

Neuropsychological Effects of Marijuana Use During Adolescence & Young Adulthood

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(Thank you: Susan Tapert, Ph.D., UCSD)*



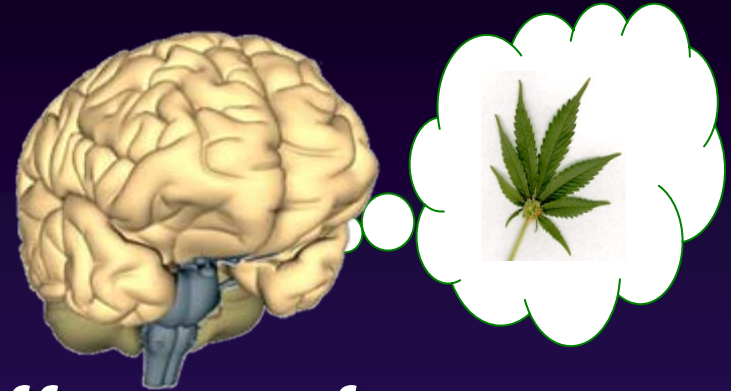
Neuropsychological Effects of MJ Use

- Research rationale

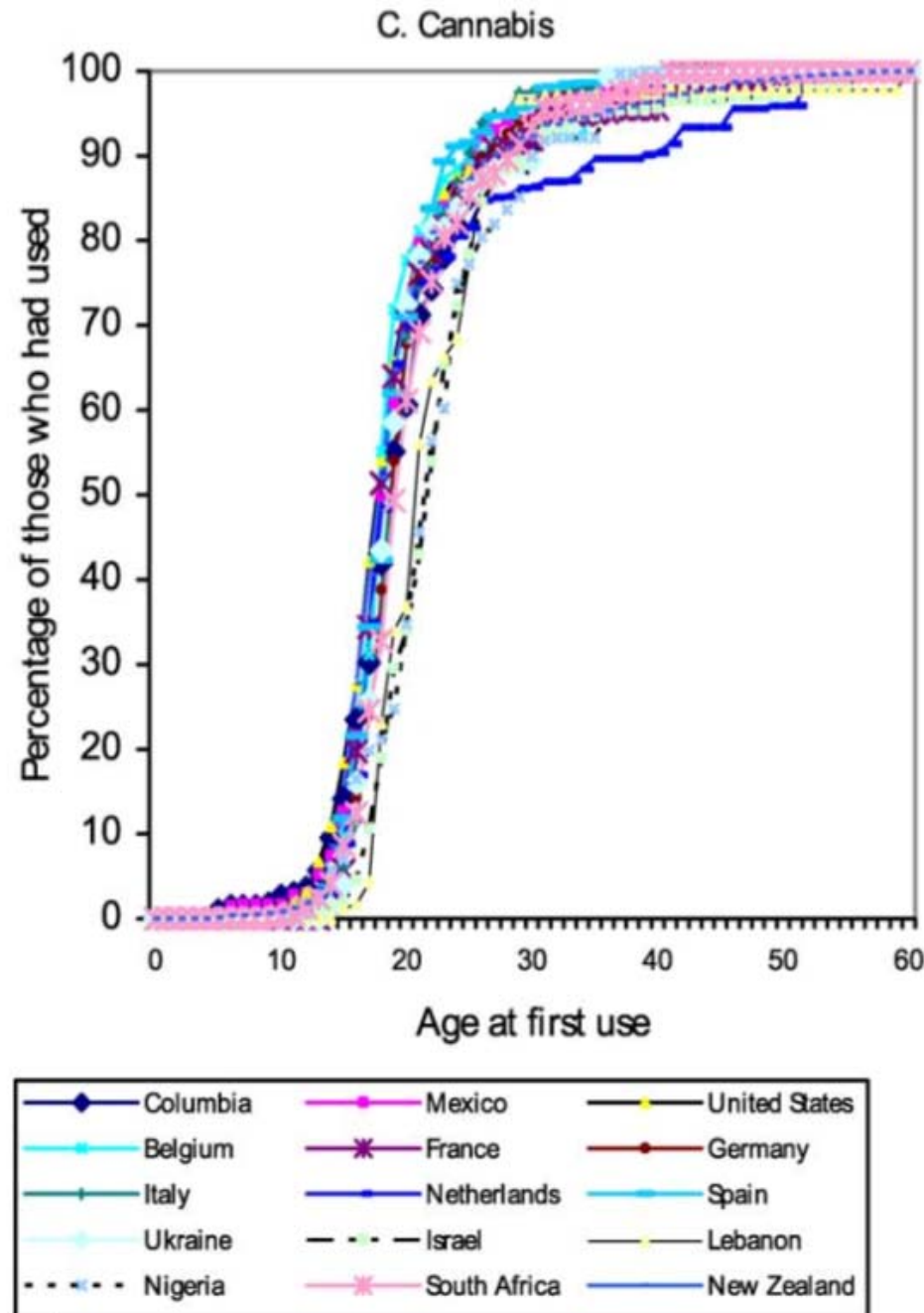
- Neuropsychological Effects of Chronic Marijuana Use

