FMRI Studies in Adolescents with Alcohol Use Disorders

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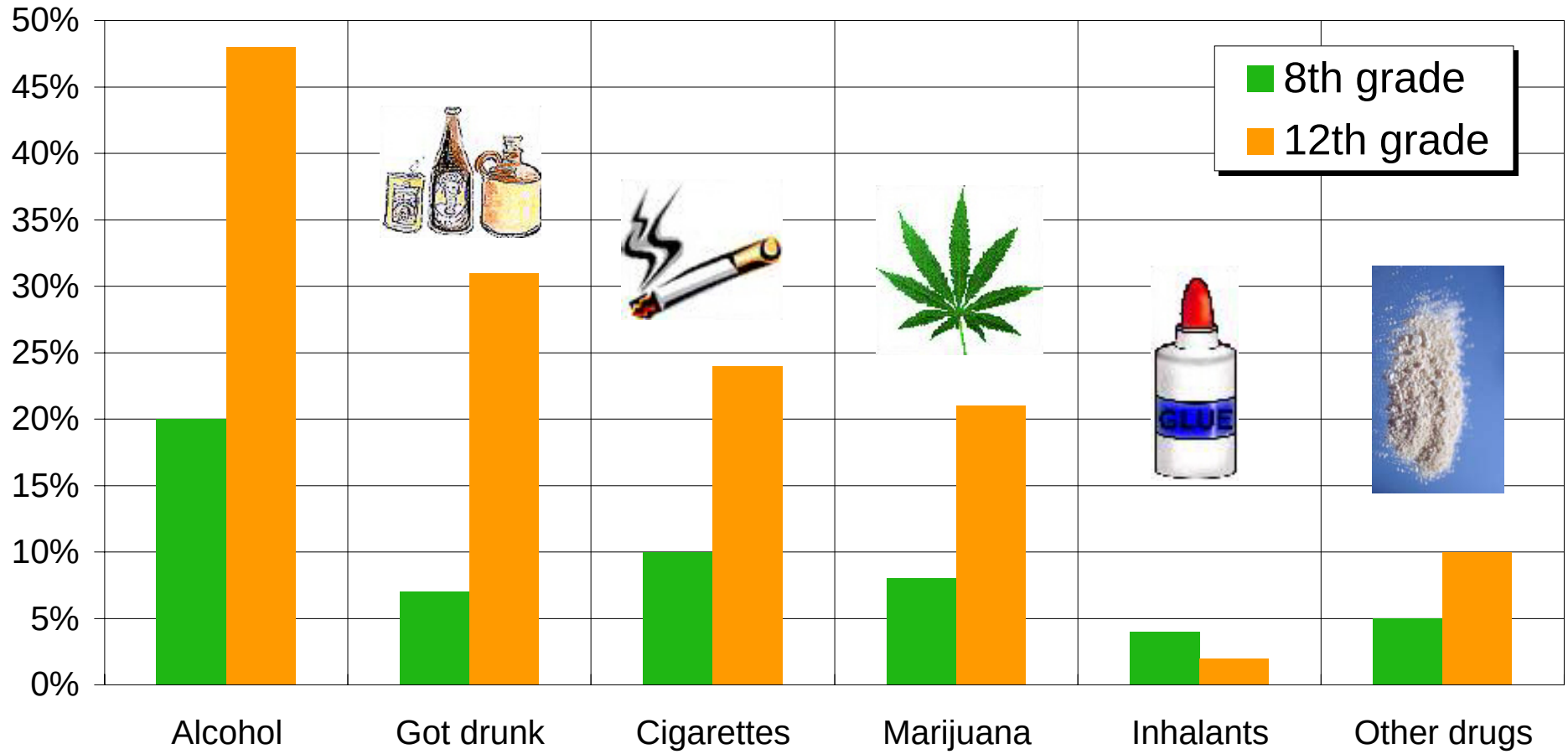
FMRI Studies in Adolescents with Alcohol Use Disorders

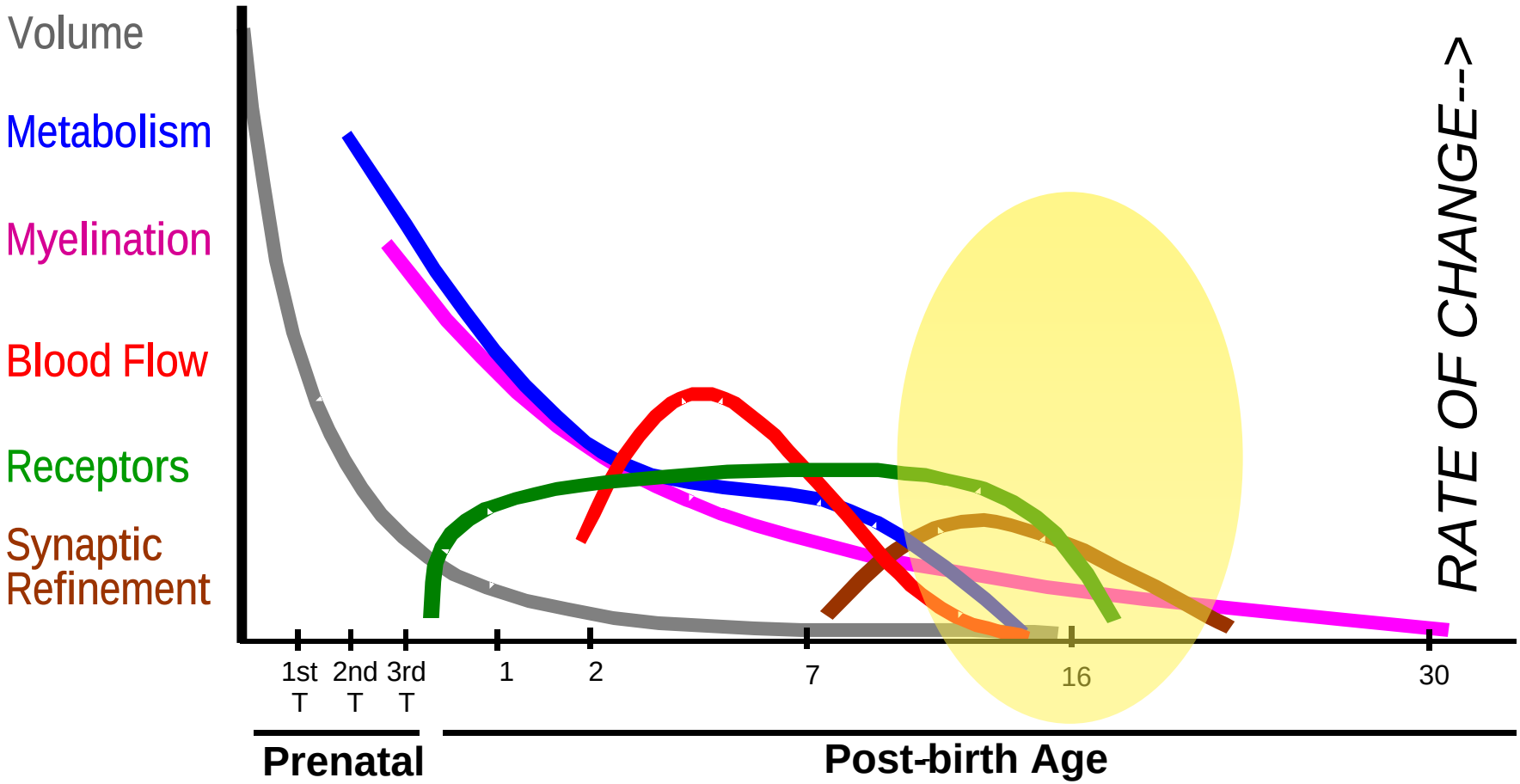
- AUD = alcohol abuse or dependence
- Cognitive functioning
  - Alcohol
  - Alcohol + other substances
  - Gender differences
  - Premorbid factors
- Cue reactivity

