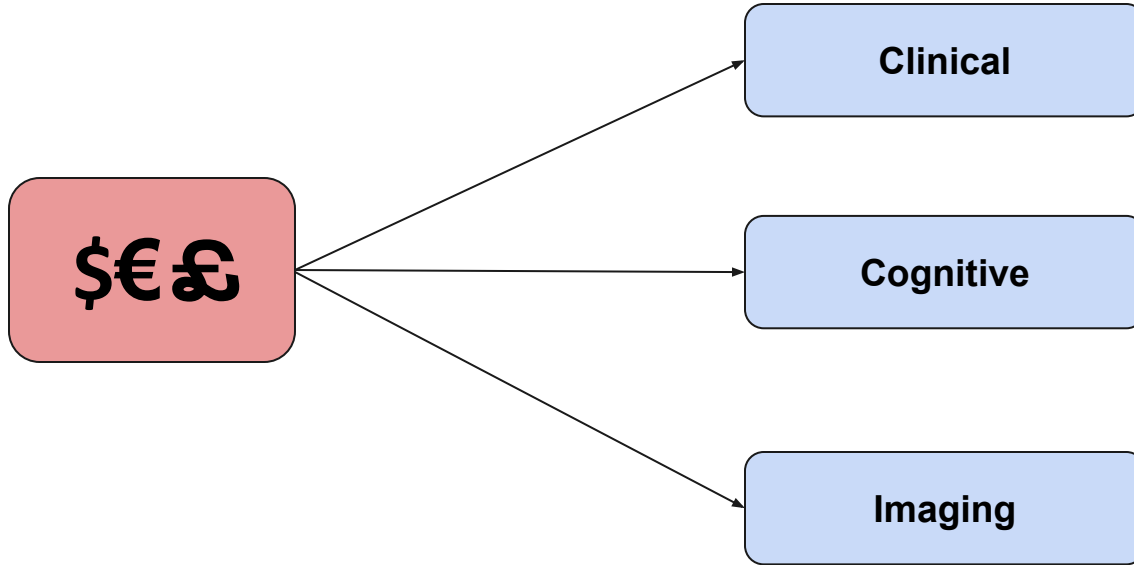


Association between Neighborhood Socioeconomic Status and Executive System Activation in Youth