- Neuroimaging Findings

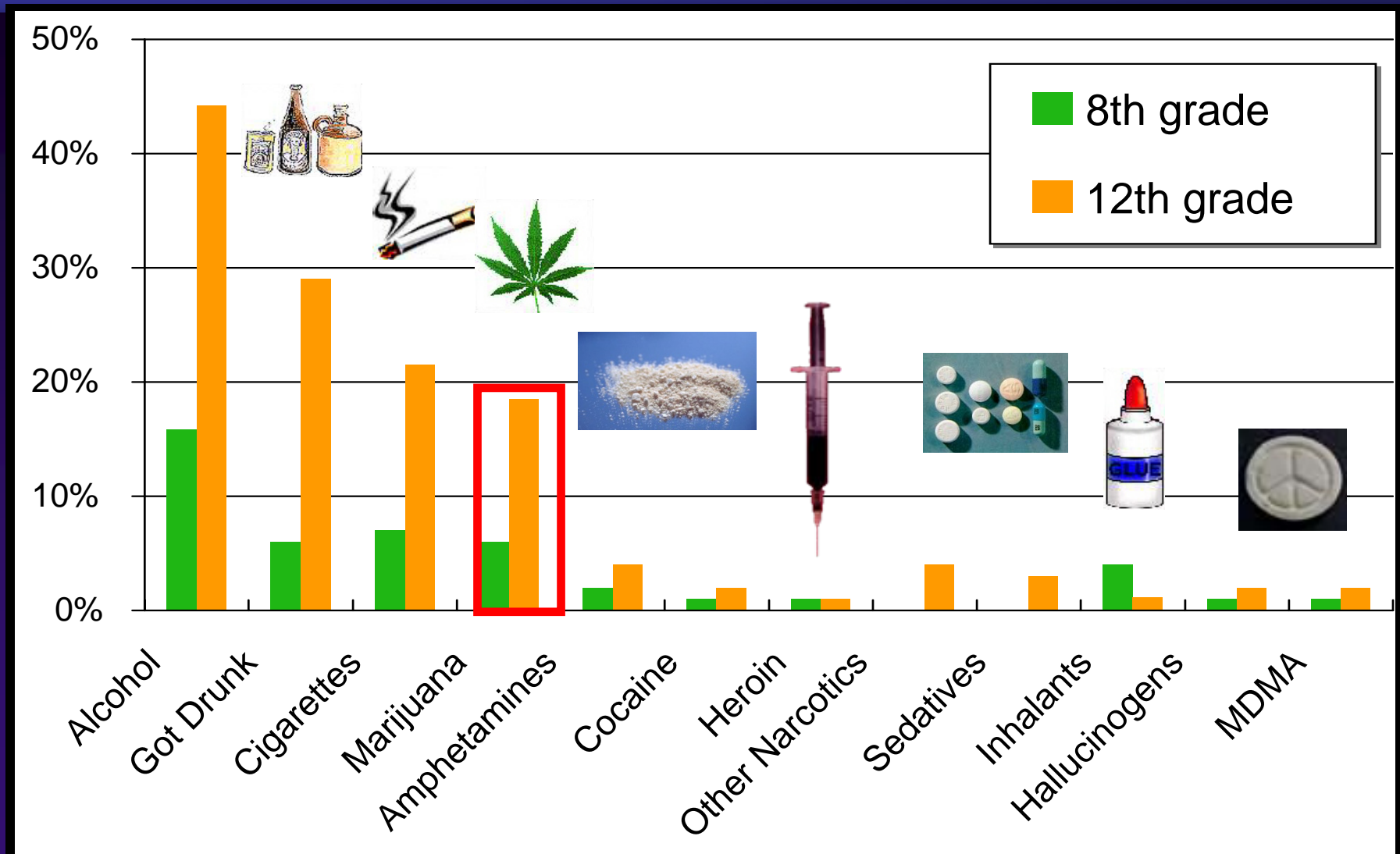
- Limitations & Future Directions



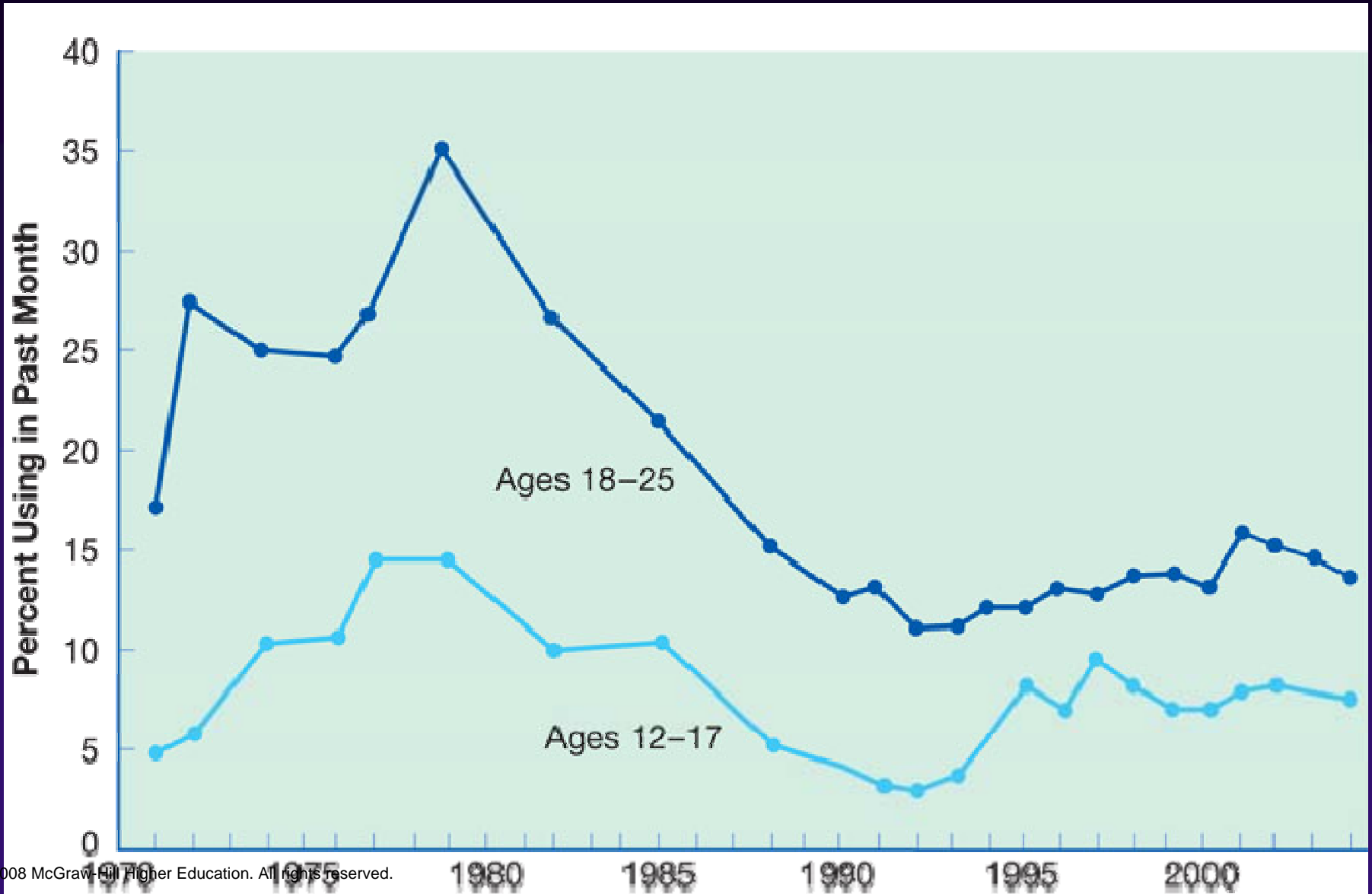
Worldwide Teen Age of Onset for Marijuana Use



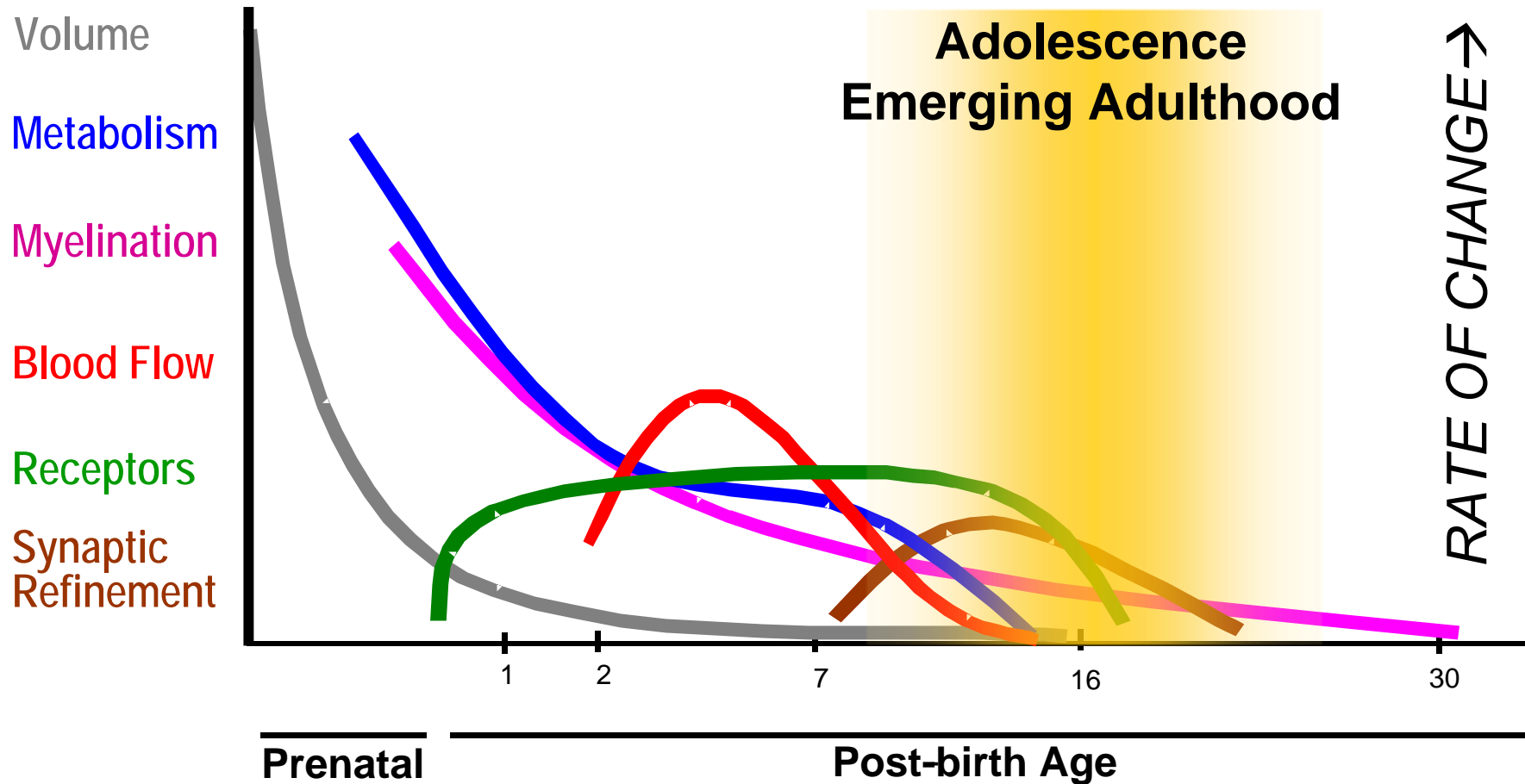
US : Marijuana Past Month Use



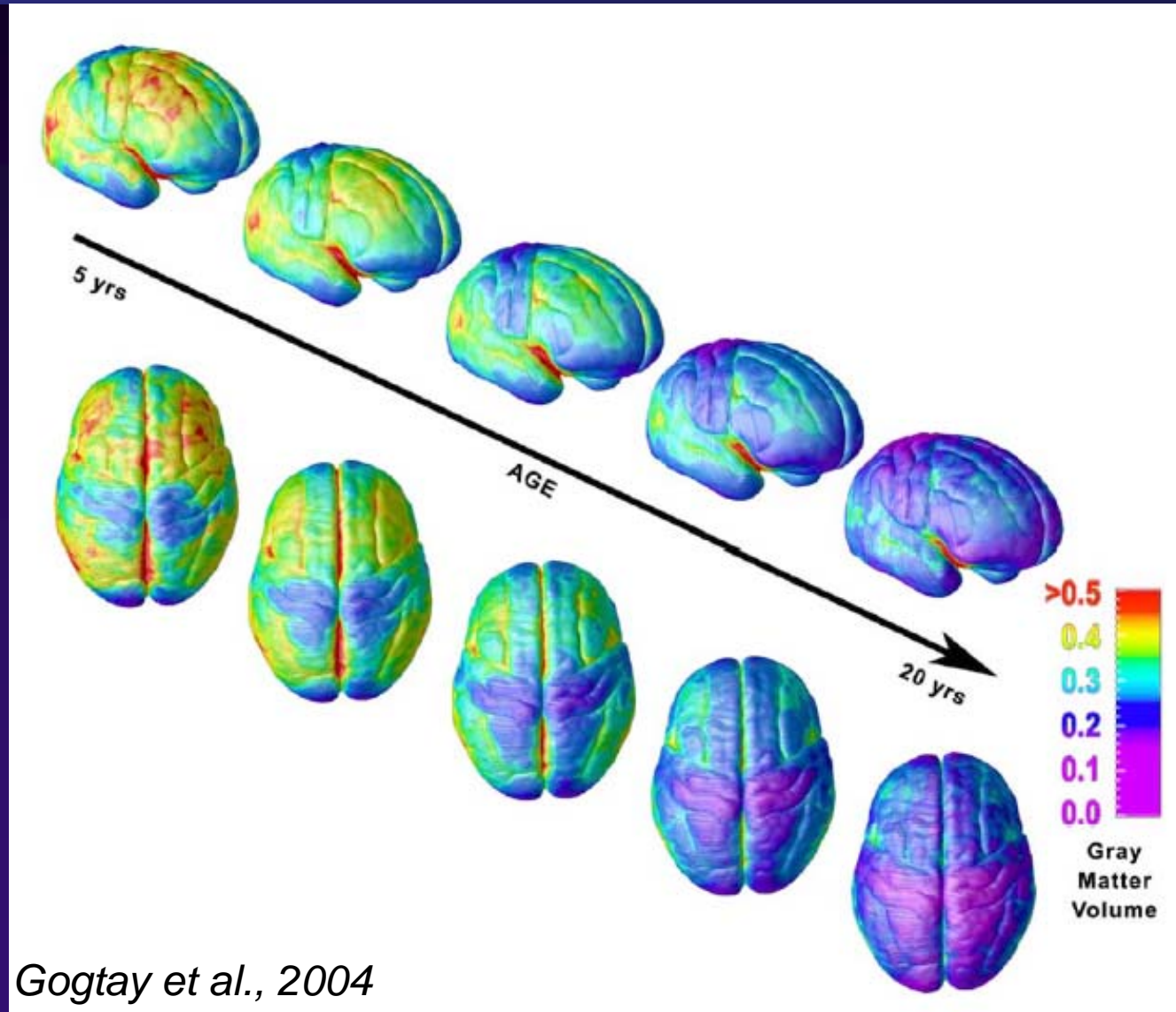
Emerging Adulthood: Peak Past Month MJ Use