% Used in Past Month



Source: Monitoring the Future, 2003

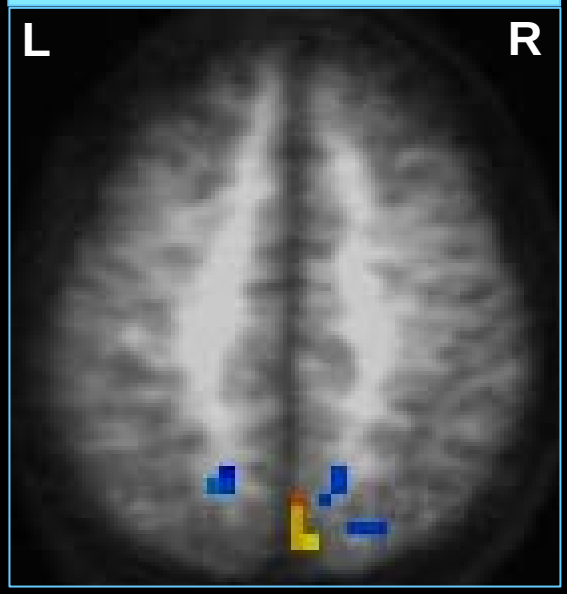
Brain Development



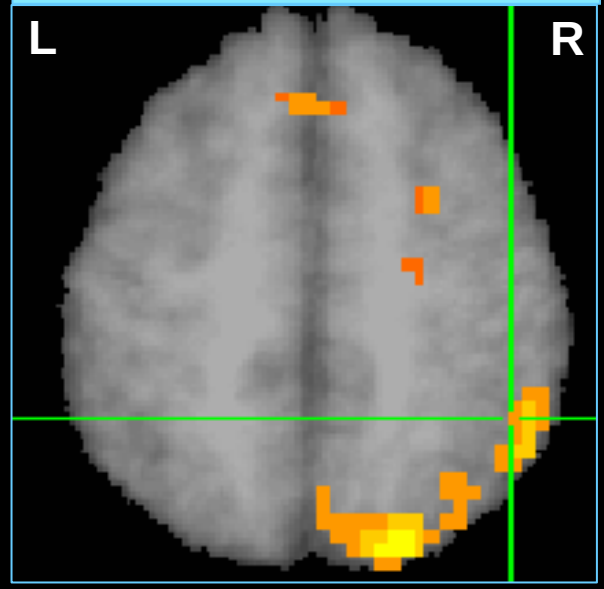
Tapert & Schweinsburg (in press)

Brain Response in AUD Youths

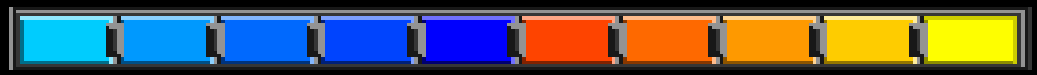
Age 14-17



Age 18-25



Task: Spatial Working Memory

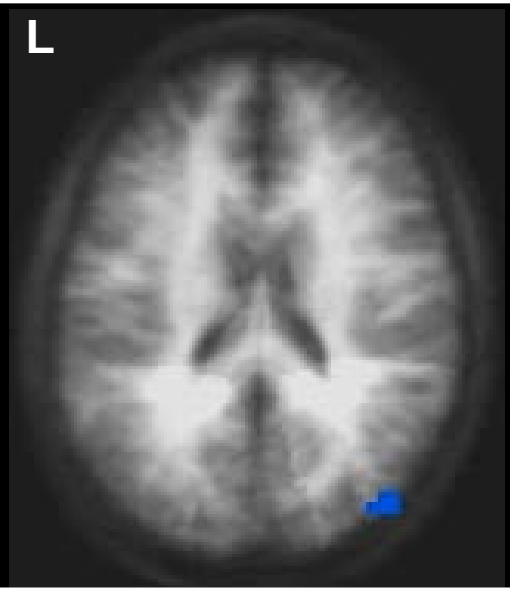


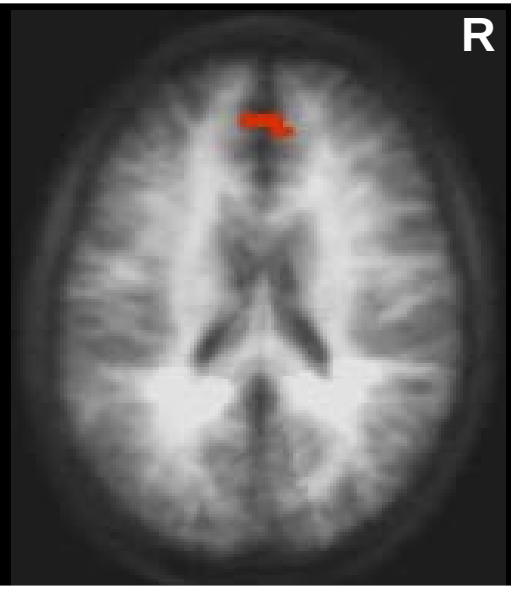
AUD > Controls *AUD < Controls*

Tapert et al. (2001). ACER.

Hangover/Withdrawal Effects

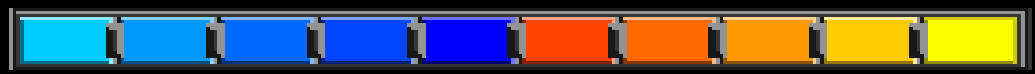
- **Withdrawal symptoms predict abnormal brain response to SWM task among AUD teens**





<u>Lifetime</u> withdrawal symptom count

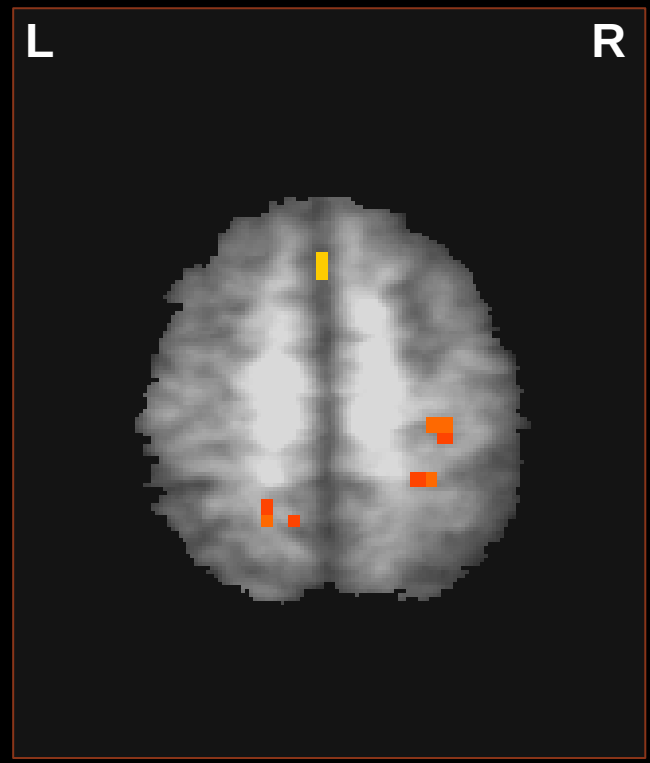
<u>Past 3 month</u> withdrawal symptom count