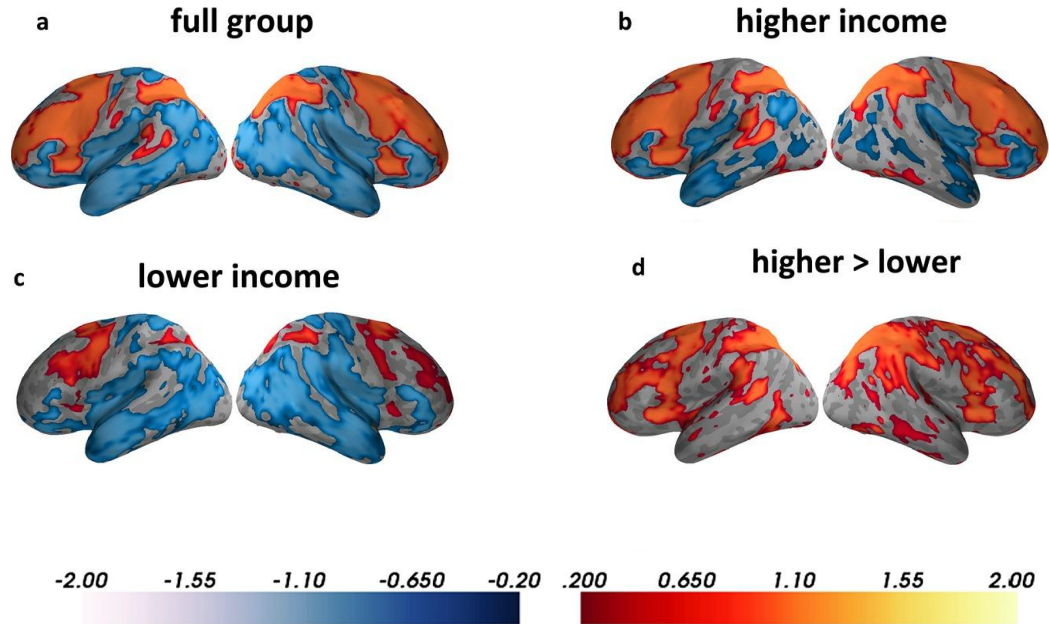
Kristin Murtha

April 5th, 2021

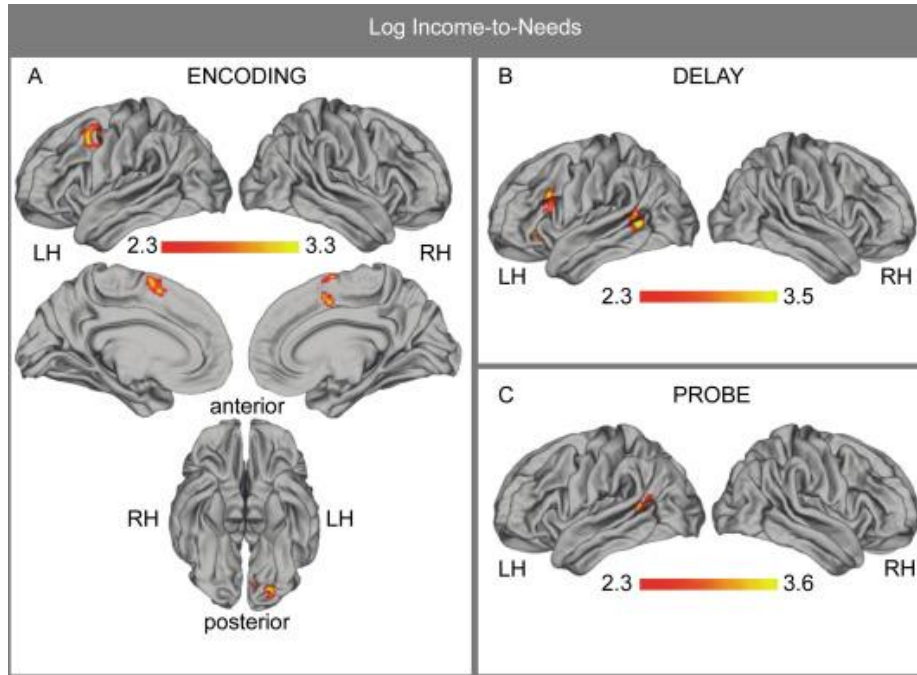
Background: Environmental SES