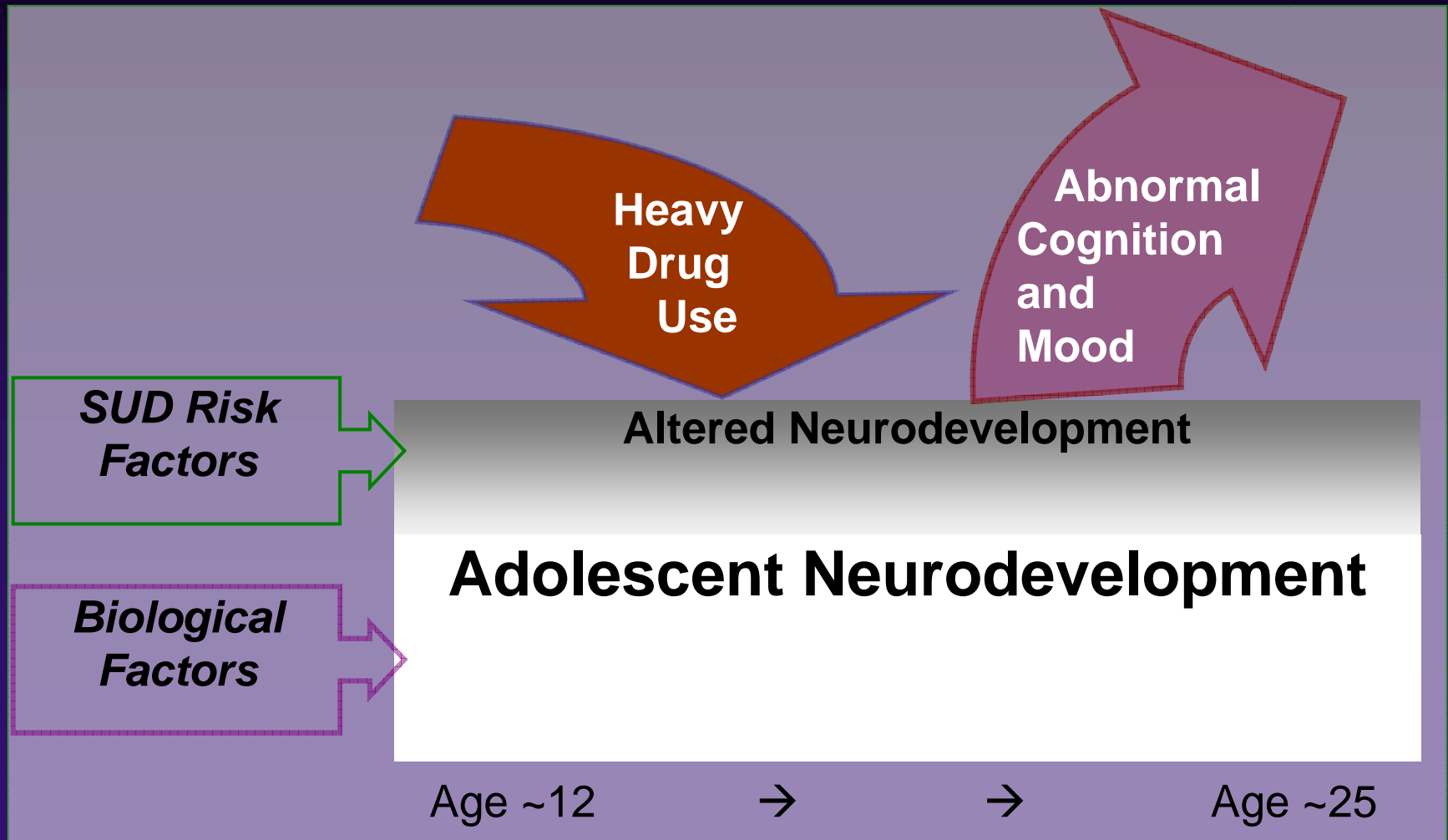
Adolescent Brain Development



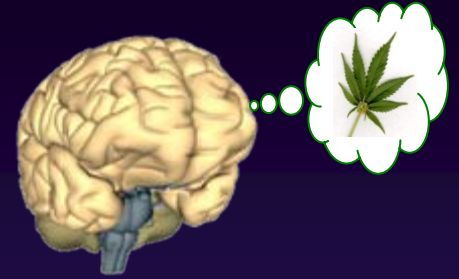
Gray Matter Development



Theoretical Model



Neuropsychological Effects of MJ Use



- ☐ Research rationale
- ☐ Neuropsychological Effects of Chronic Marijuana Use
- ☐ Neuroimaging Findings
- ☐ Limitations & Future Directions

Teen Studies Overview: Participants

- 16.0 - 18.9 Years Old (mostly males)
- Parent/Guardian Permission
- Marijuana Users
 - Used marijuana >60 times
 - Never met Cahalan criteria for Heavy Drinker
 - Haven't used other drugs >25 times
 - 30 days abstinent
- Controls
 - Used marijuana <5 times
 - Never met criteria for Heavy Drinker
 - Never used other illicit drugs



Exclusion Criteria

- MRI contraindication
- Axis I psychiatric disorder
- Psychiatric medications
- Family hx bipolar or psychosis
- Complicated/premature birth
- Prenatal alcohol/drug exposure
- Neurologic illness or injury



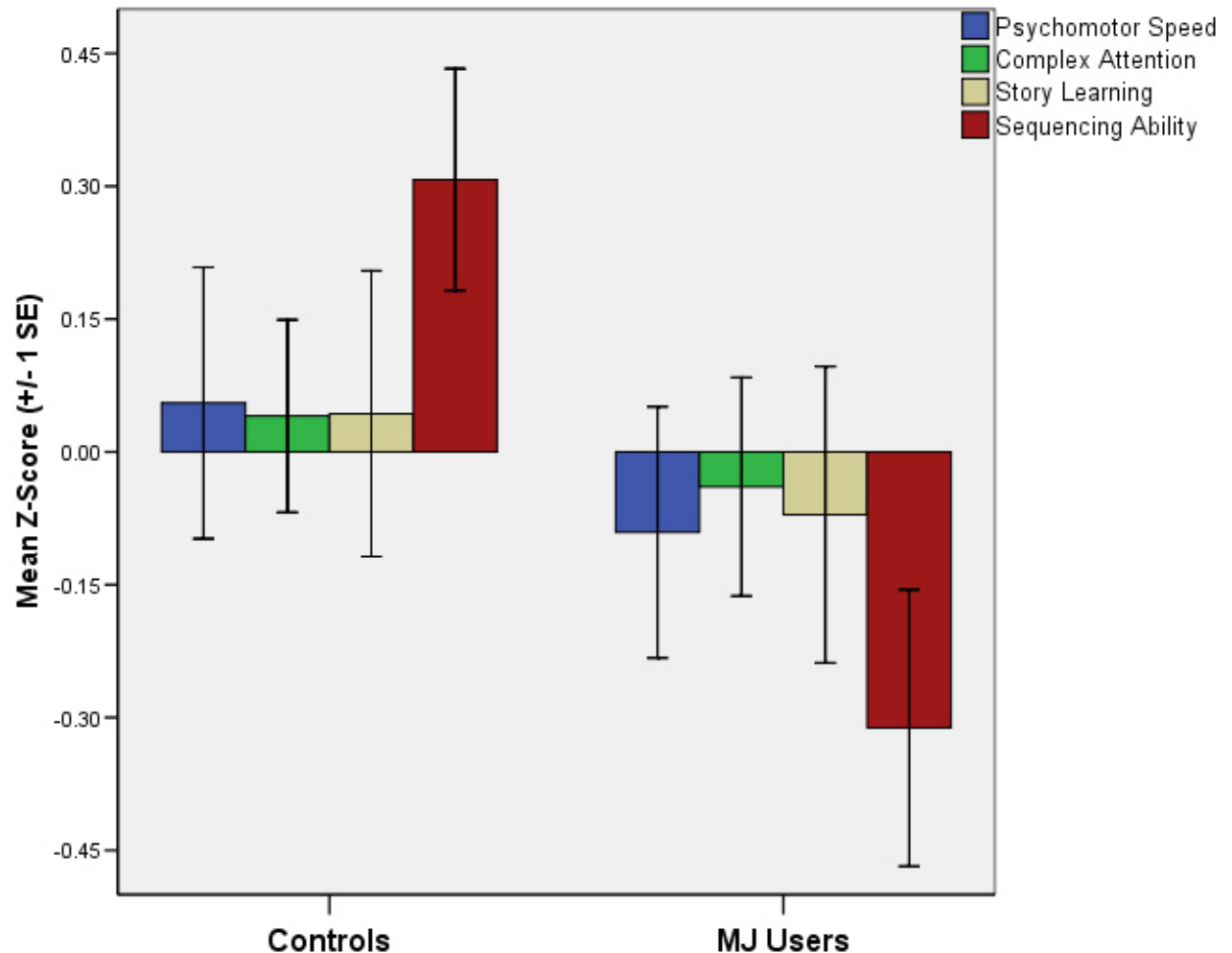
Staying Abstinent

- 2-3x/wk urine samples
- 2/3 stay abstinent 1 month
- Non-abstainers:
 - Heavier users