↑*WITHDRAWAL* ∝ ↓*BOLD* ↑*WITHDRAWAL* ∝ ↑*BOLD*

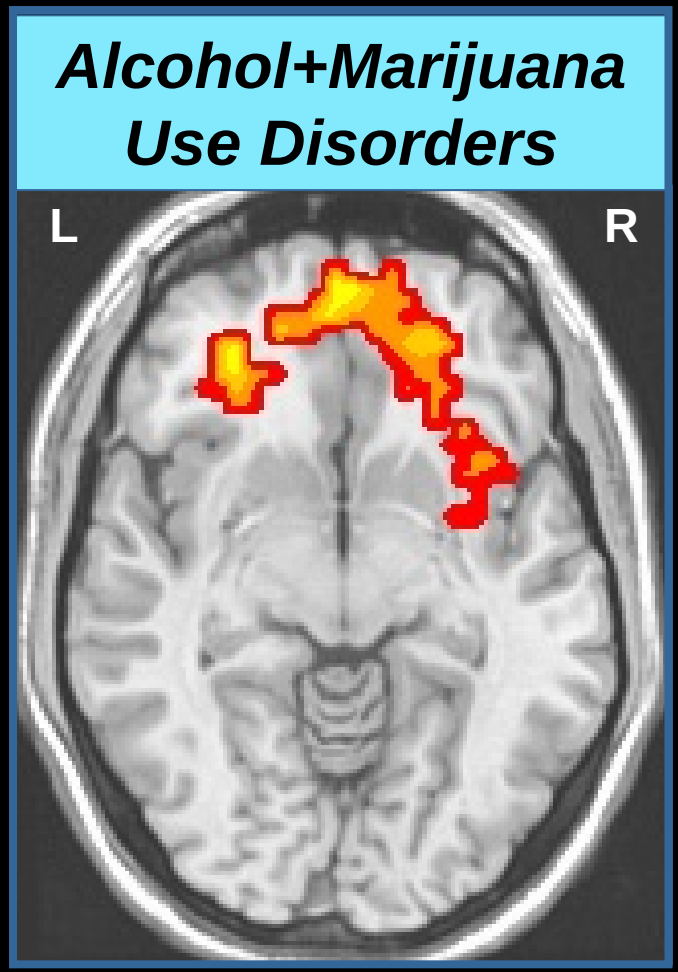
Nicotine & Alcohol

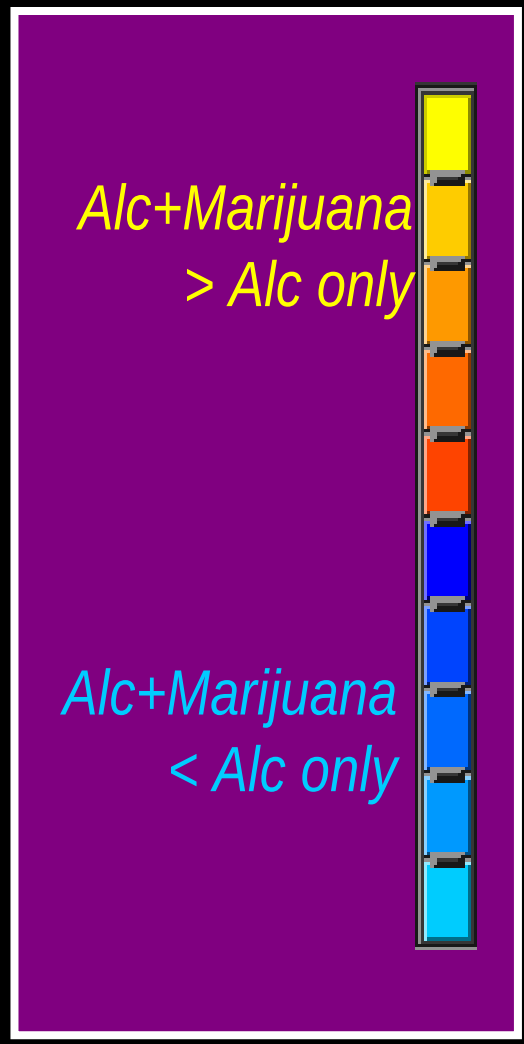
- Performance:
  - Modestly ⇓ cognitive flexibility
  - Further ⇓ by alcohol withdrawal
- Brain response:
  - Modestly ⇓ brain response to pattern recognition task
  - Greatest effect for early onset smoking



Marijuana & Alcohol

Ages 14-17

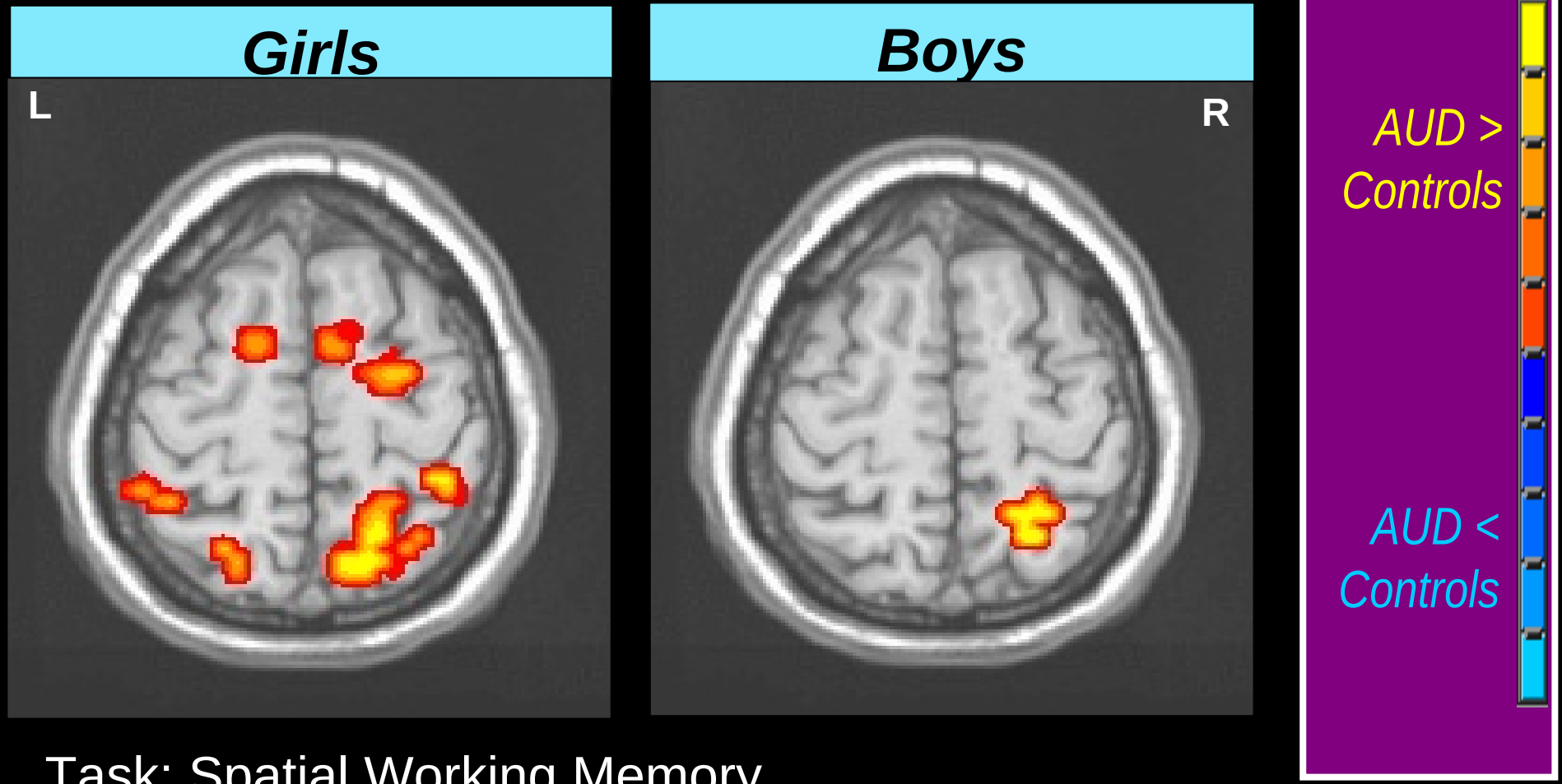




Task: Spatial Working Memory

Schweinsburg et al. (in prep).

