How bad could it be? Alcohol's effect on startle to uncertain intensity threat

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BACKGROUND AND AIMS

• Stress Response Dampening (SRD) is a strong motivator for both social and problematic alcohol use [1]. Unfortunately, researchers are still unsure what psychological or neurological mechanisms produce SRD since "stress" remains poorly defined [2]. Recent translational research suggests that presentation of uncertain versus certain threat elicits distinctive affective responses known as "anxiety" and "fear", respectively.[3] Our laboratory has revealed alcohol SRD effects selective to anxiety about uncertainty concerning *if* or *when* threats are to occur [4,5]. In order to fully define the boundaries of alcohol SRD, other aspects of uncertainty should be tested.

• **AIM 1)** *How bad* threats may be represents a conceptually distinct dimension of uncertainty relevant to anxiety [6]. We manipulated threat (shock) intensity during visual cues to test the prediction that alcohol would cause a greater reduction of Startle Potentiation (SP) during cues signaling uncertain vs. certain intensity threat.

• **AIM 2)** Despite theorized importance to alcohol SRD, little is known about dose response functions related to alcohol's effects on anxiety. We used a novel alcohol administration design to examine alcohol effects on SP across a broad, continuous distribution of BACs with the prediction that increasing BACs would lead to greater reduction of SP (i.e., a linear effect).

• **AIM 3)** Recent data has indicated that baseline startle is anxiety relevant and thus could serve as an important individual difference marker for SRD magnitude [7]. We tested the prediction that individuals with higher baseline startle would show greater reduction of SP to uncertain threat by alcohol.

PROCEDURE

• Prior to dosing, baseline startle response magnitude was assessed during a neutral task.

• Participants were randomly administered varied alcohol doses calculated to produce a range of peak BACs (0.00% to 0.125%). All participants were informed that they would receive a moderately impairing dose of alcohol.

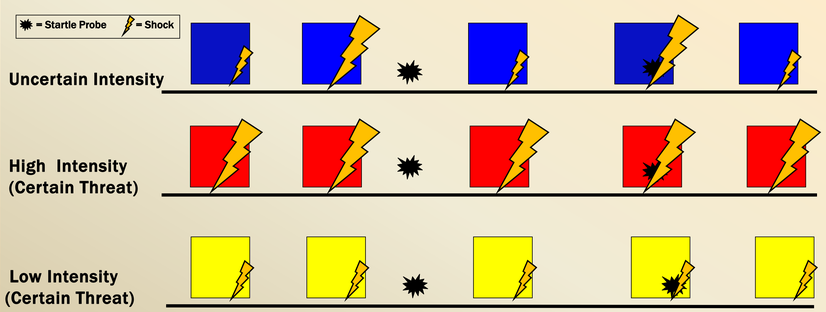
• 5 minutes after drinking, participants reported their maximum tolerance to a series of electric shocks of increasing intensity administered to their left hand.

• BAC was assessed before, halfway, and at completion of the cued threat task.

• EMG eye blink startle response to noise probes was measured during the task. SP (i.e., increase in startle response during cues in threat blocks relative to no-threat blocks) was scored separately for each threat block.

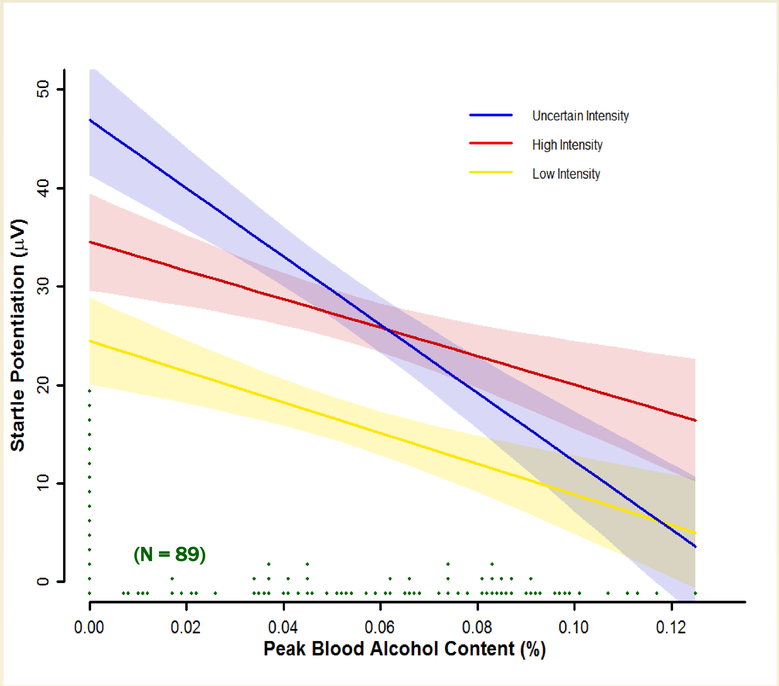
CUED THREAT TASK

• Blocks of 5 colored square cues were presented for 5 s each with a variable ITI.