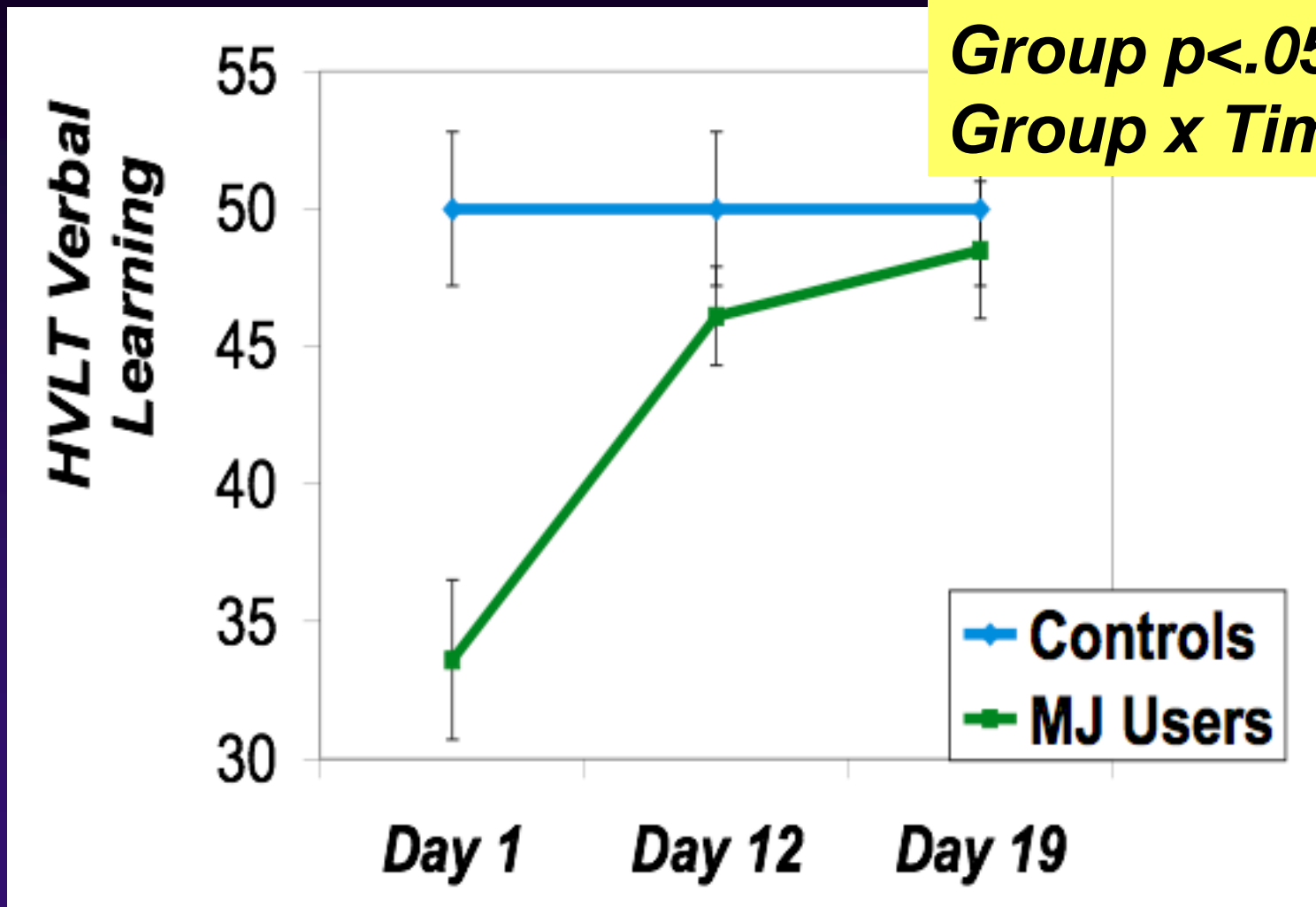


MJ & Cognition

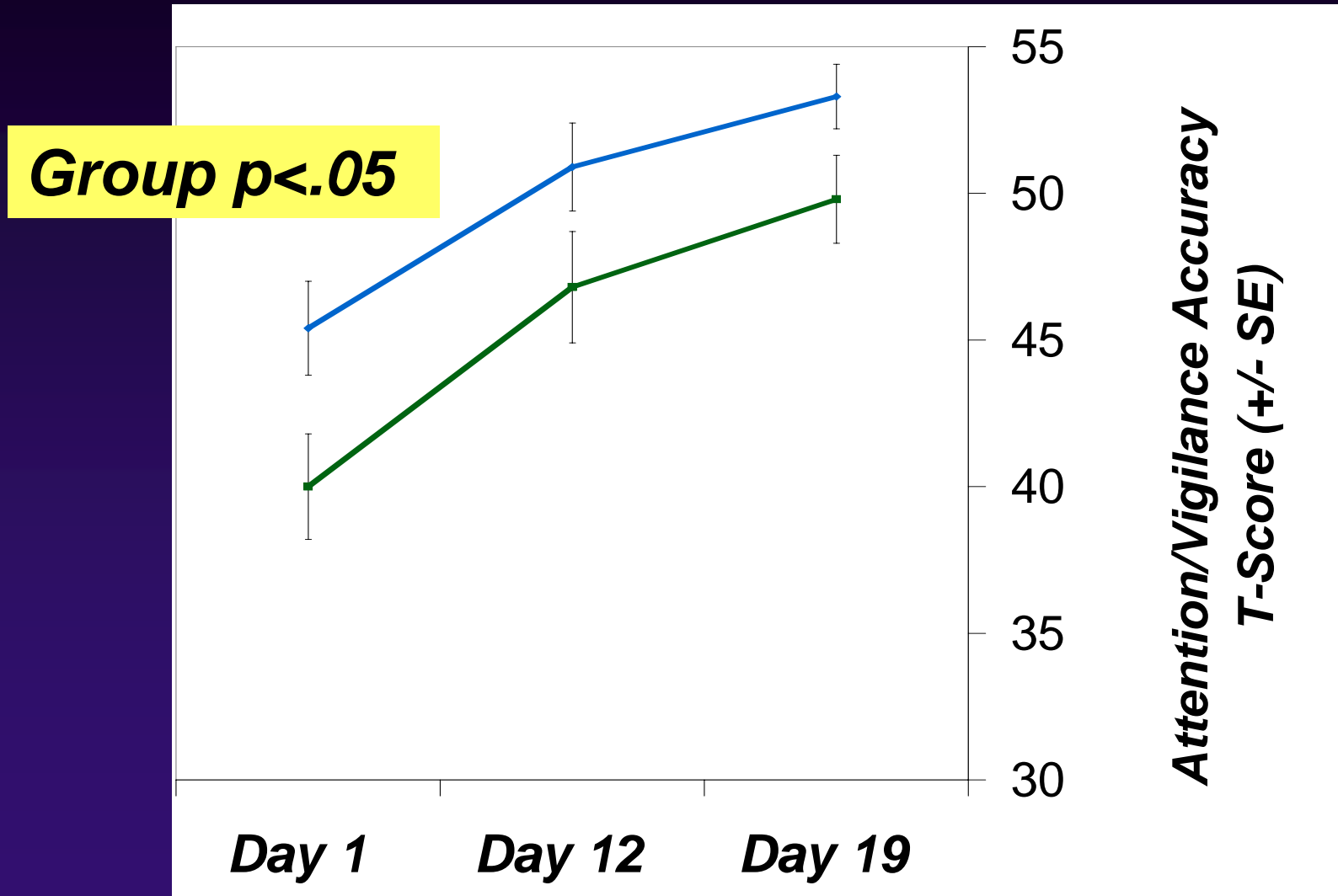
- MJ users (n=31) different than Controls (n=34), $p < .05$
- After 1 month abstinence
- Controlled alcohol use



MJ & Cognition Over Time



MJ & Cognitive Function



Young Adult Study Overview: Participants

- **18-28 Years Old**
- **Marijuana Users (23)**
 - Used marijuana >50 times
 - On average, 200 times
 - Never met Cahalan criteria for Very Heavy Drinker
 - Haven't used other drugs >25 times
 - 7 days abstinent
- **Controls (36)**
 - Used marijuana <5 times in lifetime
 - Never met criteria for Very Heavy Drinker
 - Haven't used other drugs >5 times

