**ABSTRACT**

Recent research indicates that fear and anxiety are distinct processes with separable neurobiological substrates. Predictable vs. unpredictable shock administration procedures have been used to elicit fear vs. anxiety, respectively, and we have recently demonstrated that alcohol reduces anxiety to unpredictable shock but not fear to predictable shock. However, previous manipulations of predictability have varied both the probability and temporal precision of shock threat, leaving looming questions as to which stimuli stimulate the elicitation of anxiety and the anxiolytic effects of alcohol. We developed a novel paradigm to systematically vary temporal presentation of threat while holding probability of threat constant. Intoxicated (0.08% BAC), non-intoxicated, and placebo participants viewed a series of visual cues. Fixed 5s cue presentations were equivalent to predictable shock cues eliciting fear in earlier research. Variable duration cues (5s, 20s, 50s, or 80s) were designed to elicit anxiety due to the temporal uncertainty of threat. Startle potentiation relative to matched cue periods in no-shock blocks provided the primary measure of affective response.

All shock cues produced robust startle potentiation. Alcohol reduced startle potentiation during the first 4s of cue presentation in variable but not fixed duration threat cues. Alcohol also reduced startle potentiation during later time points in the longer variable duration cues, suggesting that these alcohol "stress dampening" effects persist over time.

This work builds on evidence suggesting that fear and anxiety are discrete affective responses, and indicates that temporal uncertainty as well as probabilistic presentation of threat can elicit anxiety. Underscoring previous findings regarding alcohol’s selective effects on anxiety, this work has implications for comorbidity between anxiety disorders and alcoholism.

**METHOD**

- **Participants:** 72 social drinking undergraduates
- **Procedure:** Three beverage groups: Alcohol (target BAC: 0.08%), placebo, and no alcohol

**General Procedure**

- All participants completed a pre-drink baseline startle assessment and a post-beverage manipulation shock tolerance assessment.
- Participants viewed blocks of colored square “cue” presentations separated by an inter-trial interval.
- Two types of shock blocks were used and compared to corresponding no shock blocks.
- Variable duration shock block
- Fixed duration shock block
- **Measures:**
  - EMG eyelid startle response to noise probes scored as peak response in 20-120ms post-probe onset
  - Potentiation scores are calculated as the startle response to a given probe during a shock block minus startle response magnitude to the corresponding probe during corresponding no shock block

**RESULTS, Continued**

- The beverage group X Probe time (early vs. late) interaction was not significant, t(63)=1.24, p = 0.229
- The simple effect of beverage group on startle potentiation for the average of 3 later probes is significant, t(63)=2.51, p = 0.015
- This indicates that alcohol’s effect on SP during Variable blocks was sustained to later time points

**SUMMARY AND CONCLUSIONS**

- This work provides a conceptual replication of both Moberg & Curtin (2009)’s and Hefner & Curtin (2011)’s findings that alcohol selectively reduces threat potentiation during uncertain threat.
- We have extended those findings by demonstrating alcohol’s selective effect on anxiety, utilizing a different dimension of uncertainty; that is, threat imminence (proximal vs. distal).
- The novel study design also enabled us to demonstrate that this effect was sustained over a longer period of time.
- In addition, the finding that those who have greater baseline threat response magnitude even under neutral conditions (baseline startle) experience greater levels of alcohol stress dampening suggests that baseline startle may be an important biomarker to identify individuals who are most likely to experience these effects, and consequently, may be potentially more susceptible to developing problems with alcohol use.
- Furthermore, other studies in our laboratory have identified baseline startle as a predictor of anxiety response (Bradford et al. poster) as well as drug deprivations effects (Giora & Curtin, 2009).
- Alcohol’s effects on the neurobiological substrates of anxiety (e.g., BDNF) may be one target for neuropsychiatric changes supporting alcohol (and other drug) dependence.
- These selective effects may help to account for high rates of co-morbidity between alcohol use disorders and anxiety disorders.

**REFERENCES**

Bradford DE, Kaye JT & Curtin JJ. (In press). Alcohol/Placebo) and repeated measures of Cue Type (Fixed vs. Variable).
- **RESULTS:**
  - The main effect of Beverage group was significant, t(63)= 2.23, p = 0.029
  - The beverage group X Cue type interaction was significant, t(63)=2.81, p = 0.007.
  - Within fixed cue blocks, the beverage group effect is not significant, t(63)=0.89, p = 0.396
  - Within variable cue blocks, the beverage group effect is significant, t(63)=3.2, p = 0.027