Alcohol and cannabis effects on young adults’ neurocognitive function

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Introduction

• Adolescence and young adulthood is a period of maturation, with the frontal and temporal lobes of the brain reaching maturity in the mid-twenties

• Executive function (e.g., decision-making, behavioural control, attentional control) and memory processes are subserved by these regions, and are known to be damaged in older, substance-dependent individuals

• Are there subtle deficits in brain function in younger individuals who have been using for a shorter period of time, but may be doing more damage to these developing areas of brain?
Methods

• Recruited 33/60 young adults aged 18-21
  • Today, only presenting data from 25 participants who vary in alcohol use and do not regularly use other drugs

• Examination of
  • Alcohol Use Disorders Identification Test (AUDIT)
  • Lifetime alcohol and cannabis use
  • The electrical activity of the brain is recorded
  • Tests of cognition; today, discussing only inhibitory control task (the “stop-signal task”)
The stop-signal reaction time

- An estimate of the time needed to stop a response
- Shorter SSRT reflects better inhibitory performance
- A higher AUDIT score is associated with a longer SSRT ($r = .540$, $p = .005$), indicating deficient inhibition in hazardous/harmful drinkers.

![Graph showing the relationship between AUDIT score and SSRT with $R^2 = 0.2911$.]
The error-related negativity

- A brain potential indexing monitoring of actions and detection of errors
- Greater negativity relates to better performance monitoring
- Hazardous drinking is associated with a smaller ERN ($r = .404$, $p = .045$), indicating deficient monitoring of performance in hazardous drinkers

![Graph showing ERN amplitude vs. Hazardous AUDIT score with $R^2 = 0.1631$](image)
Post-stop slowing

• After a signal to inhibit is presented, participants typically slow down on the next trial.

• Greater post-stop slowing indexes greater trial-by-trial adaptive adjustment of performance.

• Those with a heavier lifetime history of alcohol use show **less adaptive adjustment** \( (r = -0.457, p = 0.021) \).
Hazardous/harmful drinkers show:

- **Poorer behavioural inhibition** – more likely to make impulsive, inappropriate responses

- **Poorer brain monitoring of performance** – engage in less checking of actions relative to desired outcomes for long-term goals

- **Less adaptation of performance** following inhibitory tests

- If these results hold when the full sample is collected, atypicalities in inhibitory processing are apparent in a younger group with less alcohol exposure than previously considered

- Correlation is not causation: It may be that these deficits precede and contribute to later alcohol abuse problems – ask me next year!
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