Gender Differences



Task: Spatial Working Memory

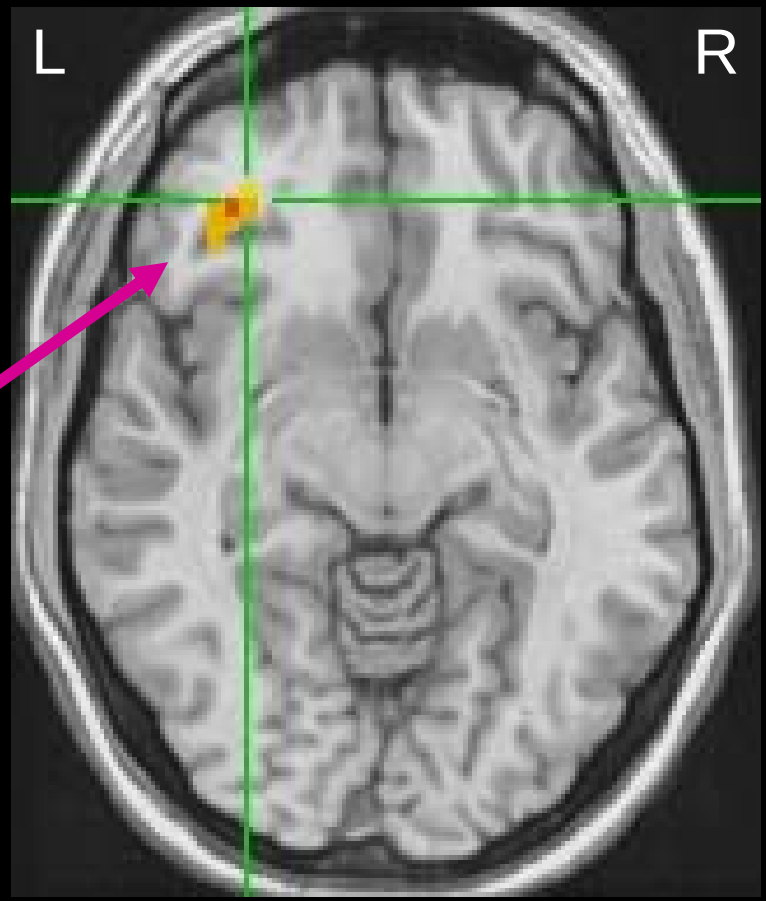
Caldwell et al. (in prep).

Premorbid Factors

- Family history of AUD
- Conduct disorder

Family History of AUD

Task: Go/No-Go

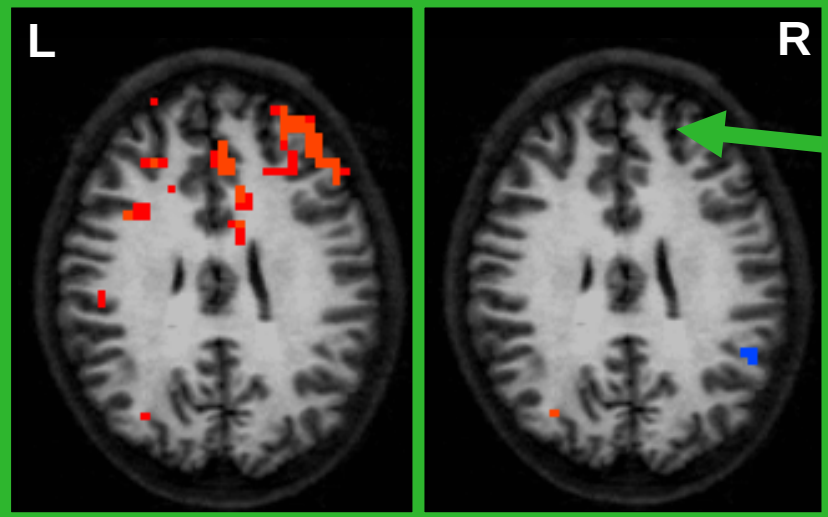
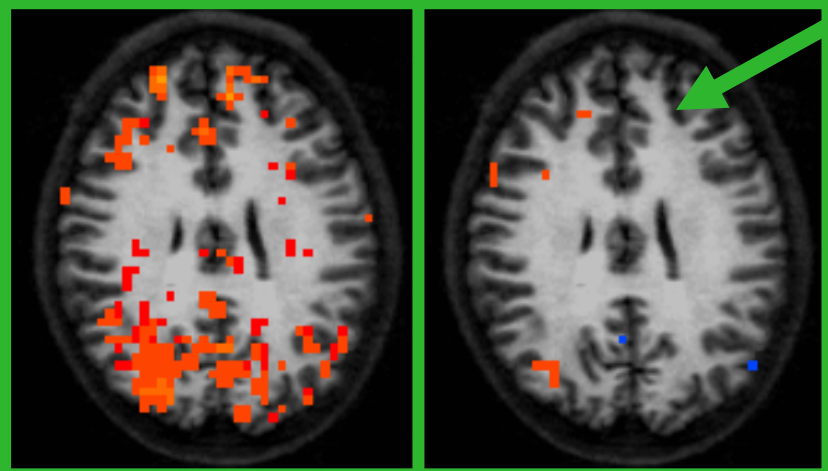


FHP<FHN

in left middle frontal gyrus
(BA 47/11)

Schweinsburg et al. (in press). ANYAS.

Family History of AUD

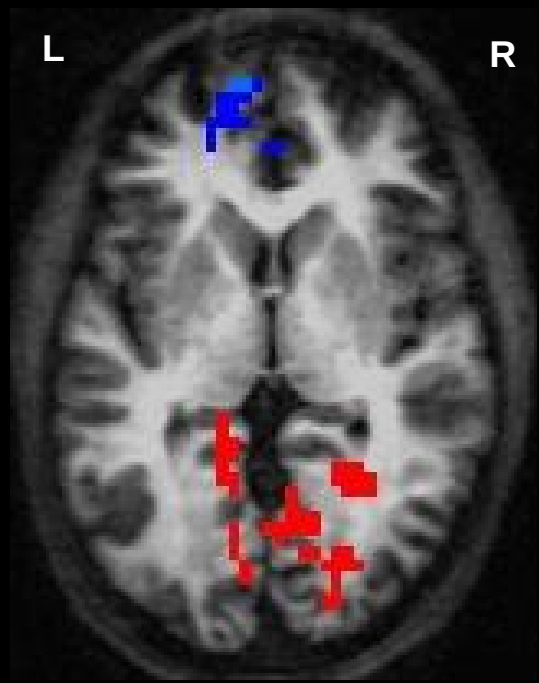
	FHN	FHP
Non-drinker		
Alcohol Use Disordered		

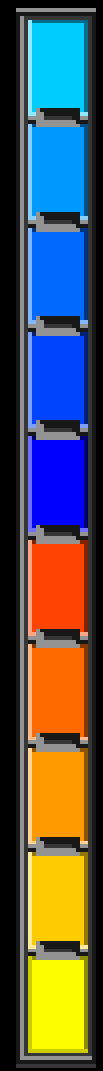
FHP teens show less prefrontal response

Orange = increased working memory response

Conduct Disorder (CD)

- AUD+CD less working memory response than AUD-only
- AUD+CD more working memory response than AUD-only





AUD+CD < AUD-only

AUD+CD > AUD-only

Task: Pattern Recognition

Barlett et al. (in prep).

