Alcohol Affects Emotion And Behavior Through Cognition

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Abstract

Affect disruption is pivotal to many theories of alcohol use, yet the mechanisms by which alcohol alters emotional response are poorly understood. In the case of threatening stimuli, there are indications that alcohol may attenuate fear by compromising cognitive processing necessary for appetitive motivation of threat cues (Lang, Patrick, & Strickland, 1999). This experiment further evaluated the hypothesis that alcohol reduces reactivity to threat primarily in complex contexts demanding simultaneous attention to competing stimuli.

Participants received either alcohol (0.08g/100 ml) or no alcohol. They then viewed words from two semantic categories: animals and body parts. Words from one category (CUE+) were followed by electric shocks, whereas no shocks followed words from the other category (CUE-). Words were presented in blocks of 20. Blocks Types were either "Threat focused" (participants simply attended to the words) or "Divided attention" (words were colored either red or green, with the color serving as the discriminative stimulus for a speeded Go/No-Go task). Fear potentiated startle (FPS) was measured for acoustic probes delivered after cue onset. Change point test was used to assess ERP response. 

Dependent Measures

Emotion states entail activation of "action dispositions" that prepare an organism to react. Emotional response represents activation of a subcortical primary motivation system: appetitive and aversive motivation systems. Reciprocals emotions exist between these subcortical primary motivation systems and higher level cortical structures. Alcohol does not directly affect emotion at the level of these primary motivation systems but instead influences emotional response by its impact on higher level cortical structures.

Methodology

Participants

48 social drinkers (24 male/24 female) assigned to 2 beverage groups
- Alcohol (peak blood alcohol level of 0.080 g/100 ml)
- No-Alcohol

Description of Paradigm

Two Block Types were utilized: Threat focused (S1) were from 2 word categories (CUE+ and CUE-), and CUE+ trials could result in shock administration. Cue color was constant.

Divided attention blocks: Cue word category and color varied simultaneously. Task processing was prioritized.

Trial Structure

S1               S2

300ms         1000ms        300ms         2000ms   2000ms

S1 Identity

- Threat focused: Animal or Body-part
- Divided attention: Animal or Body-part

Dependent Measures

- Fear Response: Fear potentiated startle (FPS) indexed fear response to shock cues in Threat focused and Divided attention blocks. Fear potentiated startle was calculated as the difference in eyeblink reflex magnitude to auditory probes presented after CUE+ vs. CUE- words.
- Threat Cue Processing: P3 differentiation indexed attentional resource allocation to threat cue processing. P3 differentiation was calculated as the difference in the P3 component of the event-related potential waveform to CUE+ vs. CUE- word cues.
- Task Performance: Reaction time to CUE+ and CUE- GO trials in Divided attention blocks was measured to examine alcohol intoxication effects on "shock interference" (a slowing in RT on CUE+ relative to CUE- GO trials).

Hypotheses

Fear Response

- Differential alcohol effects on fear potentiated startle (FPS) across attentional load conditions
- Reduced FPS in alcohol group in Divided attention blocks
- No beverage group effect on FPS in simpler Threat focused blocks

Threat Cue Processing

- Differential alcohol effects on P3 differentiation across attentional load conditions
- Reduced processing of threat cues in Divided attention blocks
- No beverage group effect on threat cue processing in Threat focused blocks

Task Performance

- Differential "shock interference" effects across beverage groups
- Reduced interference of shock on task performance in Divided attention block for alcohol group

Threat Cue Processing

P3 differentiation was analyzed within a Beverage (Alcohol vs. No-alcohol) X Block Type (Threat focused vs. Divided attention) repeated measures ANOVA. A significant Beverage X Block Type interaction was observed for P3 differentiation, F(1,46) = 4.72, p < .037. Simple efect tests revealed no beverage group differences in P3 in Divided attention blocks. In contrast, P3 was significantly lower for intoxicated participants in Divided attention blocks, F(1,46) = 3.85, p < .001. Thus, processing of threat cue information was sensitive to alcohol in conditions of divided attention but not threat focus.

Fear Response

Fear potentiated startle (FPS) was analyzed within a Beverage (Alcohol vs. No-alcohol) X Block Type (Threat focused vs. Divided attention) repeated measures ANOVA. The pattern of results for fear potentiated startle (FPS) mirrored deficits in threat cue processing indexed by P3 differentiation (see previous figure). A significant Beverage X Block Type interaction was observed for FPS, F(1,46) = 7.51, p < .007. Simple effect tests revealed no beverage group differences in FPS during Threat focused blocks. However, FPS was significantly reduced among intoxicated participants in the Divided attention blocks, (8)(4) = 2.36, p = .023. FPS results indicate that alcohol selectively reduced fear response only when participants were required to divide attention between competing stimuli. Reference to P3 results reveals that comparable selective deficits in threat cue processing in divided attention conditions co-occurred and preclude this reduction in fear response.

Conclusion

In divided attention conditions, alcohol-induced deficits in cognitive processing resulted in impaired processing of peripheral threat cues. In contrast, alcohol intoxication did not negatively impact processing of "prioritized" task-related cues.

Intoxicated participants exhibited a selective deficit in fear response to threat cues only when required to divide attentional resources between these threat cues and processing of competing task-related information. This defect in fear response co-occurred with impairment in threat cue processing, strongly suggesting cognitive mediation of this alcohol effect on fear.

Alcohol intoxication reduced the impact of "shock interference" on task performance. Specifically, intoxicated participants exhibited less reaction time slowing in conditions of shock threat than did sober participants, suggesting that intoxication facilitated task performance in this stressful environment.