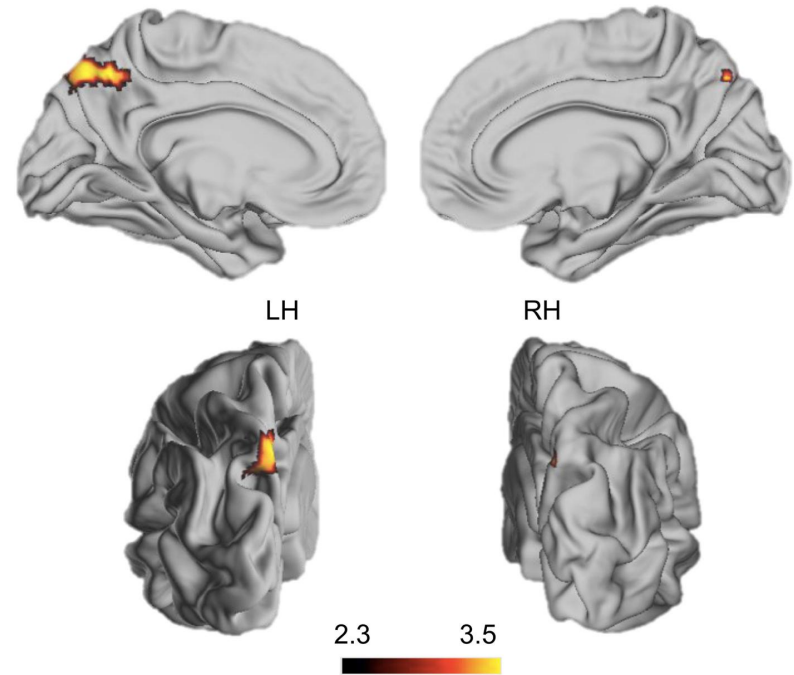
Background: Environmental SES



Background: Environmental SES

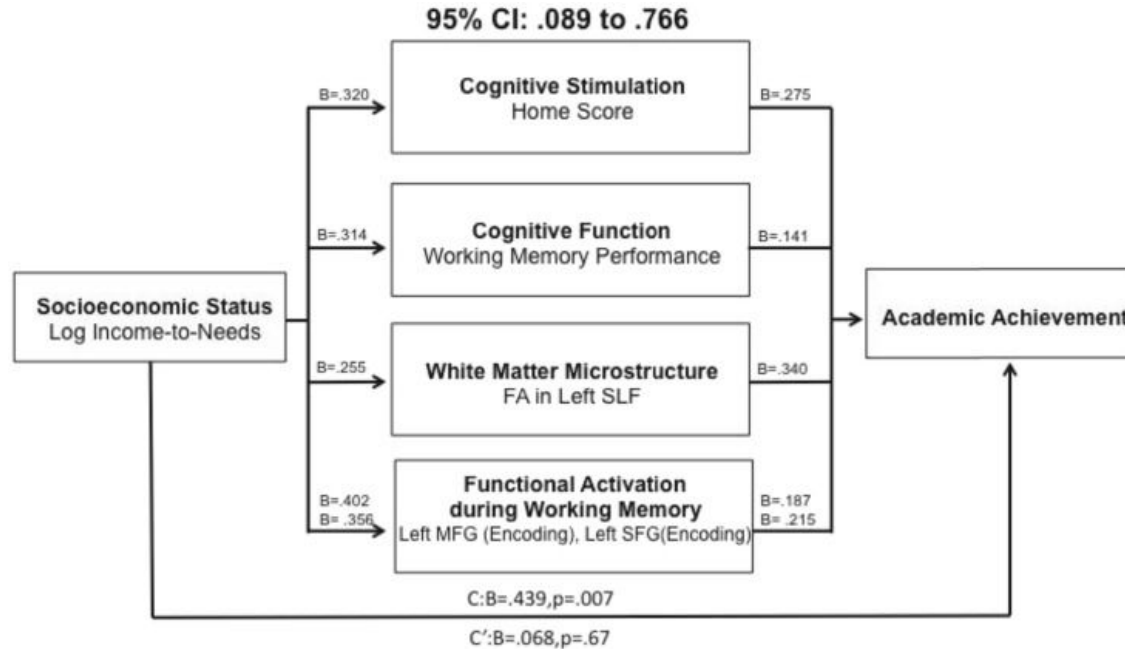


[Rosen et al., 2018](#)