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- Cognitive functioning
  - Alcohol
  - Alcohol + other substances
  - Gender differences
  - Premorbid factors
- **Cue reactivity**

Cue Reactivity: Adolescents

Alcohol Pictures

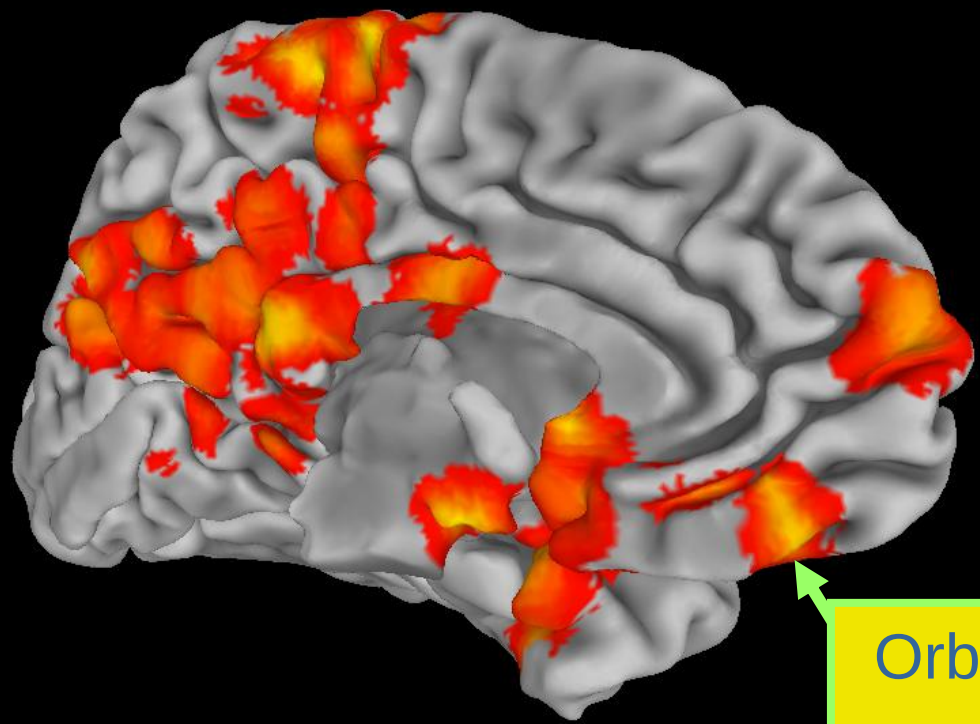
Non-Alcohol Pictures

Tapert et al. (2003). Arch Gen Psychiatry

Cue Reactivity: Adolescents

- Alcohol picture trials relative to non-alcohol beverage trials:

LEFT HEMISPHERE



Orbital/prefrontal (BA11)

- Orange: AUD teens had more response to alcohol pictures
- Blue: Controls had more response to alcohol pictures

Cue Reactivity: Adolescents

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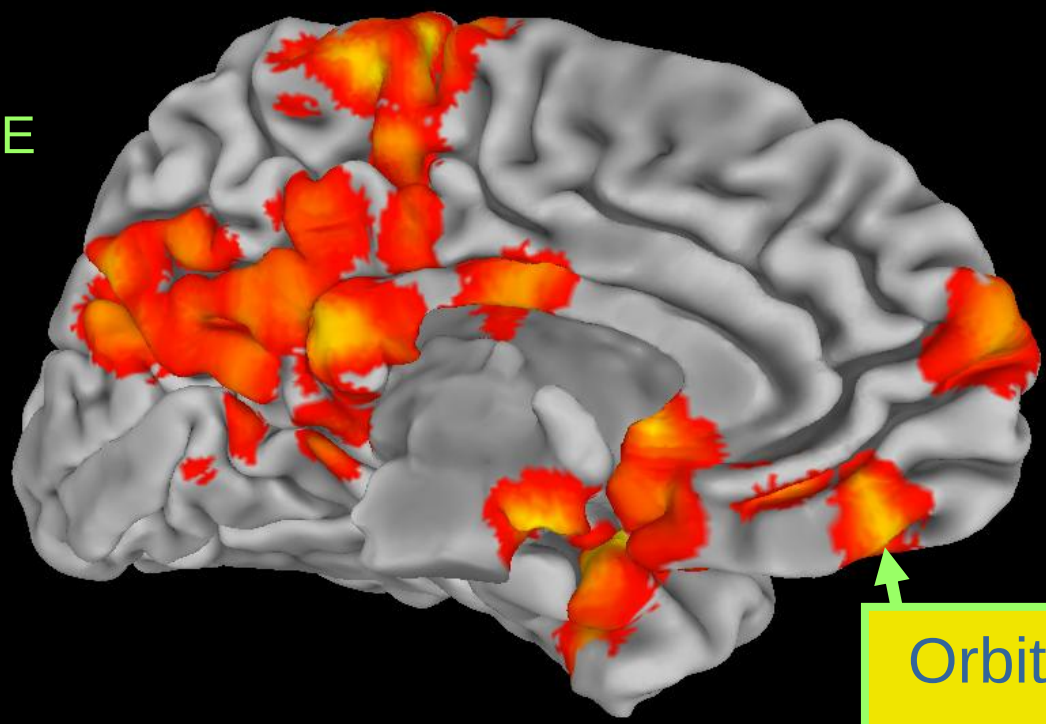

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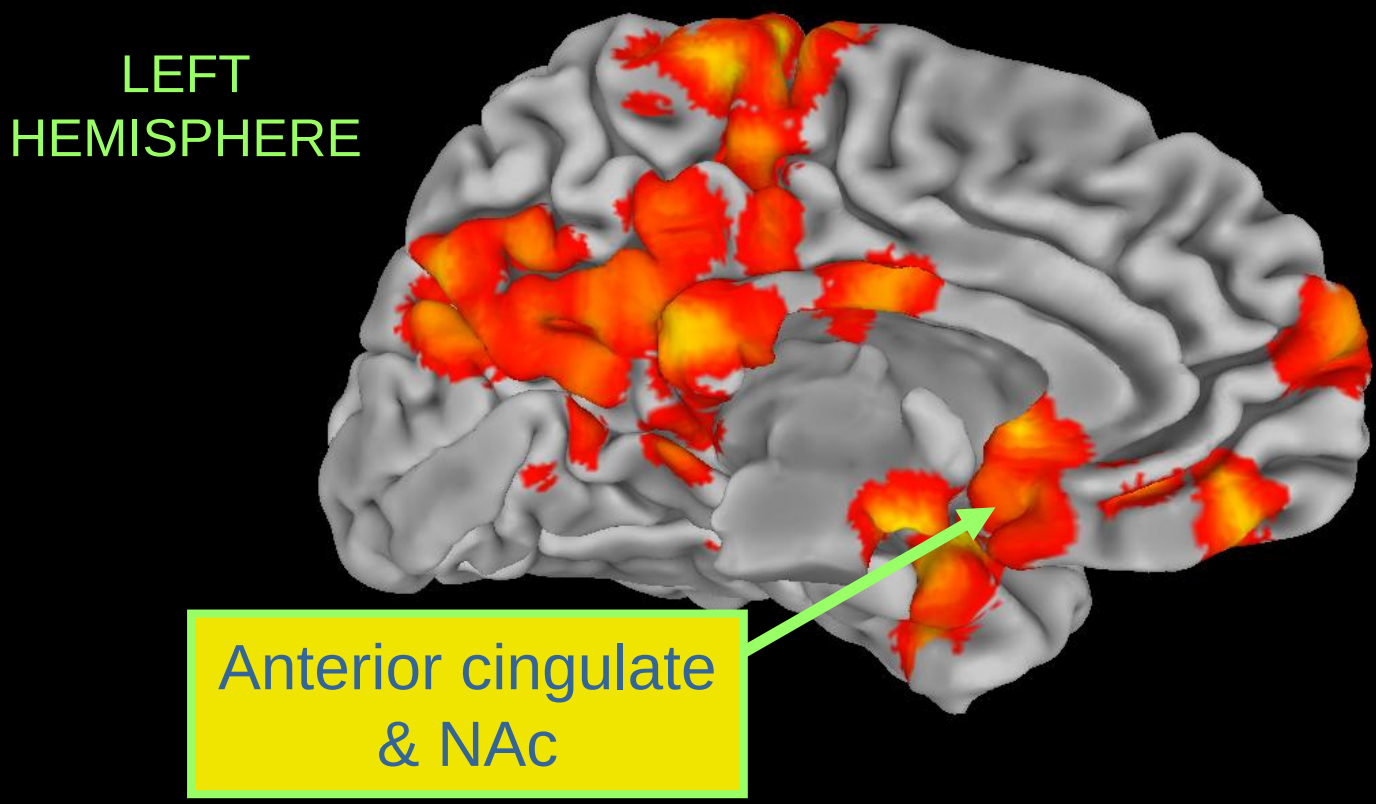