• "Low" and "High" shock block levels were calibrated to 33% and 100% of each participant's maximum reported shock tolerance. In uncertain blocks, participants were told shock intensity would vary across cues but would never exceed that of shocks in the high intensity block.

AIM 1: BAC BY THREAT TYPE



• SP was analyzed in a general linear model (GLM) with repeated measures for threat intensity (uncertain vs. high vs. low) and fully interactive between subject regressors for Peak BAC, Gender, Block Order, and Baseline startle.

• At BAC = 0%, there was a significant increase in SP during uncertain vs. certain (high/low) threat, B = 17.4 μV, p <0.001. SP was significantly increased during high vs. low threat, B = 10.0 μV, p =.050.

• A significant effect of BAC was observed across threat types such that SP decreased 2.2 μV (B) for every .01% increase in BAC, p =.002.

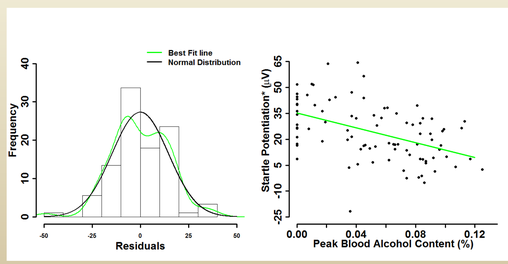
*** The BAC effect was significantly increased during uncertain (B = −3.5 μV) vs. certain (high/low) (B = −1.5 μV) threat, p =.011 (see figure above).** The BAC effect was comparable across high (B = -1.5 μV) vs. low (B = -1.6 μV) threat, p = .890.

AIM 2: LINEARITY OF BAC EFFECT

1. Statistical tests confirmed that all model assumptions, including linearity, were met [8].

2. Visual inspection of residuals (overall and across range of BACs) also confirmed model assumptions (see figure right).

3. Parameter estimates for more complex BAC functions (e.g., quadratic, cubic) were not significant.



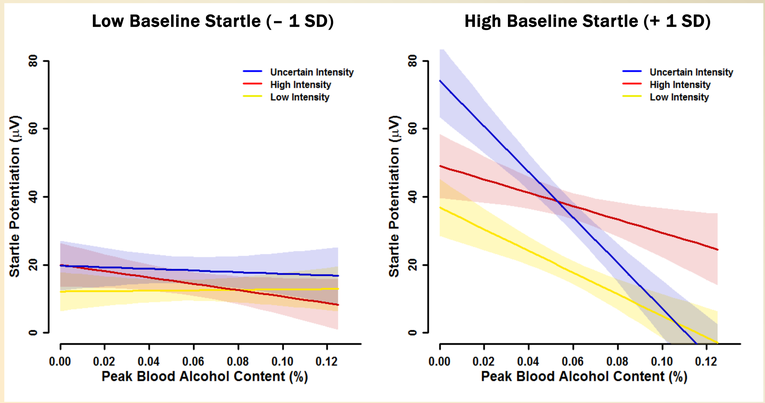
* Residualized SP accounting for all regressors in model

AIM 3: BAC BY THREAT TYPE BY BASELINE STARTLE

• At BAC = 0%, a significant effect of baseline startle was observed across threat types such that SP increased .23 μV (B) on average for every 1 μV increase in baseline startle, p = .001.

• The magnitude of the baseline startle effect was significantly increased during uncertain (B =.34) vs. certain (high/low) (B = .17) threat, p = .024. The baseline startle effect was comparable across high (B = .18) vs. low (B = .15) threat, p = .740.

* **Baseline startle significantly moderated alcohol's effects on uncertain (B = .04) vs. (high/low) (B = .01) threat, p = .017. (see figure below).** Baseline startle did not moderate alcohol's effect to high (B = .01) vs. low (B = .02) threat, p = .253.



SUMMARY

• *If* or *when* a stressor is going to occur (e.g., will I get fired?; when will I run out of money?) constitutes a dimension of uncertainty conceptually distinct from uncertainty about *how bad* a stressor may be (e.g., how much trouble will I be in?). Our findings support the assertion that alcohol reduces anxiety in the face of ambiguous threat regardless of the source of that ambiguity.

• Using a novel beverage manipulation we confirmed that the dose response function of alcohol on SP to threat was linear, with alcohol producing some SRD even at low doses.

• Present data suggests that baseline startle predicts the magnitude of SRD effects on anxiety.

• Still, other aspects of uncertainty (e.g., the *where* dimension) should be tested as elicitors of anxiety (see poster 110 this session). Uncertainty about positive events (e.g., in gambling) may also prove sensitive to alcohol effects.

REFERENCES AND SUPPORT

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