Exploring the Relationship Between Early Drinking Patterns and Vehicle Control Measures in Driving Simulation Among Sober Young Adults

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Objectives

- Worldwide, alcohol impaired driving is a highly prevalent high-risk behavior associated with motor vehicle crashes and crash injury and death (World Health Organization, 2021).
    - In the U.S., crash-related injuries outnumber fatalities 100 to 1.
- Far more commonly, driving occurs while the driver is not intoxicated.

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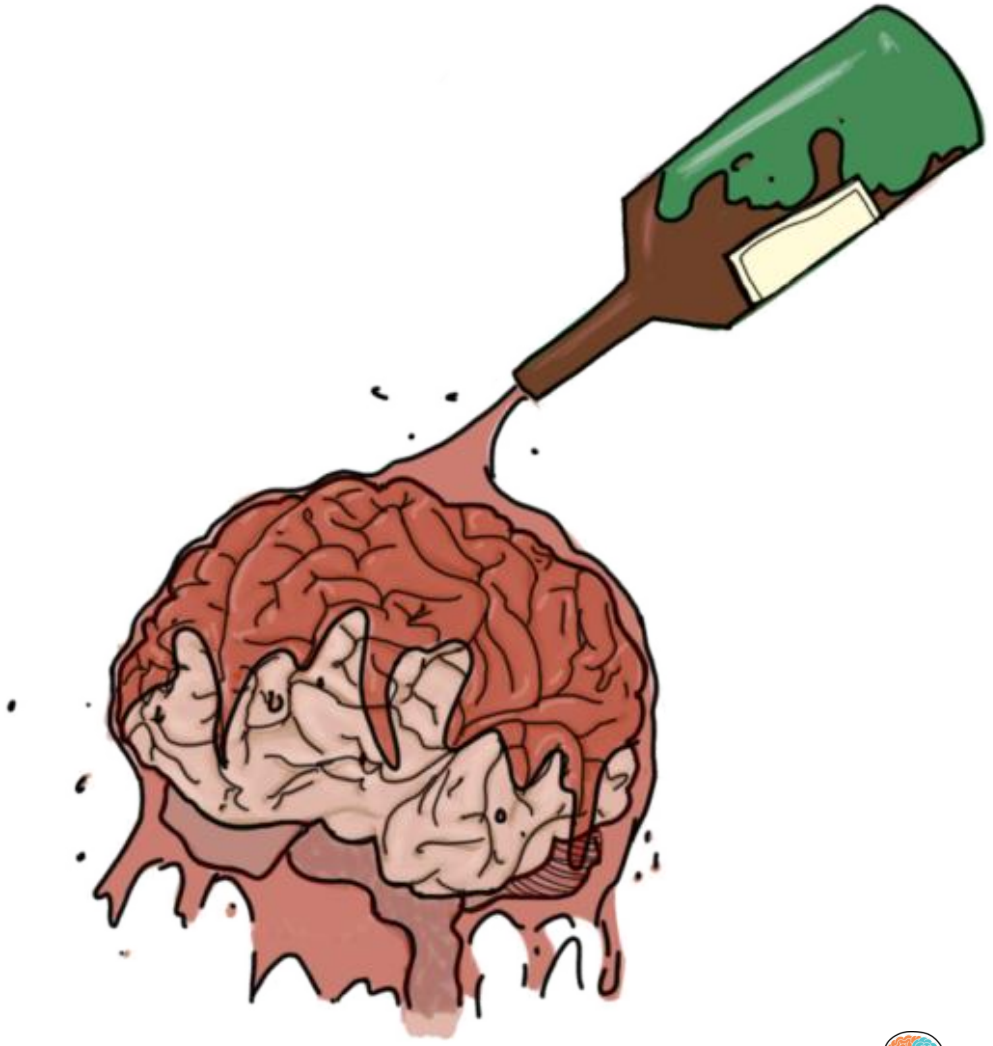
Objectives

- Drinking metrics, sober drivers, & driving simulation:
  - Vehicle control measures (Banz et al. 2020)
  - Neurocorrelates of sustained attention (Banz et al. 2020)
- Younger drinking initiation (Nguyen-Louie et al. 2017):
  - Alcohol-related neurocognitive vulnerabilities
  - Alcohol- and non-alcohol-related risky behaviors
- Explore the relationship between early drinking patterns and vehicle control in high-fidelity driving simulation among sober young adult drivers.