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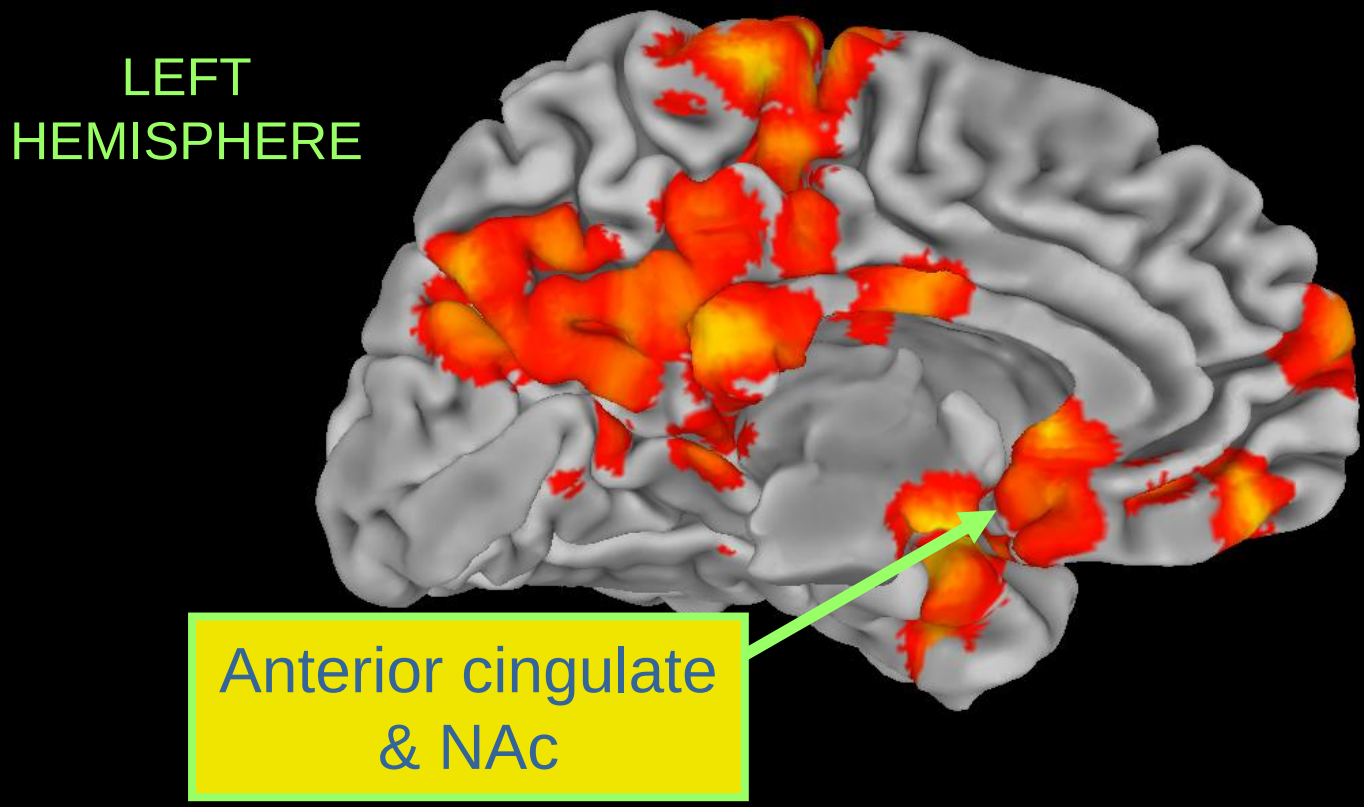

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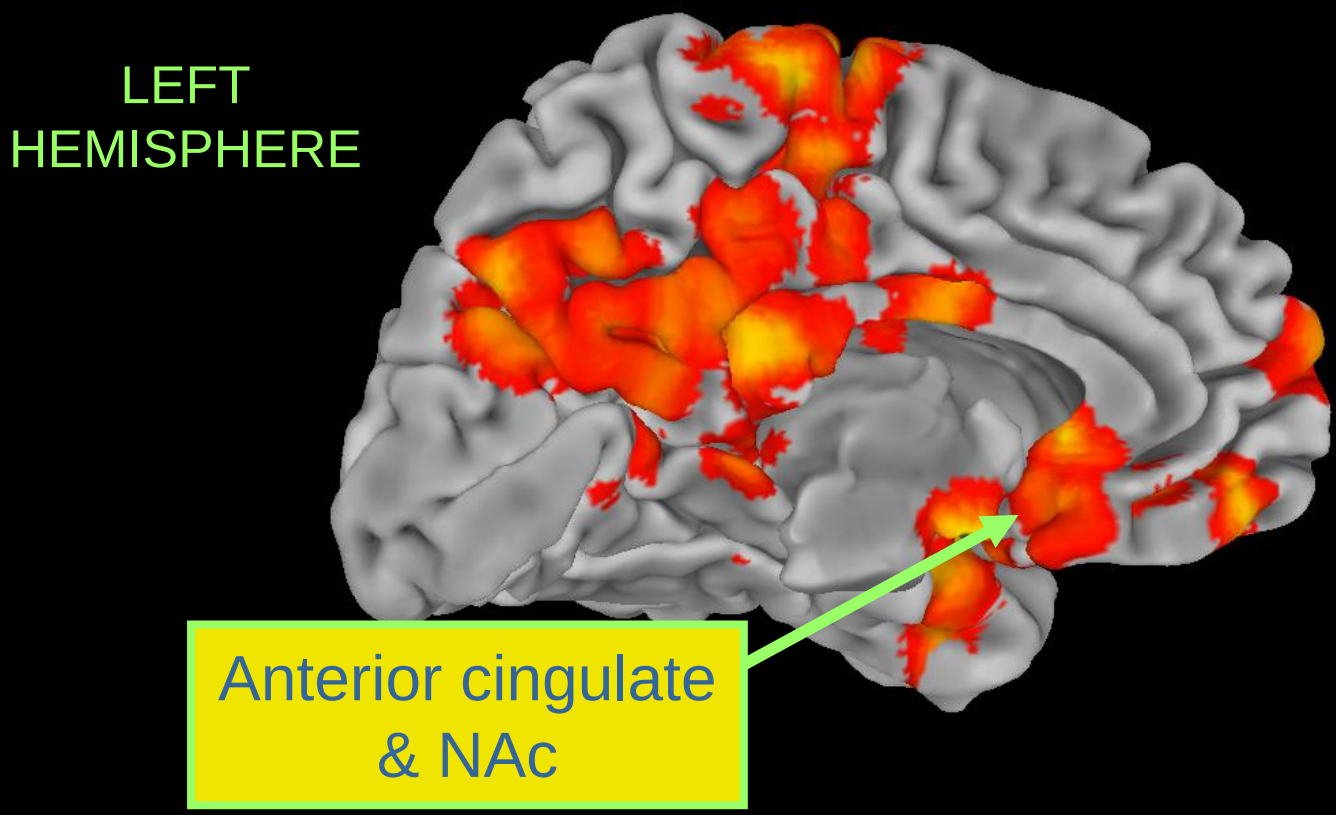