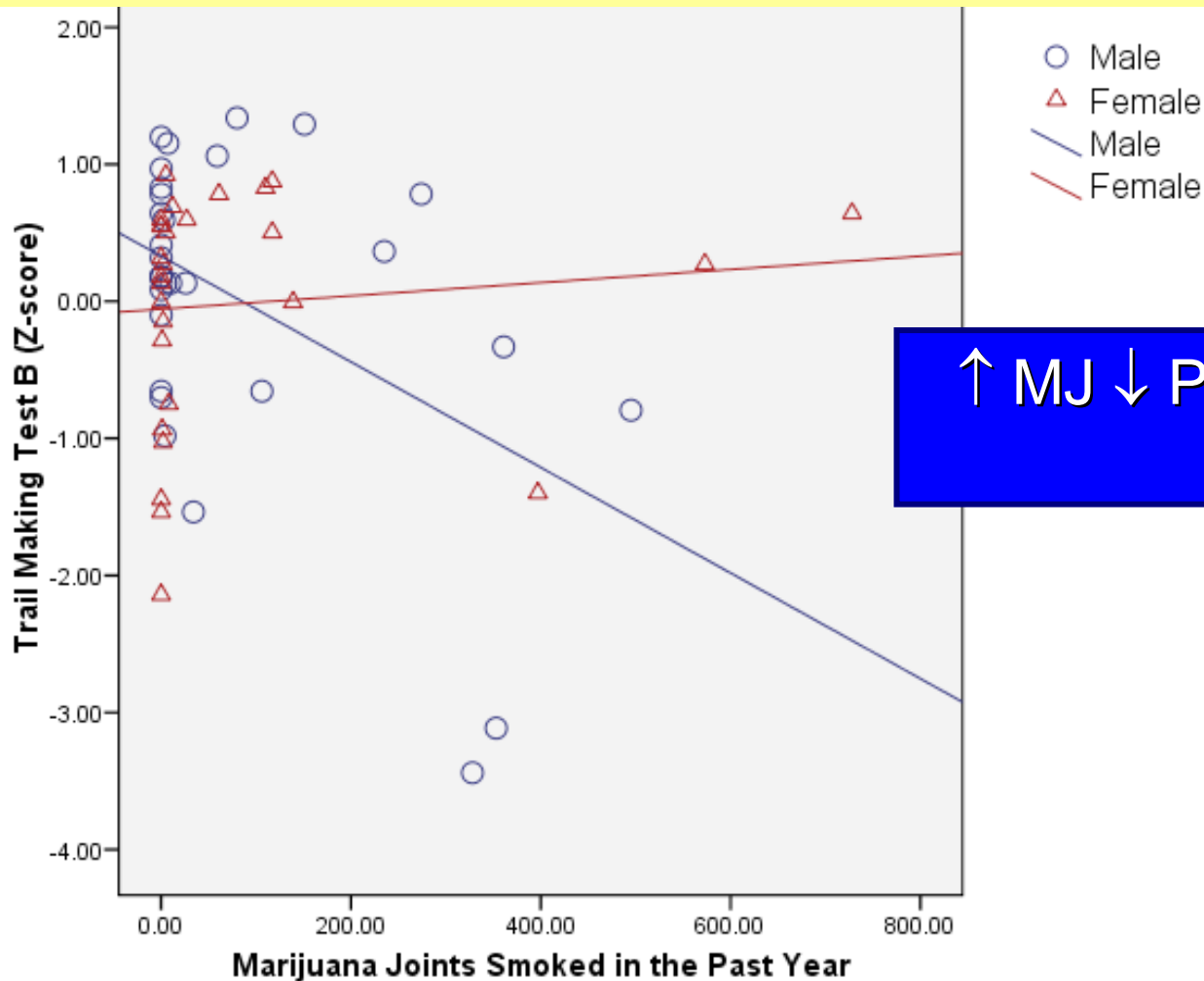


Young Adults (18-26 yo): MJ Use & Cognition

	Controls (n=36)	MJ Users (n=23)
Age	20.7±2.2	21.2±2.8
Education	13.6±1.7	12.7±1.9
% Female	50%	44%
% Caucasian	92%	70%
Reading	104.8±8.6	108.3±12.3
BDI-2	6.1±5.6	7.0±7.2
BMI	24.7±4.7	27.2±7.3

MJ Use & Psychomotor Speed

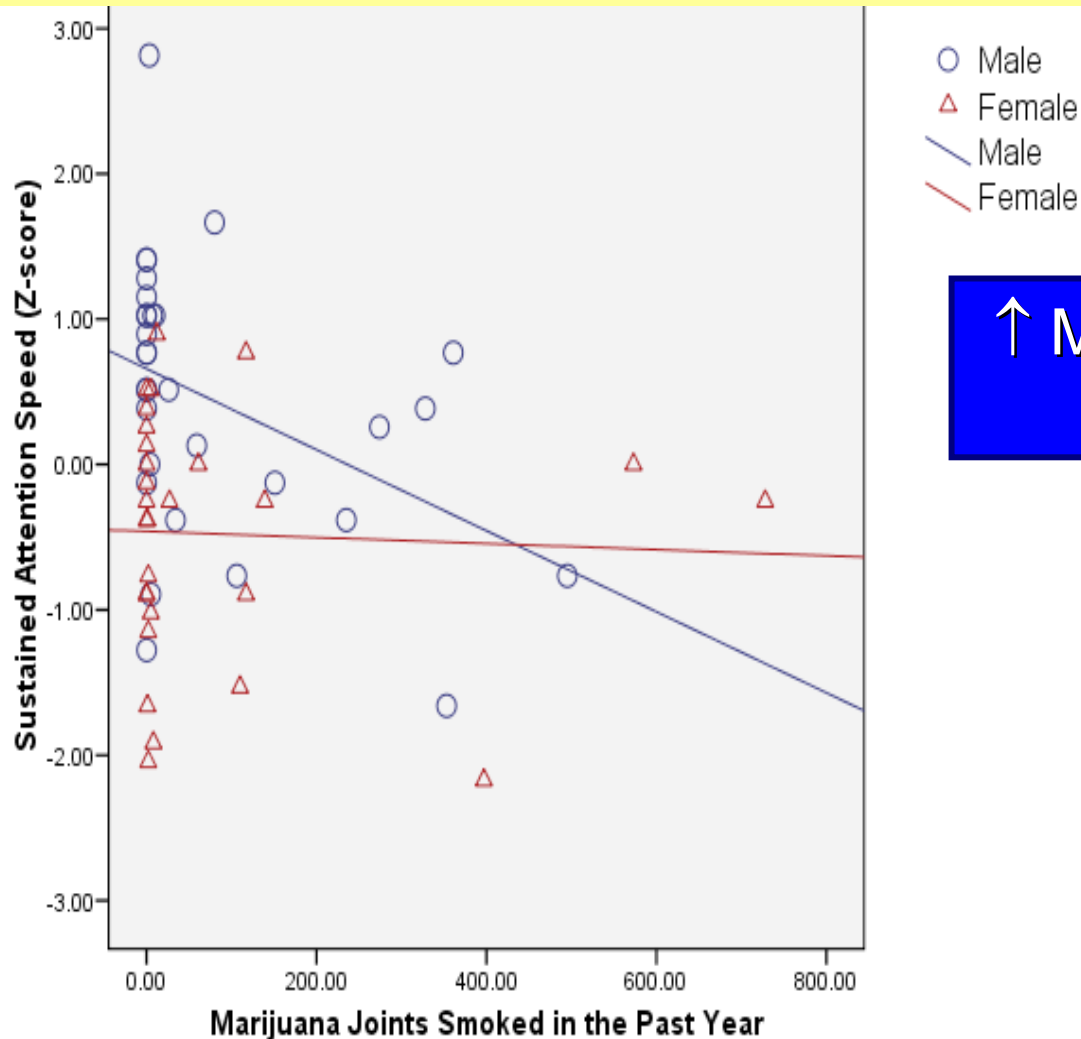
... controlled gender, reading ability, alcohol use, other drug use, BDI, gender, BMI



↑ MJ ↓ Psychomotor Speed
in Males

MJ Use & Sustained Attention Speed

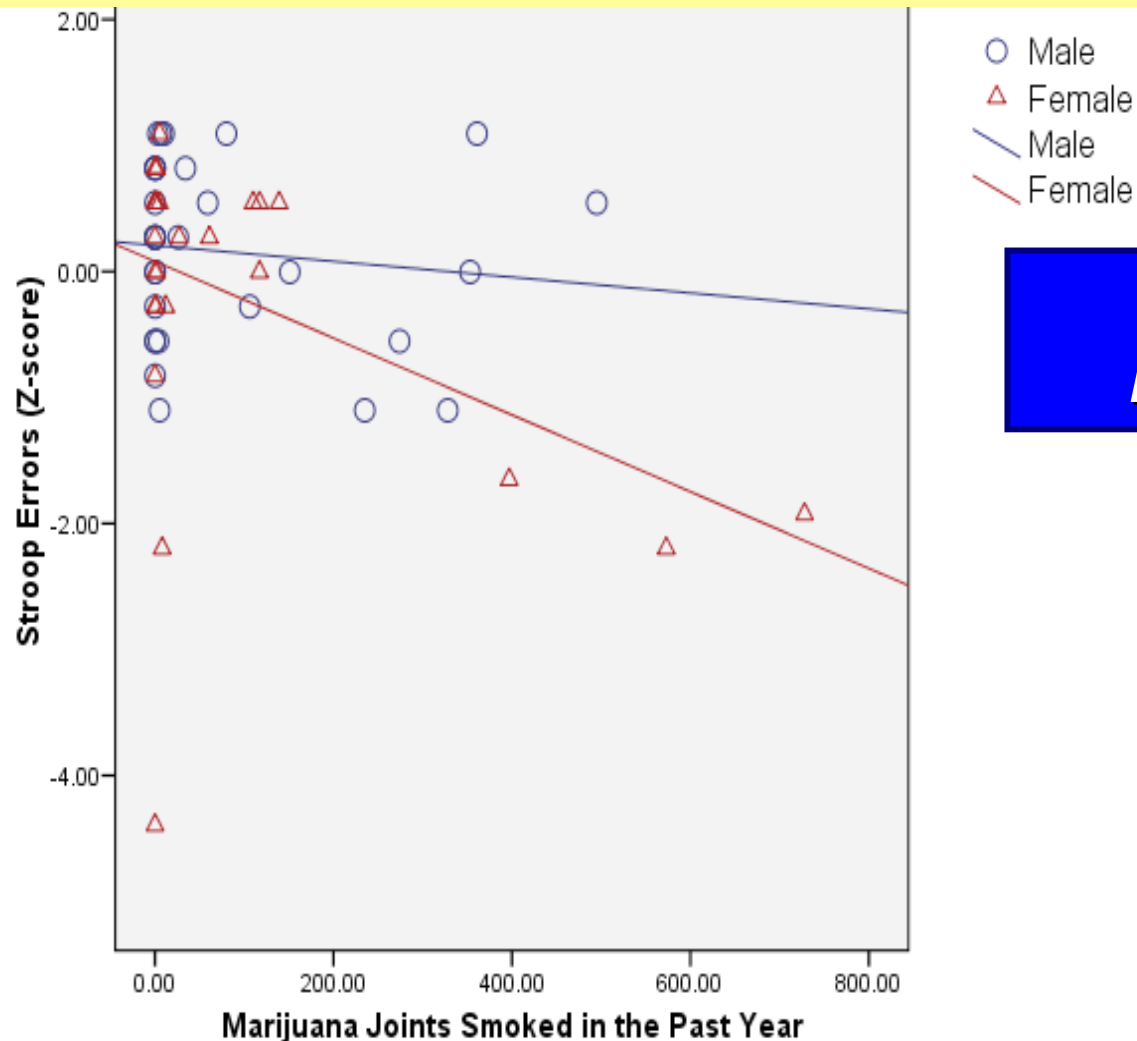
... controlled gender, reading ability, alcohol use, other drug use, BDI, gender, BMI