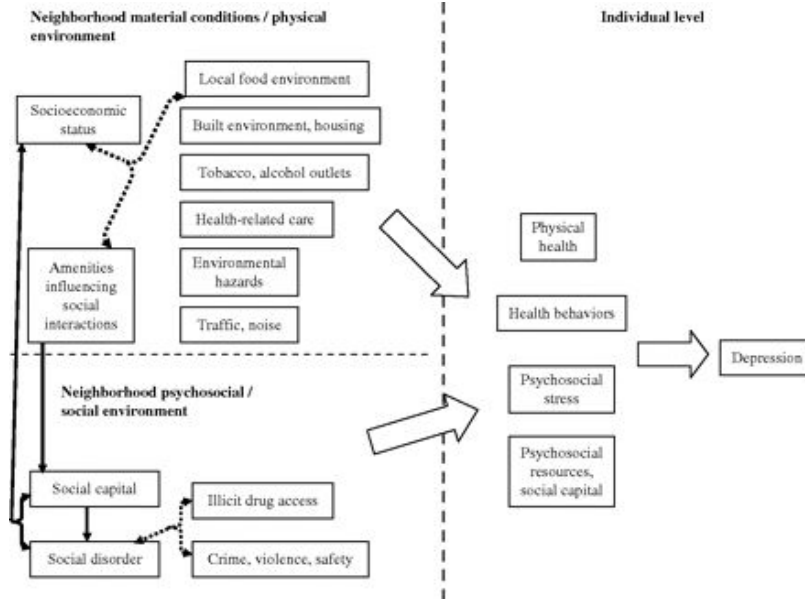
[Sheridan et al., 2017](#)

Background: Environmental SES

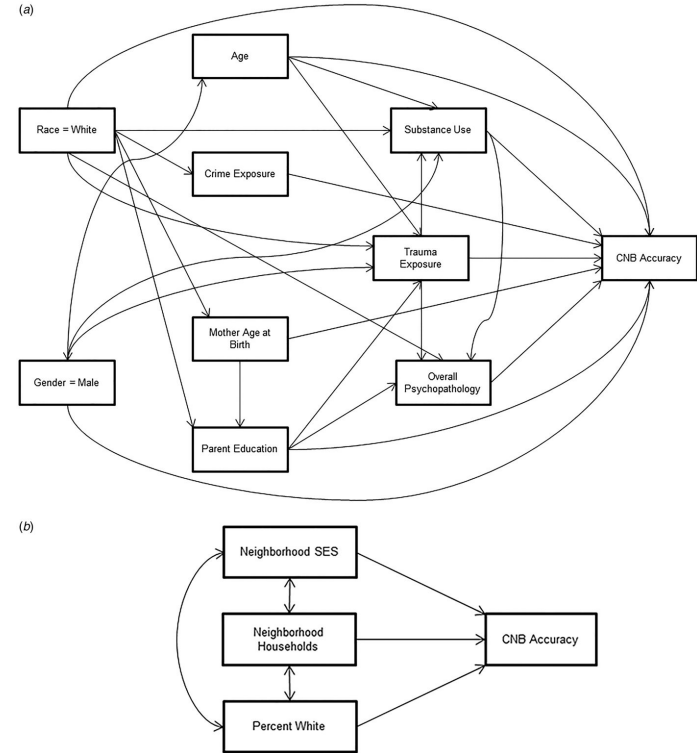


[Rosen et al., 2018](#)