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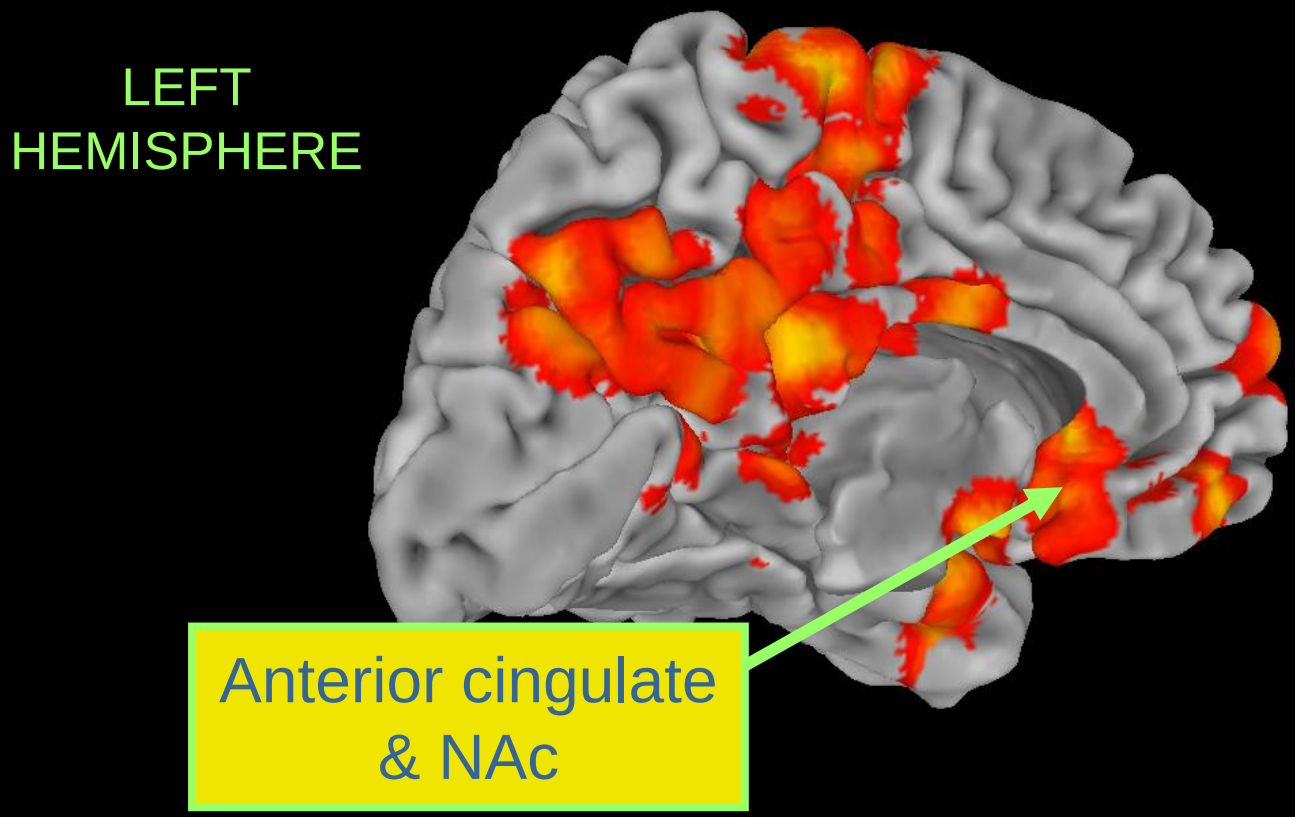

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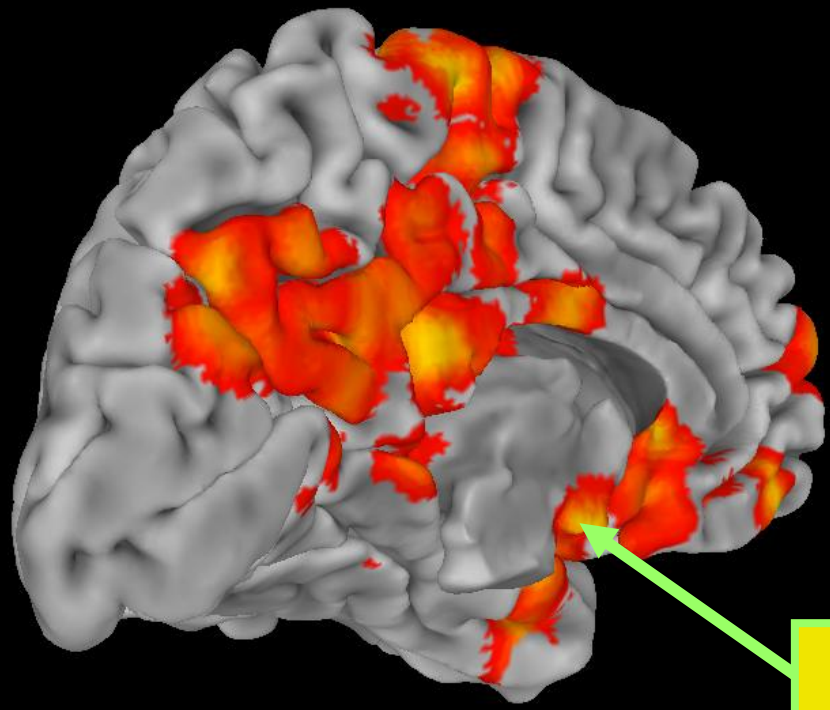

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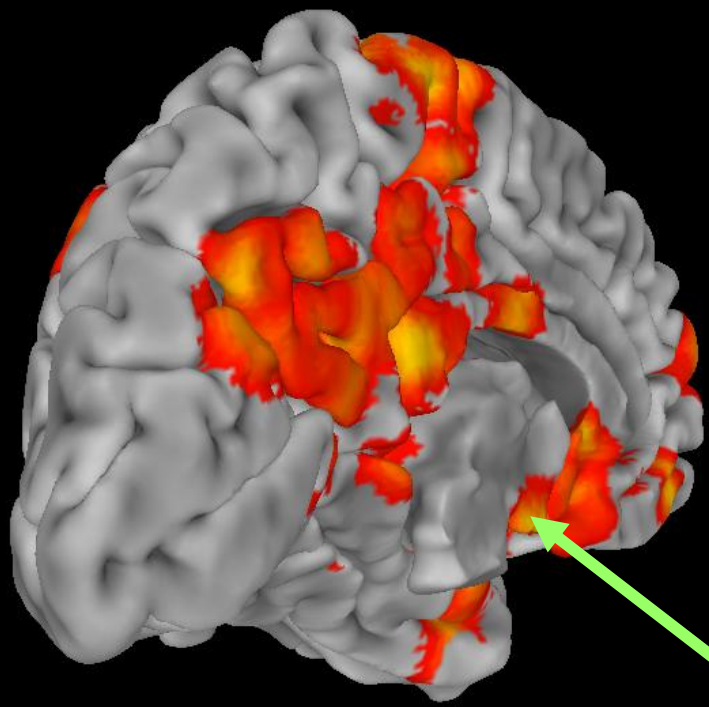