↑ MJ ↓ Sustained Attention
Especially in Males

MJ Use & Cognitive Inhibition Errors

... controlled gender, reading ability, alcohol use, other drug use, BDI, gender, BMI



↑ MJ ↑ Stroop Errors
Especially in Females

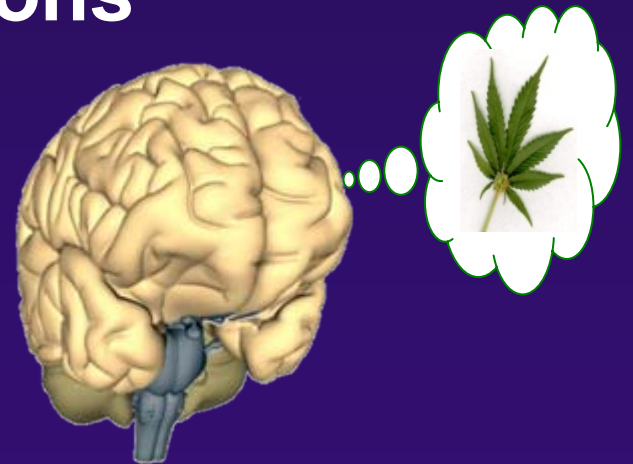
Marijuana Use NP Summary

- **↑ Marijuana use~ poorer neurocognition**
 - ↓ story memory (16-19 yo)
 - ↓ psychomotor speed (16-19 and 18-26 yo)
 - ↓ complex attention (16-19 and 18-26 yo)
 - Especially in young adult males
 - ↓ cognitive inhibition (16-19 and 18-26 yo)
- **Some recovery over the 1st month of abstinence**
- ***Following 7-30 days of abstinence in samples that excluded psychiatric comorbidities***



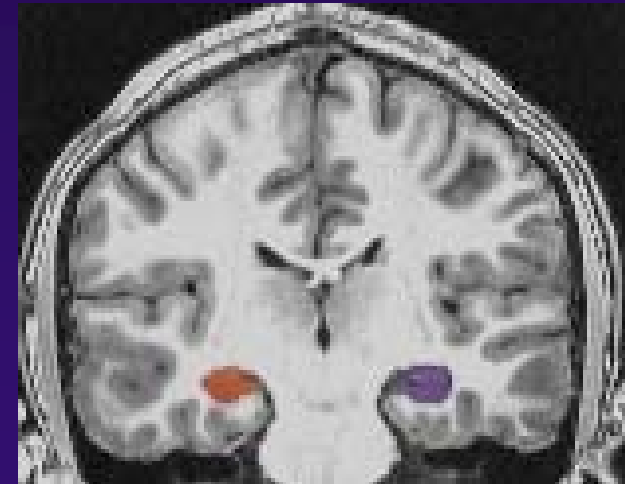
Neuropsychological Effects of MJ Use

- Research rationale
- Neuropsychological Effects of Chronic Marijuana Use
- **Neuroimaging Findings**
- Limitations & Future Directions

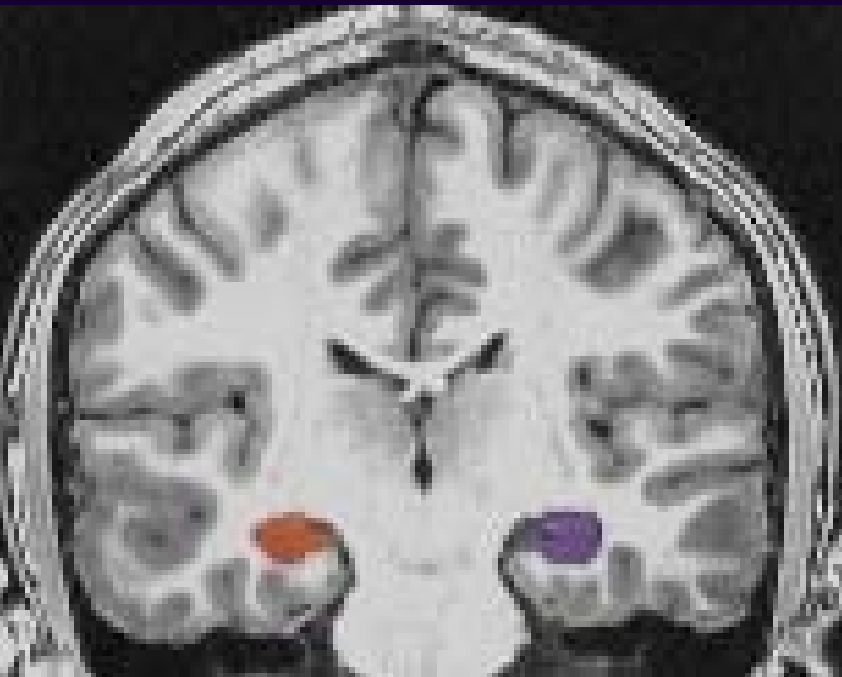


Marijuana Use: MRI Findings

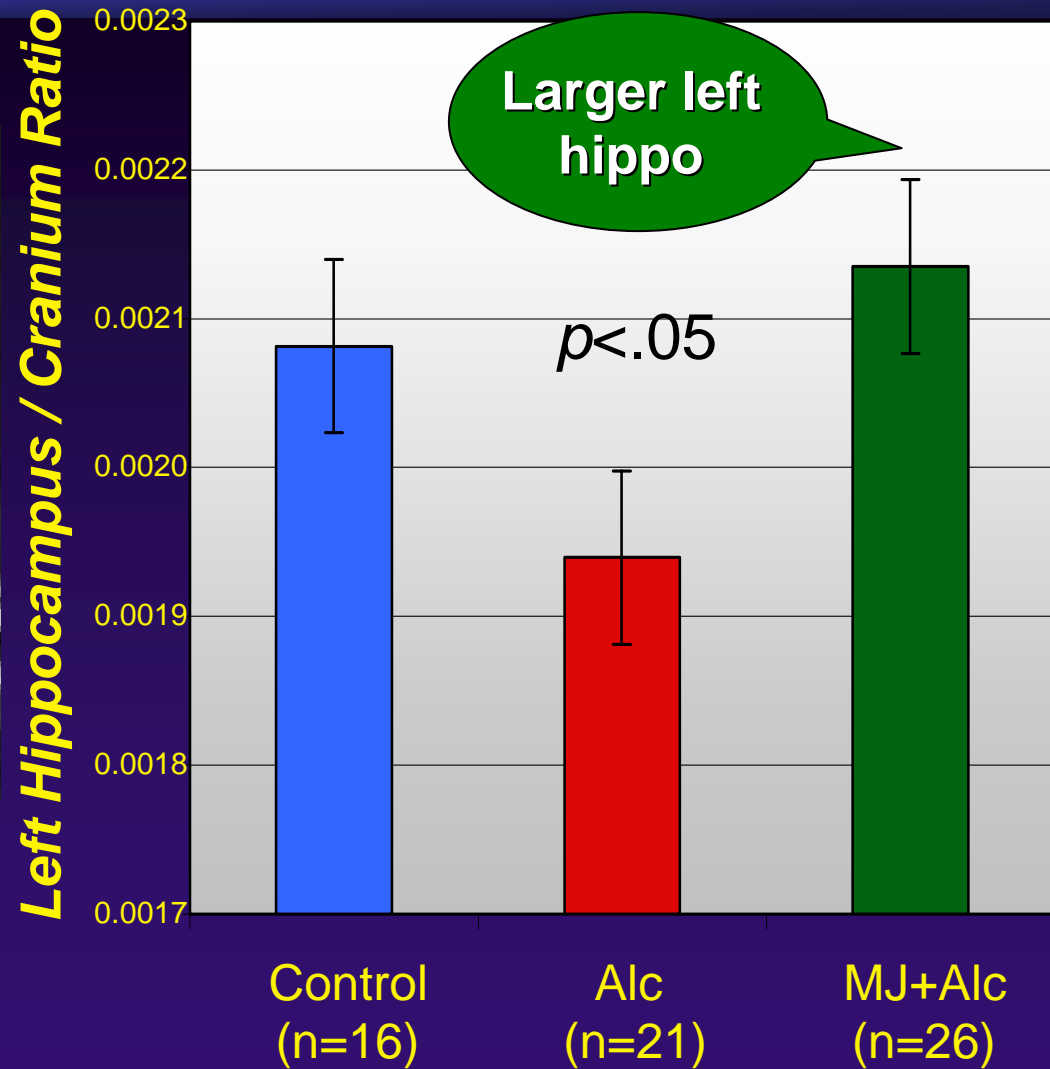
- Targeting Brain Regions:
 - ↓ story memory: *Hippocampus?*
 - ↓ complex attention & cognitive inhibition: *Prefrontal cortex?*
 - ↓ psychomotor speed: *Cerebellum?*
 - *Dense CB1 receptors in all regions*