Background: Environmental SES

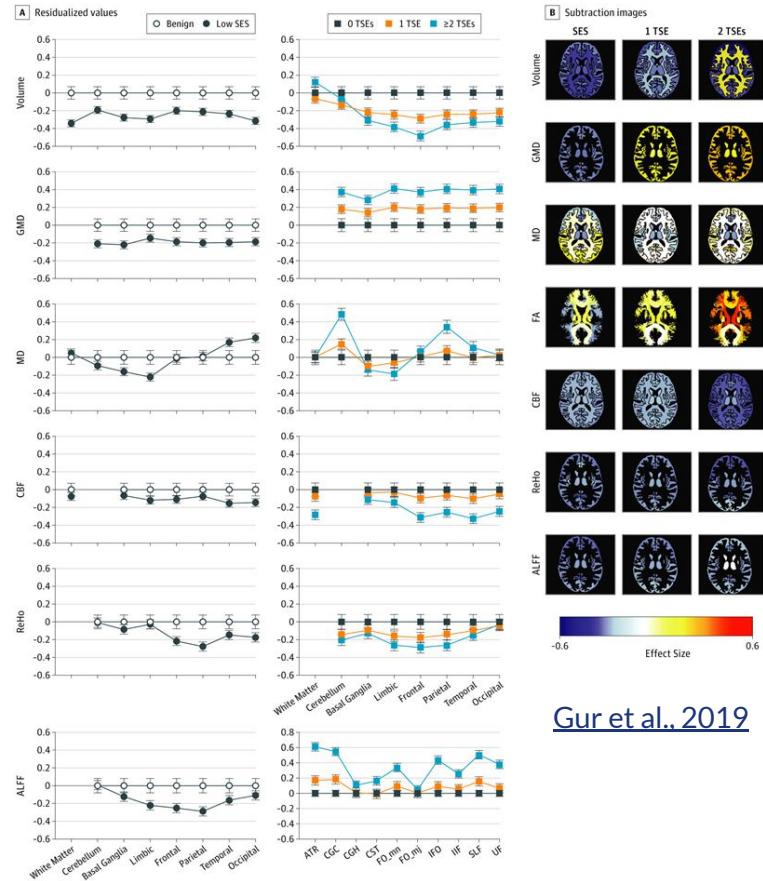
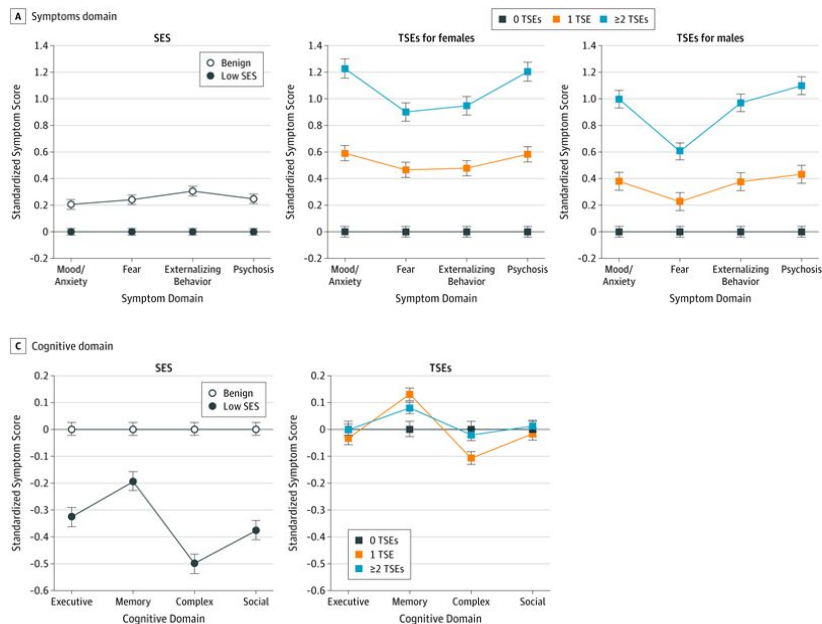


[Kim, 2008](#)



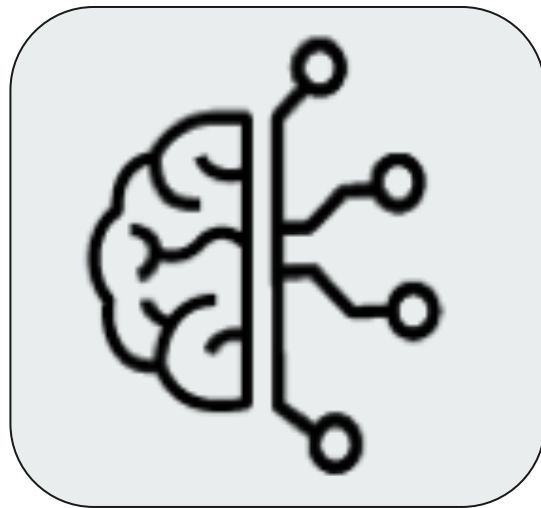
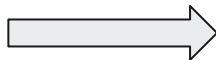
[Moore et al., 2016](#)