Hypothalamus

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Cue Reactivity: Adolescents

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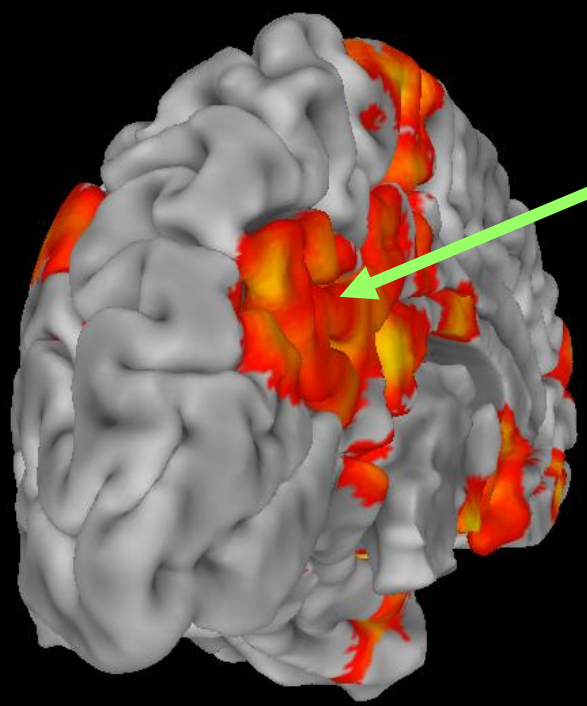

Posterior cingulate/ Precuneus

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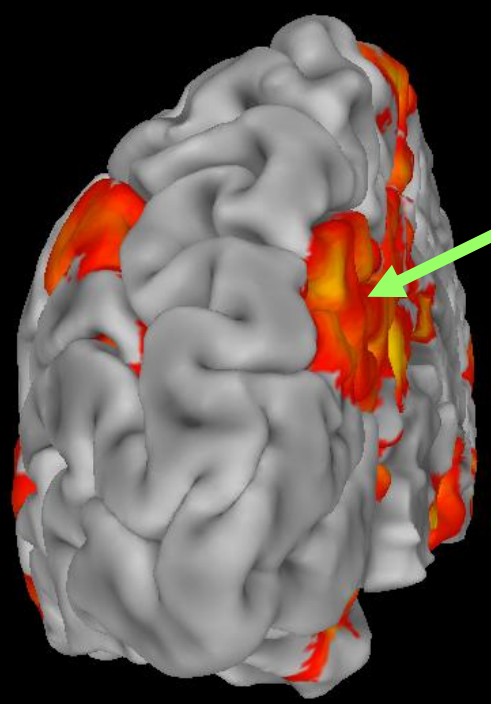

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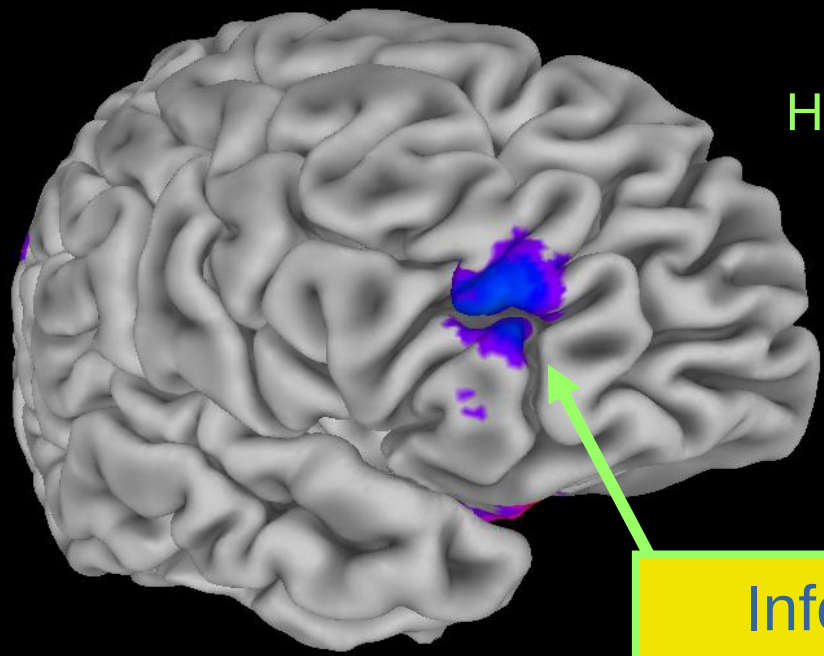

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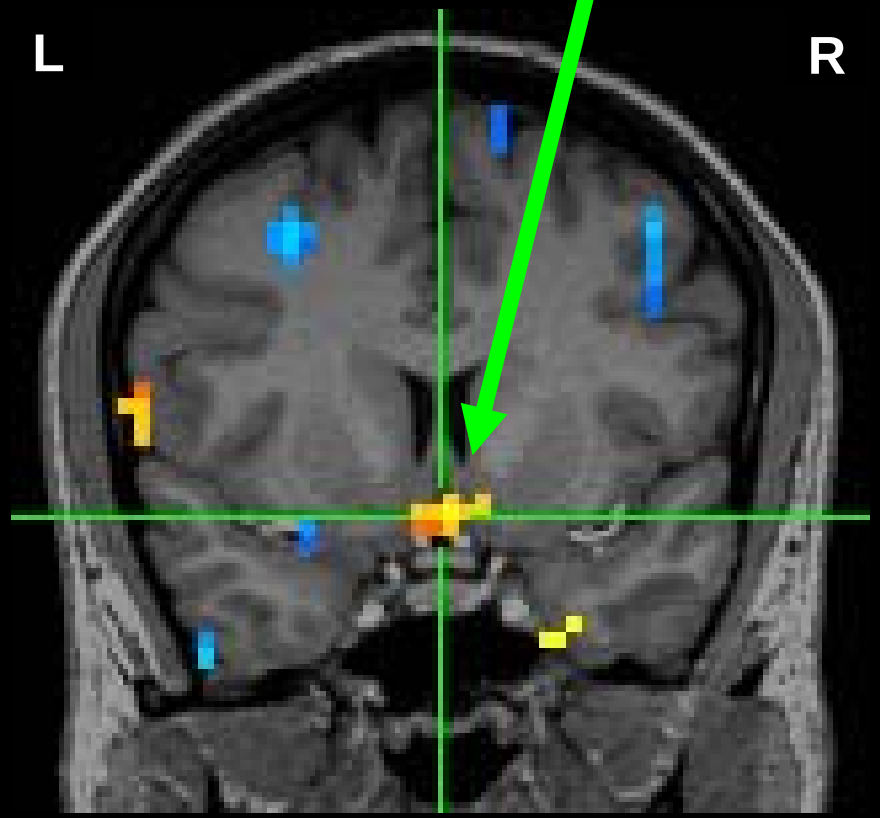
Cue Reactivity: Young Adults

- Alcohol Stroop
  - Alcohol words
    - "**KEG**"
    - "**BINGE**"
  - Non-alcohol words
    - "**FIG**"
    - "**SHAVE**"

Alcohol words:
AUD > control
AUD < control

Subcallosal cortex/NAc



Tapert et al. (2004). Addictive Behaviors

Summary

1. Disrupted brain activity
   - Reorganization and compensation early in AUD
   - Hangover/withdrawal linked to greater abnormality
2. Effects vary
   - Gender
   - Other substance use
   - Pre-existing vulnerabilities
3. Abnormally enhanced response to alcohol cues
4. Longitudinal studies are needed
   - AUD initiation
   - AUD resolution

Acknowledgements

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  - Supplemental grant to R01 AA09033 (Sandra Brown)
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