Hippocampal Volume



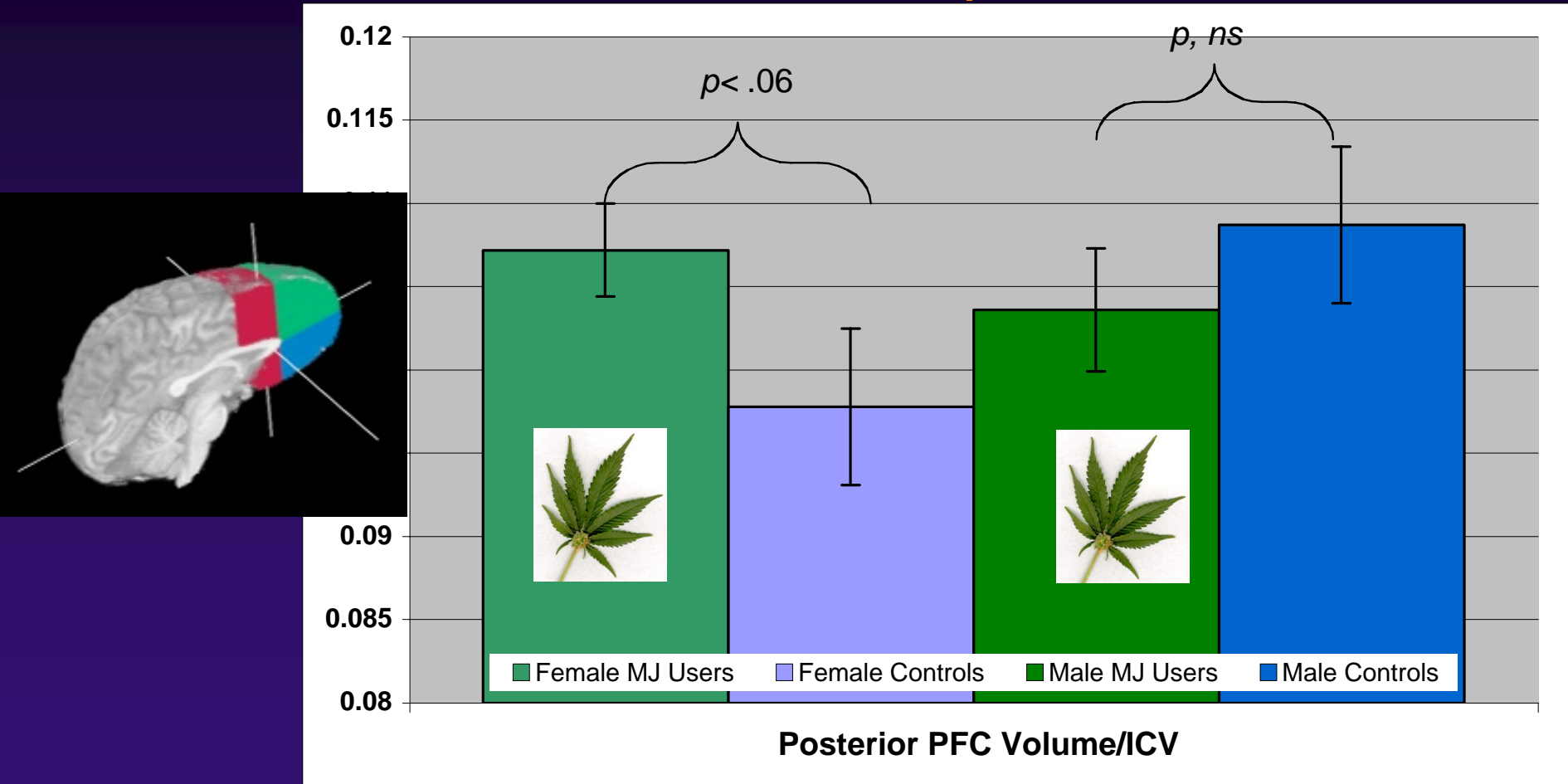
Right / Left



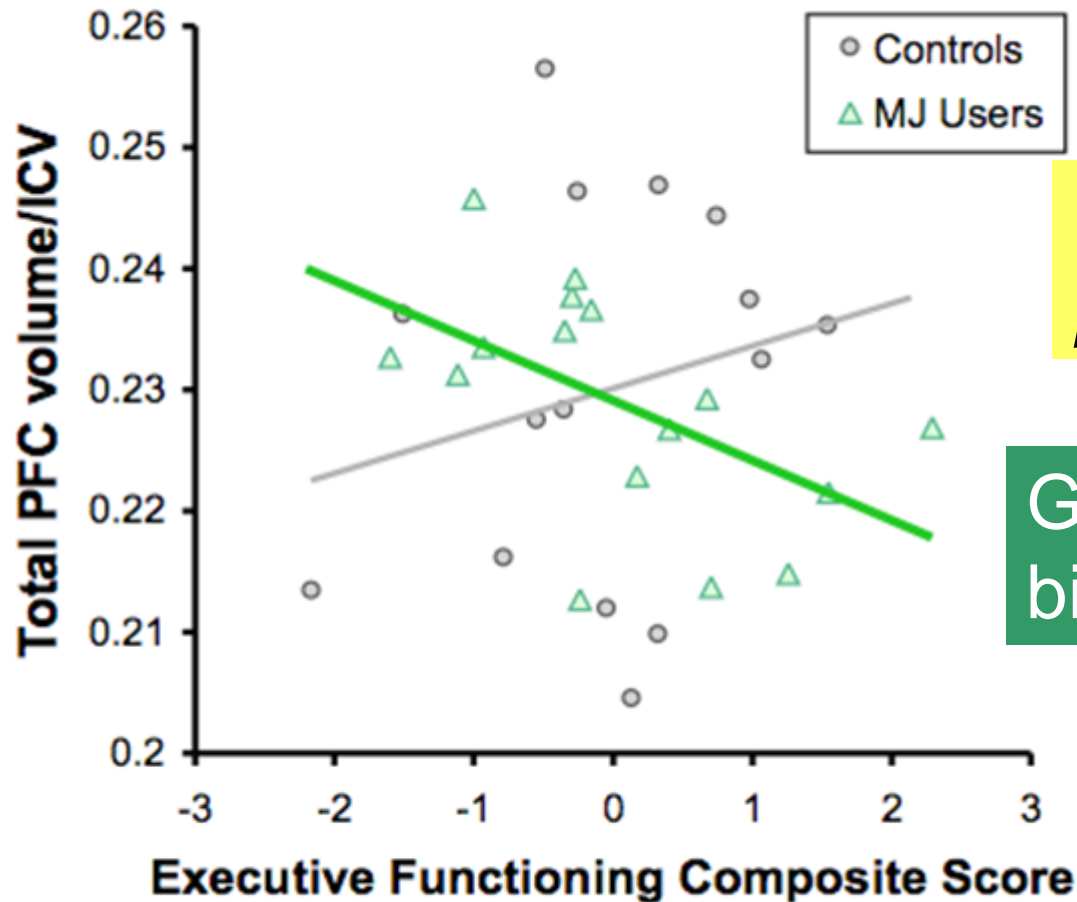
MJ & PFC Structure

MJ users vs. Controls (N=32; 16-19 year olds)