Background: Environmental SES



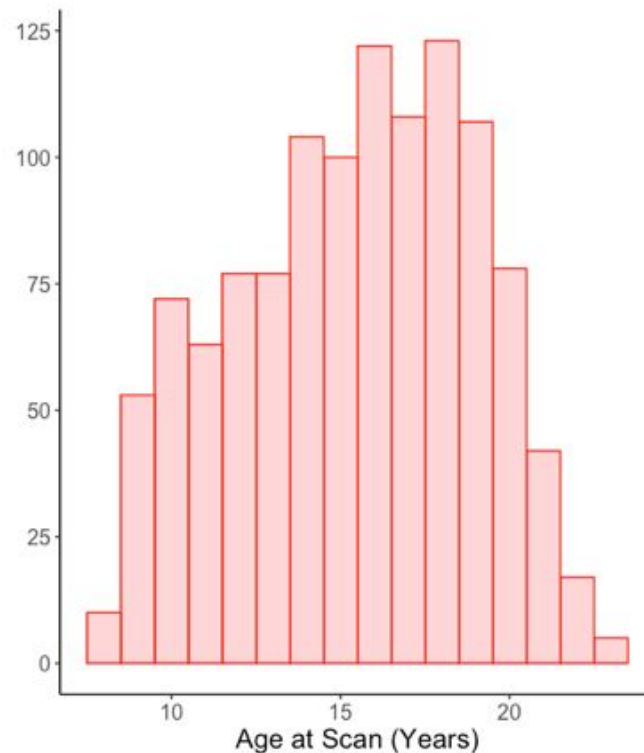
[Gur et al., 2019](#)

Current Study



Sample: PNC n1601 Data-freeze

- 1,158 participants (622 females)
- Age range: 8-22
- Exclusions for medical comorbidities that impact brain function, image quality, or incomplete clinical data



Methods: Clinical and Demographic Measures

- Geo-coded variables derived from participant address
- Clinical + demographic data collected from a structured clinical interview
 - Parental education level
 - Exposure to traumatic stress

Table 1.

Unidimensional, two-, and three-factor solutions of the social environment census variables

