

Alcohol Selectively Affects Anxiety But Not Fear

Christine A. Moberg, Jason N. Jaber & John J. Curtin
University of Wisconsin-Madison

ABSTRACT

Alcohol challenge research using fear-potentiated startle (FPS) has begun to clarify when and how alcohol reduces stress (Curtin et al., 1998, 2001). Moderate doses of alcohol do not reduce FPS to simple, punctate threats that elicit fear. However, recent evidence suggests that the neurobiological substrates of fear vs. anxiety may be dissociable (Walker, Toufexis, & Davis, 2003). Laboratory research designed to test for a selective effect of alcohol on anxiety using precise experimental methods has not been conducted in humans to date. This study compared alcohol's effects on fear vs. anxiety using a modified version of a procedure designed by Grillon and colleagues (2006).

Intoxicated (BAL = 0.08%) and non-intoxicated participants viewed a series of colored squares separated by a variable inter-trial interval (ITI) in three distinct conditions. In the first condition, electric shocks were contingently paired with square presentation. In the second condition, shocks were administered non-contingently (i.e., during squares and ITI). In the third condition, no shocks were administered. Preclinical research has suggested that predictable (contingent) vs. unpredictable (non-contingent) aversive stimuli elicit fear vs. anxiety, respectively; this work also suggests distinct neural pathways for FPS in these two conditions (efferents from central nucleus of the amygdala vs. bed nucleus of the stria terminalis).

Alcohol produced a larger decrease in FPS in the unpredictable shock condition. Synthesis of this result with previous research suggests that moderate doses of alcohol disrupt FPS when threats are unpredictable and participants are "anxious." Implications for the co-morbidity between alcohol problems and anxiety disorders are discussed.

BACKGROUND & HYPOTHESES

- Alcohol challenge research using fear-potentiated startle (FPS) has begun to clarify when and how alcohol reduces stress.
- Moderate doses of alcohol do not reduce FPS to simple, punctate threats that elicit fear (Curtin et al., 2001).
- Precise experimental methods to elicit fear vs. anxiety in humans have been developed.
- Preclinical research suggests that the neurobiological substrates of fear vs. anxiety may be dissociable (Walker et al., 2003).
- Preclinical research has suggested alcohol selectively impairs conditioning to context but not to specific threat cues (Melia et al., 1996).
- In humans, anxiolytic drugs (e.g., alprazolam, diazepam) have larger effects on response to anxiety vs. fear manipulations (Baas et al., 2002; Grillon et al., 2006).
- Hypothesis:** A moderate dose of alcohol will selectively reduce anxiety but not fear.

This research was funded by a grant to John Curtin from NIAAA (R01 AA15384)

METHOD

Participants

- 64 healthy social drinkers
- Two beverage groups: Alcohol (target BAC: 0.08%) and placebo.

General Procedure

- All participants completed a pre-drink baseline startle assessment and a post-drink shock tolerance assessment.
- Participants viewed blocks of 6s colored square "cue" presentations separated by an inter-trial interval (range 19-23s).
- Shock contingency was manipulated within subjects across three block types
 - No Shocks:** No shocks are administered
 - Predictable Shocks:** Shocks administered during every red square cue
 - Unpredictable Shocks:** Shocks administered during both blue cues and ITI

No Shocks



Predictable Shocks



Unpredictable Shocks

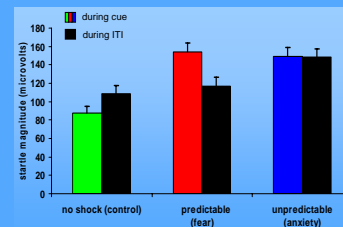


★ Startle probe ⚡ Electric shock

Measures

- EMG eyeblink startle response to noise probes was measured during both cue presentation and ITIs in all blocks. Scored as peak response in 20-120ms post-probe onset. Analyses of both raw startle response and potentiated startle (vs. no shock blocks) were conducted.
- EMG corrugator response to cues was measured in a -1000ms – 4000ms epoch surrounding cue presentation. Scored as mean response post-cue – pre-cue.

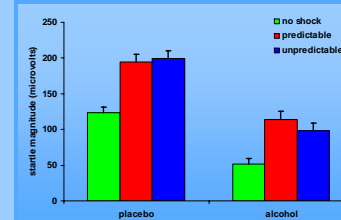
MANIPULATION CHECK



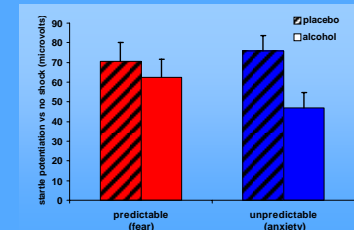
- The Block type X Condition (cue vs. ITI) interaction was significant ($p < .001$)
- The Condition effect was significant in predictable blocks ($p < .001$)
- The Condition effect was NOT significant in unpredictable blocks ($p = .835$)
- Startle response during cues was significantly higher in predictable ($p < .001$) and unpredictable blocks ($p < .001$) than in no shock blocks

PRIMARY RESULTS

Startle Response

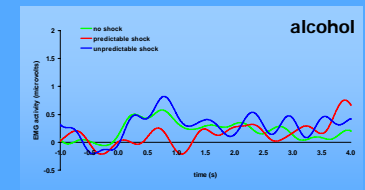
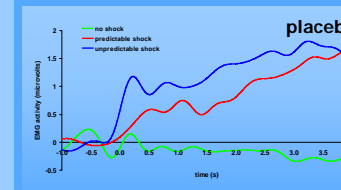


- The main effect of **Beverage group** was significant ($p < .001$)
- The main effect of **Block type** was significant ($p < .001$). Startle response during cues was significantly potentiated in both predictable ($p < .001$) and unpredictable ($p < .001$) blocks relative to no shock blocks
- The **Beverage group X Block type** interaction was significant ($p = .038$)



- The **Beverage group X Block type** interaction was significant ($p = .033$)
- The simple effect of **Beverage group** was NOT significant during predictable blocks ($p = .537$)
- The simple effect of **Beverage group** was significant during unpredictable blocks ($p = .011$)

Corrugator Response (Preliminary)



- Although the time series graphs suggest an effect of Block type, analyses failed to document a significant main effect of Block type ($p = .125$) or a significant Beverage Group X Block type ($p = .154$).

DISCUSSION/FUTURE DIRECTIONS

- Precise manipulations of eliciting stimuli (e.g., shock-cue contingencies) and startle response measurement may provide a method to parse fear vs. anxiety.
- These methods suggest a selective effect of moderate doses of alcohol on anxiety but not fear.
- This observation may help resolve the heterogeneity of findings regarding alcohol's "stress response dampening" effects.
- This selective effect may account for the pattern of co-morbidity of alcohol use disorders with anxiety disorders.
- Alcohol's effects on the neurobiological substrates of anxiety may be one target for neuroplastic change supporting alcohol (and other drug) dependence.