Gender moderated affects of MJ, $p < .09$



MJ & PFC Structure

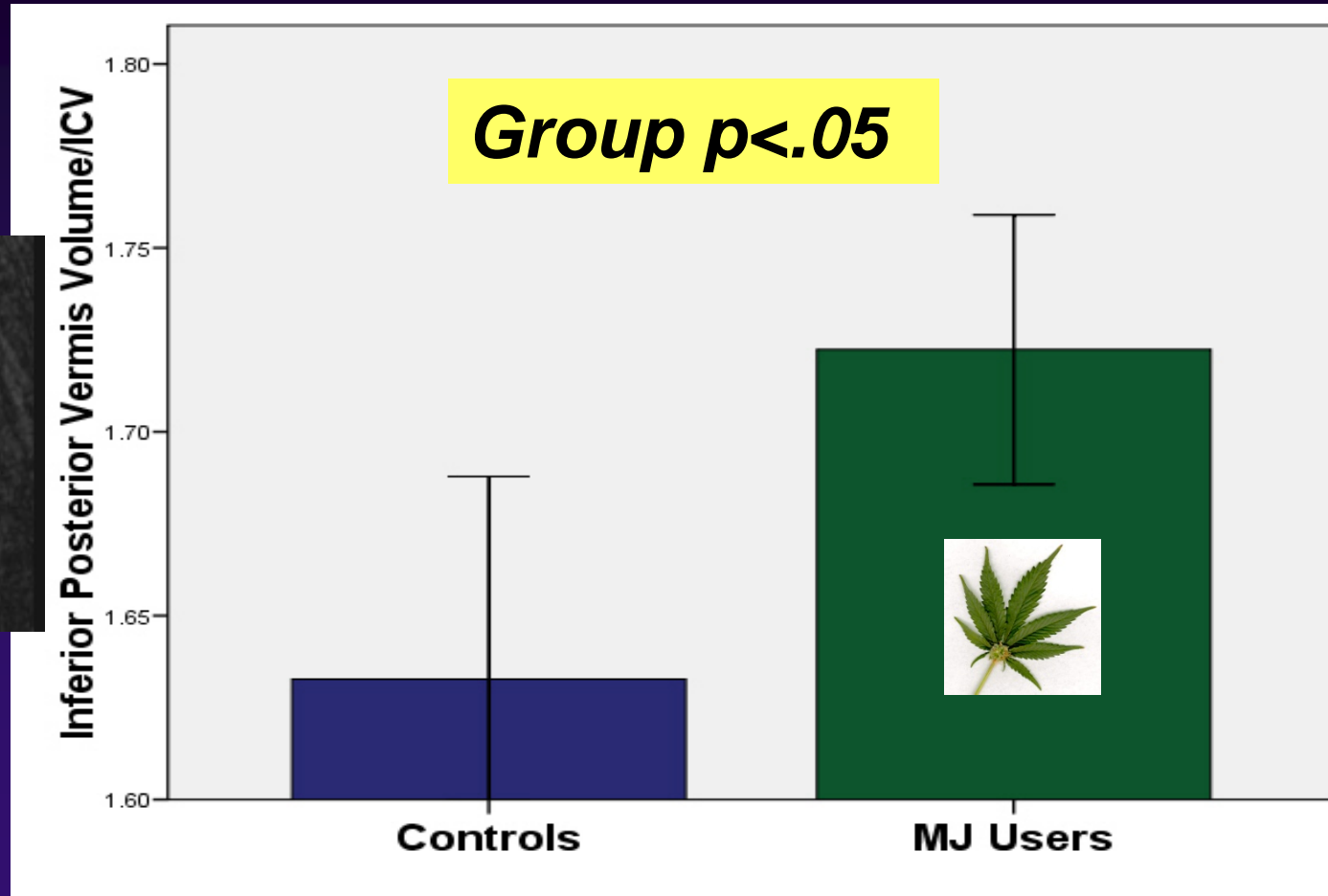


Group x PFC
 $p < .05$

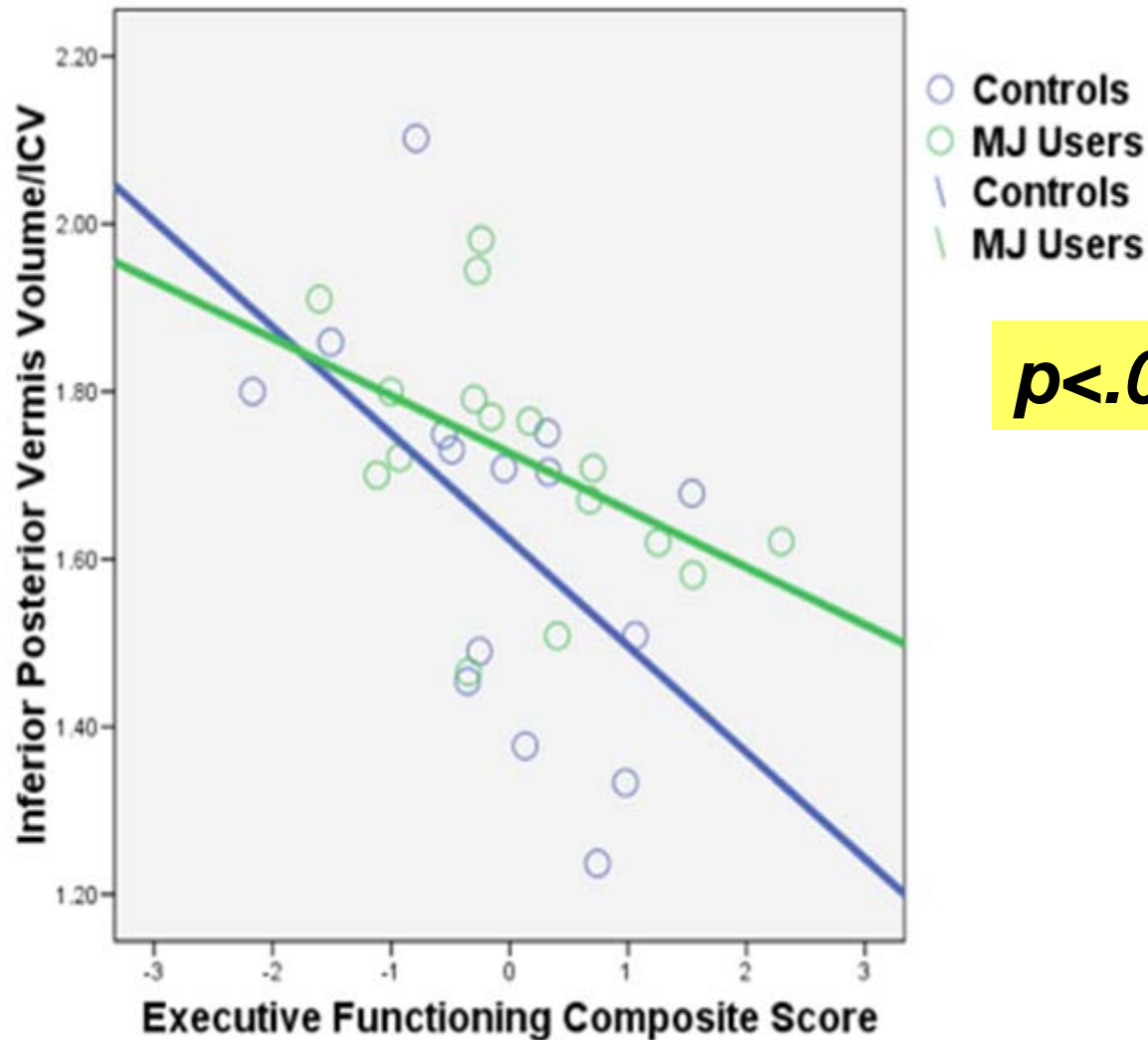
Girl MJ users,
bigger NOT better

MJ & Cerebellar Structure

... controlled alcohol, gender, ethnicity, reading level



MJ & Cerebellar Structure



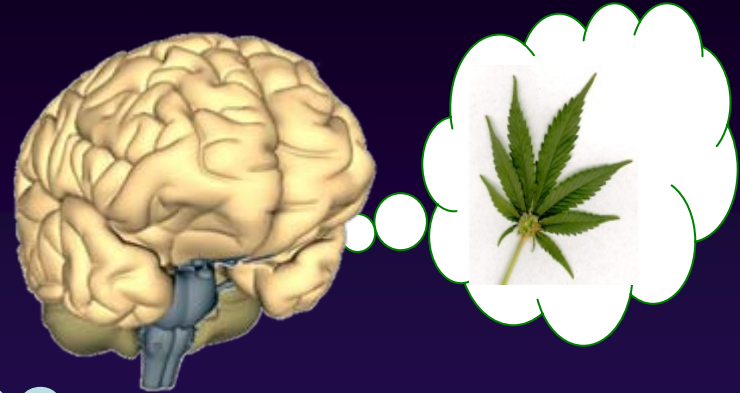
$p < .001$

Marijuana Use & MRI Summary

- ↑ Marijuana use ~ ↑ brain volumes in teens
 - ↑ left hippocampus
 - ↑ PFC ↓ executive functioning (in girls)
 - ↑ vermis volumes ~ ↓ executive functioning
- *Following 30 days of abstinence in samples that excluded psychiatric comorbidities*

Neuropsychological Effects of MJ Use

- ❑ Research rationale
- ❑ Chronic Marijuana Use
- ❑ Neuropsychological Effects of Chronic Marijuana Use
- ❑ Limitations & Future Directions

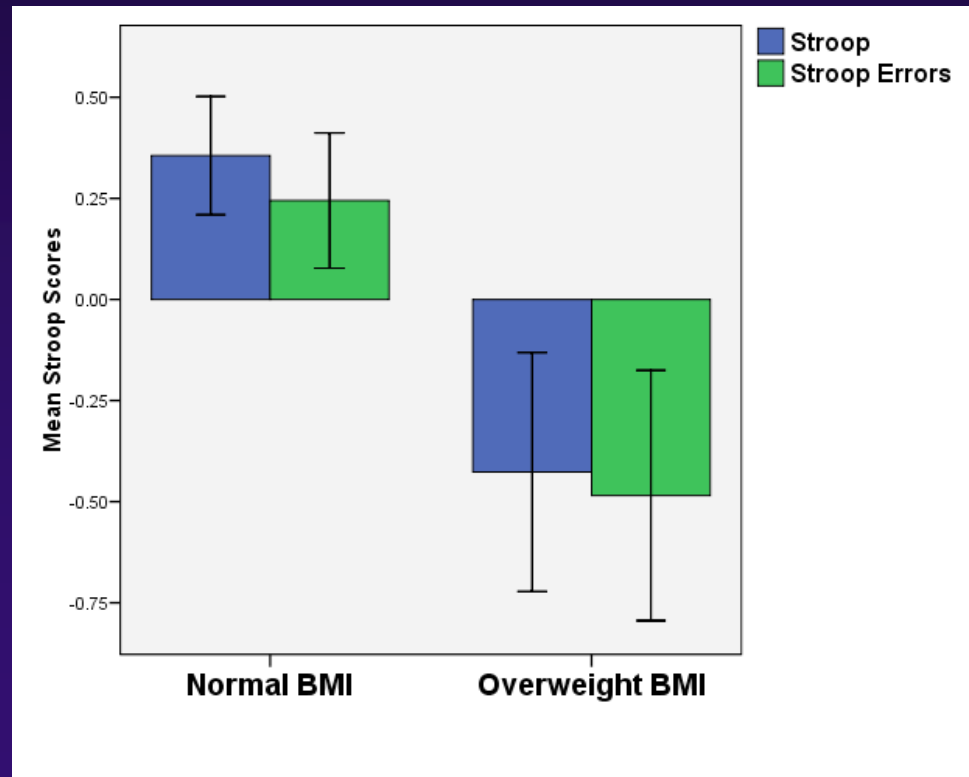


Limitations

- Do preexisting differences explain findings?
 - Subclinical conduct, attentional, mood sx
 - *Preexisting* executive functioning deficits
- Need...
 - Longitudinal studies of at-risk adolescents
 - Longitudinal studies following treatment/abstinence
 - Larger samples of female MJ users

Future Directions

- Recovery with Continued Abstinence?
- Neurocognition affect treatment?
 - At risk groups?
- Treatments?
 - CBT/ EF training
 - Pharmacological
 - Reduce weight?
 - Exercise?



Acknowledgements

- **Funding Institutes**

- **NIDA/NIH:** R21 015228, R01 DA021182 (PI: Tapert); F32 DA020206, R03 DA027457 (PI: Medina)
- **UC Center for Environmental Genetics** P30 ES06096 (PI: Medina)

- **UCSD Adolescent Brain Imaging Project (past & present)**

- **Susan Tapert (PI)**, Sandra Brown, Bonnie Nagel (OHSU), Karen Hanson, Mairav Cohen-Zion, MJ Meloy, Sunita Bava, Alecia Schweinsburg (Yale), Carmen Pulido, Andrea Spadoni (Scripps), Larry Frank, Gregory Brown, Martin Paulus, Marc Schuckit, Brian Schweinsburg (Yale)

- **UC Brain Imaging & Neuropsychology (Brain) Lab**

- **Faculty collaborators:** Paula Shear, James Eliassen, Judith Strong, Robert Anthenelli, Ranjan Deka
- **Graduate students:** Jenessa Price, Tim McQueeney, Claudia Padula
Undergraduate students (current): Brigitte Budion, Zach Graham, Megan Miller, Monika Hawkins, Sailee Teredesai, Rokaia Mohamed, Adrienne West., Skyler Shollenbarger

Young Adults (18-26 yo): MJ Use & Cognition

	Controls (n=42)	MJ Users (n=21)
*Alcohol	132±193	304±372
Inhalants	0±0	0±0
*Hallucinogens	0±1	2±4
**MJ	1±3	208±198
MDMA	0±0	0±0
Stimulants	0±1	2±4
*Sedatives	0±0	0±1
Opioids	0±0	0±0

* $p < .05$, ** $p < .001$, Controls < MJ

MJ & Cognition