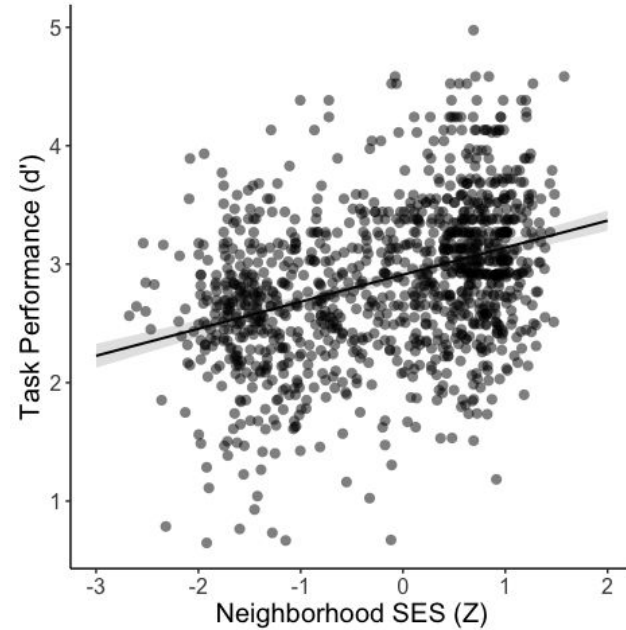
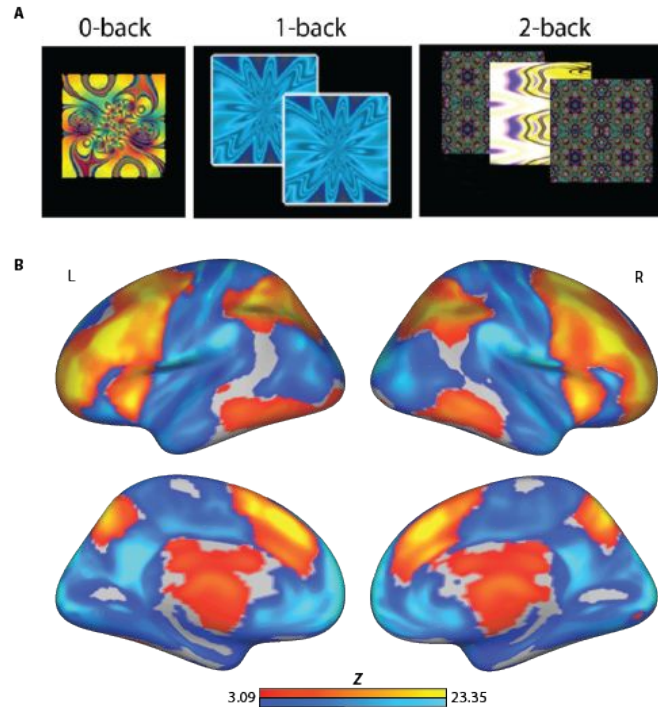
Variable	Uni	Two-factor		Three-factor		
		F1	F2	F1	F2	F3
Percent married	0.84	0.85		0.68	0.35	
Percent in poverty	-0.86	-0.86		-0.81		
Median family income	0.82	0.82		0.68		
Percent high school plus	0.75	0.74		0.69		
Population density	-0.71	-0.71		-0.53		-0.27
Percent employed	0.66	0.68	-0.31	0.89	-0.31	
Percent vacant lots	-0.60	-0.60		-0.61		
Median age	0.60	0.61				0.92
Percent female	-0.26	-0.26		-0.37		
Percent with children	0.09		0.90		0.83	
Percent English speakers	0.24		-0.54		-0.48	
Avg household size	0.02		0.37		0.41	
Percent non-family households	-0.19		-0.34		-0.42	-0.30
Inter-factor correlations (Phi)						
	F1	-		-		
	F2	0.02	-	0.05	-	
	F3			0.47	0.05	-

Uni, unidimensional; Avg, average; extraction method, least squares; rotation, oblimin.

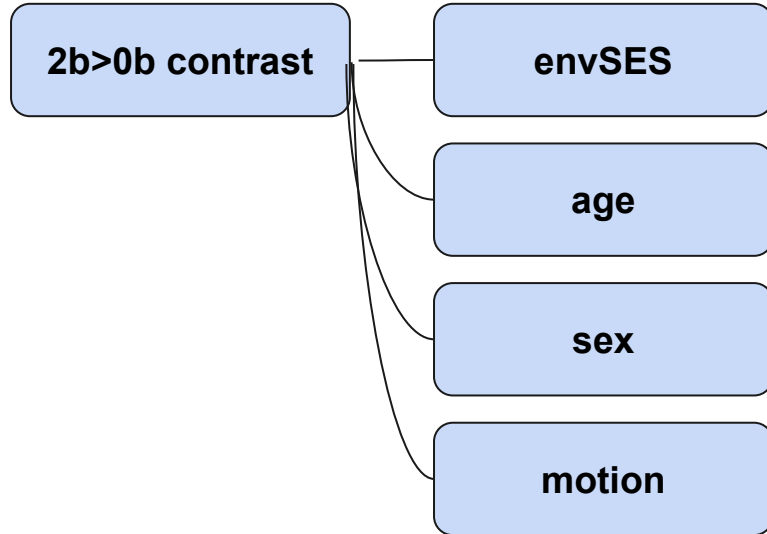
Loadings with absolute value <0.25 removed in the two- and three-factor models.

