Alcohol Sensitivity and Cognitive Abilities after Drinking

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Introduction

- Alcohol, the most frequently taken drug worldwide,[1] can impair reflexes,[2] emotional responses,[3] and other higher cognitive abilities like executive function (EF)[4]
- EF includes the ability to stop instinctual responses (inhibition or inhibitory control), keep track of things (working memory updating or WM), and shift attention (shifting or task switching, TS)
- Alcohol tends to impair EF[5]
- Alcohol sensitivity (AS) is a partly inherited trait that impacts the effects a drinker experiences from alcohol[6]
- A person with high sensitivity to alcohol (HS) needs few drinks to feel intoxicated; a person with low sensitivity to alcohol (LS) needs more drinks to feel drunk and is at higher risk of alcohol use disorder (AUD)[6]
- Despite needing more drinks to feel drunk, LS people are *more* responsive to alcohol's initially stimulative effects than HS people are[7]

Hypothesis

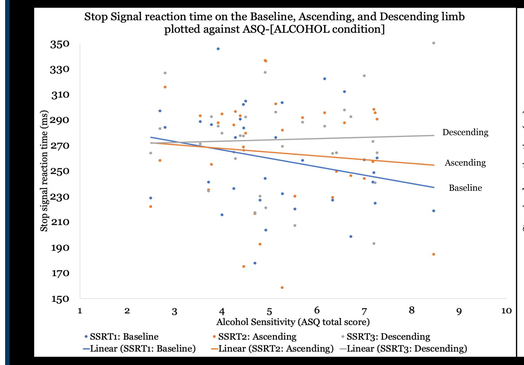
- I hypothesized that LS people would show more impairment on EF tasks after their drink than HS would people would, because LS people have been found to show more responsivity to alcohol's stimulative effects[8]

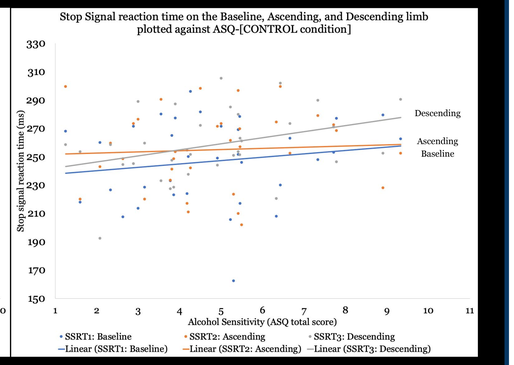
Method

- A sample of 801 moderate-drinking adults (ages 21-35; median age = 22.08; 50% women) was recruited from the Columbia, Missouri area in 2011-2013 through flyers, online advertisements, and email announcements in university systems
- Alcohol sensitivity was measured using the Alcohol Sensitivity Questionnaire (ASQ), which has 15 questions asking participants to report both the minimum number of drinks needed to experience a certain effect as well as the maximum number of drinks the participants can consume while avoiding the effect
- All participants came to the lab for baseline measurements on 9 different EF tasks:
  - 3 WM tasks (letter memory, keep track, spatial 2-back)
  - 3 inhibition tasks (antisaccade, Stroop, stop-signal)
  - 3 TS tasks (category switch, color shape, number-letter)
- 785 participants returned to the lab for Session II and were randomly assigned to:
  - 1 of 3 beverage conditions (alcohol [0.80 g/kg for men; 0.72 g/kg for women], placebo [0.04 g/kg], control)
  - 1 of 2 limb conditions (measurements taken on both the ascending and descending limb of BAC [A/D], measurements taken on only the descending limb of BAC [D-only])
  - 1 of 3 experimental task conditions (doing 3 inhibition tasks, 3 WM updating tasks, or 3 TS tasks)
- Participants drank their beverage and then completed their tasks