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Methods

- Young adult participants (18-25-y/o)
  - U.S. licensed drivers
  - Negative screen for simulator sickness
  - No diagnosis autism spectrum disorder, seizure disorder
  - No history head injury w/ loss of consciousness
  - BAC = 0.00% at time of testing
- Self report age of first:
  - Drink (>1 or 2 sips)
  - Drunk
  - 5 or more drinks

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Methods

- ½ cab miniSim®, NADSDyna™
- Simulated city scenario
  - Curved, straight roadways
  - Intersections, turns
- Drive to a prespecified location
- Incentivized to drive according to driving laws

Methods

- Vehicle control measures (60 Hz)
  - Lateral vehicle control measures: Standard deviation and average steering wheel angle; standard deviation of lane position (SDLP)
  - Longitudinal vehicle control measures: Minimum headway time/distance; SD/minimum/maximum speed

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Results: Age of First Drink

- M = 17.22; SD = 2.5

Lateral Vehicle Control	Longitudinal Vehicle Control

• Straight
  • SD steering wheel angle ($r(19) = -.58$, $p = .01$)
  • SDLP ($r(19) = -.6$, $p = .006$)
• Curved
  • Average steering wheel angle ($r(19) = -.55$, $p = .02$)
  • SD steering wheel angle ($r(19) = .5$, $p = .03$)
• Intersections
  • SDLP ($r(19) = -.51$, $p = .03$)
• Turns
  •Average steering wheel angle ($r(19) = .56$, $p = .02$)
  •SD steering wheel angle ($r(17) = .6$, $p = .008$)
	• Curved
	  • Minimum headway time ($r(17) = -.5$, $p = .03$)
	  • Minimum headway distance ($r(17) = -.5$, $p = .03$)
	• Intersections
	  • Maximum speed ($r(19) = -.5$, $p = .03$)

Results: Age of First Drunk

- M = 18.61; SD = 1.98

Lateral Vehicle Control	Longitudinal Vehicle Control

• Straight
  • SDLP ($r(19) = -.5$, $p = .05$)
• Curved
  • Average steering wheel angle ($r(19) = -.7$, $p = .001$)
  • SD steering wheel angle ($r(19) = .67$, $p = .002$)
• Turns
  • Average steering wheel angle ($r(19) = .64$, $p = .004$)
  • SD steering wheel angle ($r(19) = .63$, $p = .005$)
	• Straight
	  • Minimum headway time ($r(19) = -.5$, $p = .05$)
	• Curved
	  • Minimum headway time ($r(19) = -.5$, $p = .03$)
	  • Minimum headway distance ($r(19) = -.5$, $p = .03$)

Results: Age of First 5 or More Drinks

- M = 18.56; SD = 2.06

Lateral Vehicle Control

- Straight
  - SDLP ($r(19) = -.5$, $p = .05$)
- Curved
  - Average steering wheel angle ($r(19) = -.54$, $p = .02$)
  - SD steering wheel angle ($r(19) = .56$, $p = .01$)
- Intersections
  - Average steering wheel angle ($r(19) = .5$, $p = .05$)
- Turns
  - Average steering wheel angle ($r(19) = -.5$, $p = .04$)
  - SD steering wheel angle ($r(19) = -.5$, $p = .03$)

Longitudinal Vehicle Control

- Intersections
  - SD speed ($r(19) = -.5$, $p = .05$)
  - Maximum speed ($r(19) = -.5$, $p = .04$)

Discussion

- Vehicle control → driving kinematics → real-world risky driving (Simons-Morton et al. 2013).
- Inability to maintain lane keeping, over 30% of crash-related fatalities (Kusano et al. 2014).
- Higher speed is a leading contributor to crashes; related to crash-severity (Rolison et al. 2018).

Conclusions

- Longer alcohol exposure due to drinking at a younger age is relates too driving performance that relates to driving behaviors linked to increased crash-risk, even while sober.
- Early drinking initiation could be considered an indicator for risky driving profiles, may be a useful indicator when developing prevention programming.
- Need to broaden our understanding of how youth drinking relates to sober driving behaviors and how this might heighten crash risk.

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Thank you!

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