([F(1,24)=10.59, p=0.003]\); time 120 min: \([F(1,24)=9.46, p=0.005]\) (see Fig. 2).

3. Discussion

There are two possible explanations why the BACs were higher in the beer condition than in the root beer condition, different congeners or differences in expectancy. There is no research with human subjects that compares the congeners (fructose in root beer and maltose in beer) used in this experiment. However, research with rats found that the fructose delayed the alcohol absorption while maltose hastened the absorption (Broitman, Gottlieb, & Vitale, 1976). Another possible explanation for our results is that alcohol expectancies elicited by the beer (but not by the root beer) also may have hastened the alcohol absorption because unexpected alcohol could delay gastric emptying. There is some research support for the latter idea (Collins et al., 1996; Newlin & Pretorius, 1991). It is also possible that both of these factors are involved.

Factors other than congeners or expectancies are unlikely to have caused the differences in alcohol absorption in the beer and root beer conditions. The alcohol dosage was controlled by adding alcohol to both beverages and the within-subjects design controlled for subject variability. If the congeners were responsible for our BAC differences, studies that use different beverage conditions need to be aware that their results may be confounded. If expectancies were responsible for our BAC differences, then many BPD experiments may have confounded results. Unfortunately, at the present time, we can neither support nor eliminate either possibility.
Even though we cannot definitively explain the results of the present study at this time, we believe that it is an important finding that should be reported. We hope that awareness will be increased regarding the possibility that experimental manipulations can have robust effects on BACs through influences on alcohol absorption.

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