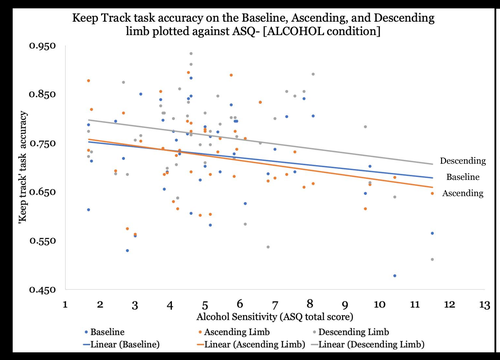
Results

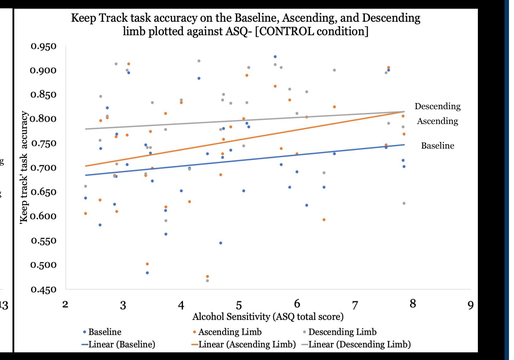
Inhibitory control



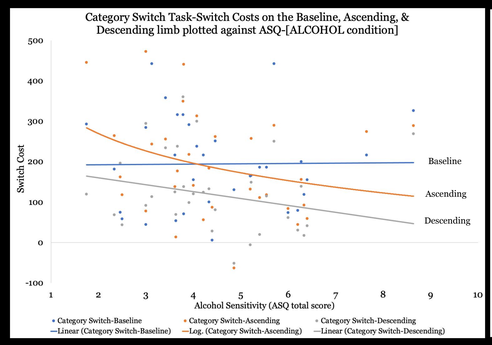


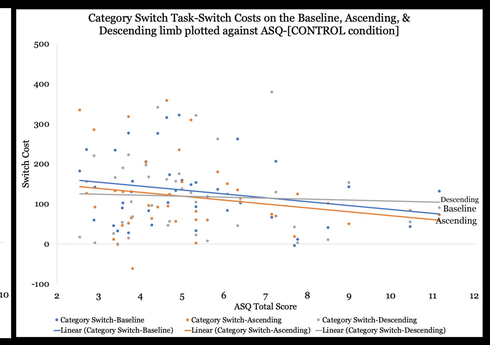
Working memory updating





Task switching





- Inhibitory control:
  - HS people's stop-signal reaction times (SSRT) stayed stagnant before and after their drink, while LS people showed more impairment (longer reaction times) on the A and D limbs. Controls showed more stagnation.
- Working memory updating:
  - HS people performed roughly the same on Baseline and A limb measures and improved accuracy on D limb, while LS people's accuracy worsened before it improved. Controls improved with each round of practice.
- Task switching:
  - Contrastingly, HS people showed more alcohol impairment than LS people, with switch cost rising on the A limb before dropping. LS people lowered switch cost with each round of practice. Controls stayed stagnant.

Discussion

- Results varied by task; LS people showed more post-drink impairment than HS people on certain inhibition and WM updating tasks, but HS people showed more post-drink impairment on switching tasks during the A limb than LS people.
- Consistent with the hypothesis, LS people displayed greater sensitivity to the initially stimulant properties of alcohol during WM tasks, in which performance worsened on the A limb.
- Contradicting the hypothesis, HS people showed more sensitivity to initial alcohol impairment on shifting tasks, with HS people having greater switch costs on the A limb than LS people.
- Results suggest that LS people's inhibitory control may be more impaired by alcohol than others', but other aspects of their EF may be impaired at the same rates as other people's.
- One explanation for LS people's inhibition showing greater post-intoxication impairment is that LS people, concordant with previous literature, were more sensitive to the stimulating effects of alcohol and were impaired by their excess stimulation.
- Another possibility is that LS people, feeling fewer subjective effects of alcohol after their drink, may have believed themselves to be less drunk and exerted less effort on A and D limb tasks than HS people did.
- However, limitations to this study must be acknowledged:
  - Some EF tasks used in the experiment (especially inhibition tasks) show low correlations with each other and may measure different abilities.
  - Participants' performance may have suffered due to boredom rather than alcohol's pharmacological properties.

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