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INTRODUCTION

- Attentional bias towards alcohol-related stimuli, described as an increased tendency to focus attention towards alcohol-related cues, is thought to play a role in abuse potential (Field & Cox, 2008). Specifically, a history of heavy alcohol use is thought to result in the ability of alcohol-related stimuli to grab the drinker's attention, often eliciting approach and consumption behavior.
- Laboratory tasks have been developed to measure attentional bias, including dot-probe and visual probe tasks. Research using these tasks has consistently demonstrated that heavy drinkers display an increased attentional bias towards alcohol-related cues (e.g., Townshend & Duka, 2001). Further, there is some evidence to suggest that attentional bias may increase following a moderate dose of alcohol (Townshend & Duka, 2004).
- Laboratory tasks have also been developed to measure attentional inhibition, and research utilizing these tasks has shown that alcohol impairs the ability to inhibit inappropriate attentional impulses (Abroms et al., 2006).
- Recent models of alcohol abuse have suggested that sensitivity to alcohol effects on mechanisms of attentional bias and inhibitory control might be related (Dawe et al., 2004). Specifically, alcohol impairment of the ability to control attention might play a role in the ability to direct attention away from alcohol-related stimuli.

STUDY OBJECTIVE: The present study was designed to test this hypothesis by examining the relation between acute alcohol effects on attentional inhibition and attentional bias.

METHOD

Participants: Thirteen adult drinkers (10 men and 3 women) between the ages of 21 and 28 (mean age = 23.2 years, *SD* = 2.4) participated in the study.

Attentional bias task: Participants' attentional bias towards alcohol-related stimuli was assessed with a visual probe task. Two pictures (an alcohol-related image and a neutral image matched for size and shape) were presented side-by-side on a computer screen. Upon offset of the picture pair, a visual probe appeared on either the left or right side of the screen. Participants were required to press a key indicating on which side of the screen the target appeared. This task ensured that participants were engaged in looking at the images. Eye-tracking equipment monitored participants' eye movements throughout the task. Attentional bias was calculated as the difference between the total time (ms) spent fixated on alcohol-related images compared to neutral images. Attentional bias towards alcohol-related images is indicated by positive difference scores while negative scores indicate a lack of attentional bias.

Delayed Ocular Return (DOR) Task: The DOR task required only eye movements, which were monitored by eye-tracking equipment. Participants were instructed to focus on a fixation point for the entire time it was presented on the screen. A distracter stimulus appeared for a brief period of time, and participants were told not to move their eyes to the look at the distracter, but to remember where it was presented on the screen. After a wait interval the fixation point disappeared, at which time participants were instructed to move their eyes to where the distracter used to be as fast as possible. The next fixation point was presented at this location to begin the next trial. Impairment of attentional inhibition was measured as the number of trials in which a participant failed to delay the eye movement until the end of the wait interval. Saccadic reaction time was also measured as the time required to execute the eye movement.

Procedure: After task familiarization, subjects attended two dose-challenge sessions where they received a beverage and then performed the attentional bias and DOR tasks. Performance was tested under an active dose (0.45 g/kg) and placebo (0.0 g/kg). The 0.45 g/kg dose produced a mean peak BAC of 56 mg/100 ml (*SD = 12.5).* BACs were not affected by gender. All participants reported that the placebo beverage did contain alcohol.

Dependent Measures:

- *Attentional Bias.* Difference in total fixation time on alcohol versus neutral images. Greater values indicate a greater attentional bias towards alcohol-related stimuli.
- *Premature Saccades.* On the DOR task, the mean number of trials in which a participant failed to delay the reflexive saccade. Greater numbers of premature saccades indicate poorer levels of attentional inhibition.
- *Saccadic Reaction Time.* On the DOR task, mean reaction time (RT) required to execute the eye movement. Greater values indicate slower RT.

RESULTS

•Inhibitory and activational aspects of performance on the DOR task were impaired by alcohol. Alcohol increased premature saccades and slowed saccadic RT compared to placebo (Figure 1).

•A significant attentional bias towards alcohol-related images was found in the placebo condition, $t(12) = 4.6$, $p < .01$. A non-significant trend for attentional bias was found in response to alcohol, $t(12) = 1.5$, $p = .08$.

•Attentional bias scores were not significantly affected by alcohol. Under placebo, the sample displayed a mean attentional bias score of 1715.2 ms (*SD* = 1335.7). Individual attentional bias scores ranged from -871 to 4044 ms. In response to alcohol, the sample displayed a mean attentional bias score of 932.8 ms (*SD* = 2316.3). Individual scores ranged from -2386 to 5580 ms.

• Individual differences in degree of attentional inhibition were related to differences in attentional bias under the active dose of alcohol. Those who displayed greater number of premature saccades also exhibited a more pronounced attentional bias toward alcohol-related stimuli. (Figure 2).

• Correlational analyses revealed that attentional bias was not related to attentional inhibition when measured in the placebo condition ($r = 0.19$, $p = .54$). Further, attentional bias was not related to saccadic rt in either condition ($ps > .20$).

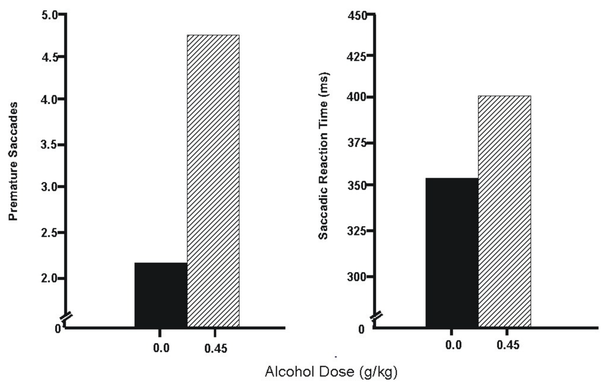

Figure 1. Mean premature saccades on the DOR task under the 0.0 g/kg (placebo) and 0.45 g/kg alcohol dose conditions (left panel). Mean saccadic reaction time under the 0.0 g/kg (placebo) and 0.45 g/kg alcohol dose conditions (right panel).

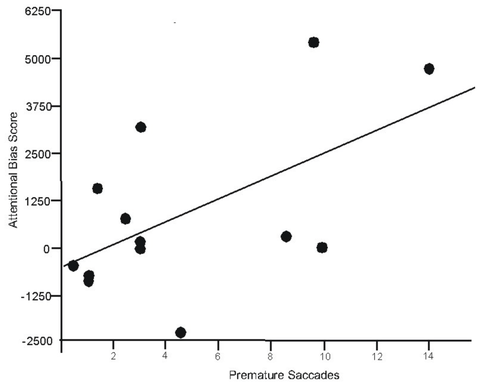

Figure 2. Relation between participants' premature saccades and attentional bias scores under the 0.45 g/kg dose of alcohol. Slope is indicated by least-squares regression line (solid line).

CONCLUSIONS

•Results demonstrated that individuals who exhibited greater sensitivity to alcohol impairment of attentional inhibition also displayed greater levels of attentional bias in response to the drug. By contrast, no relation between attentional inhibition and attentional bias was observed in the placebo condition.

•The finding that this association was evident specifically in response to alcohol suggests that inhibitory control of attention might play a more pronounced role in attentional bias after a drinking episode has been initiated. Thus, while attentional inhibition might not relate to attentional bias in the sober state, alcohol impairment of attentional inhibition could increase attentional bias after a drinking episode has already begun, possibly promoting excessive consumption within the episode.

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