[Moore et al., 2016](#)

Methods: Task Paradigm, Image Acquisition, and Image Processing



Methods: Mass Univariate Voxel-wise analysis



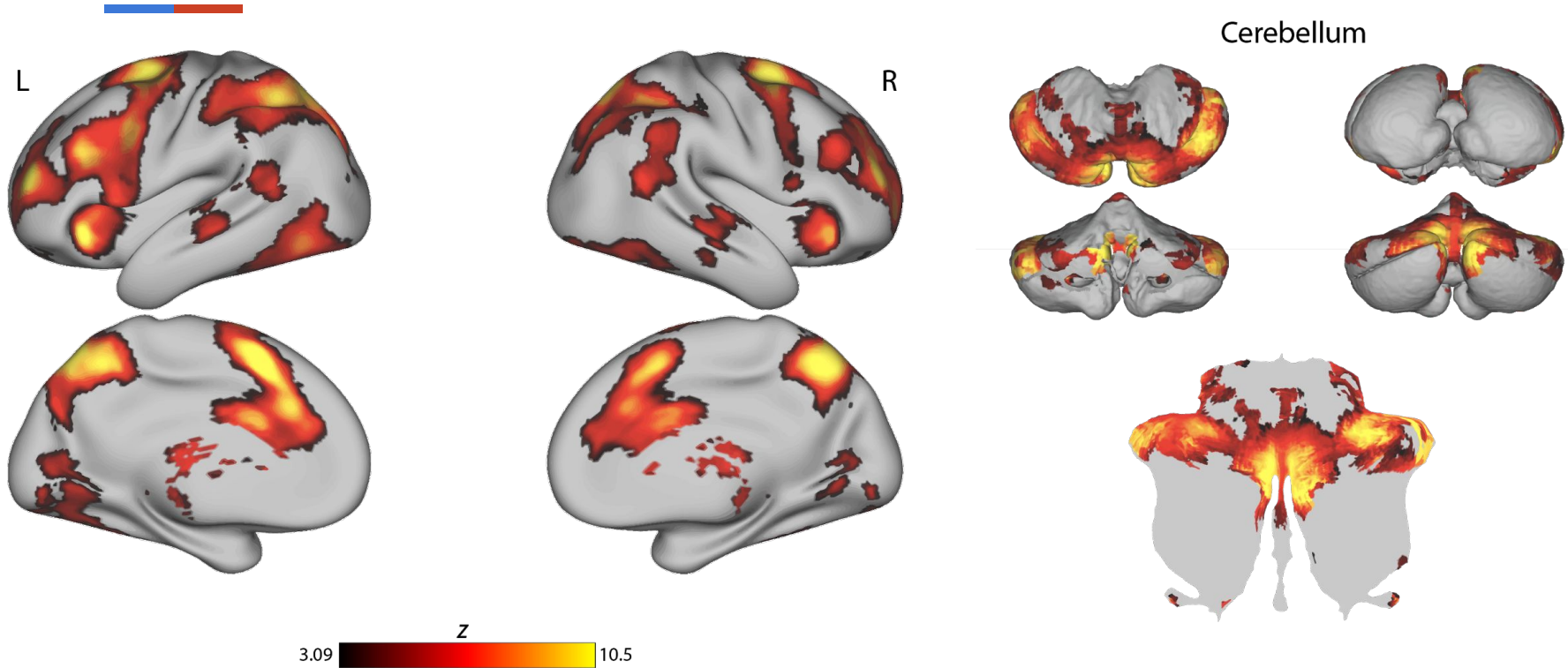
[Help](#) [Login](#)

FEAT/ [UserGuide](#)



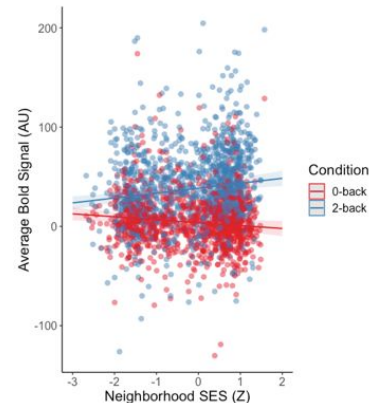
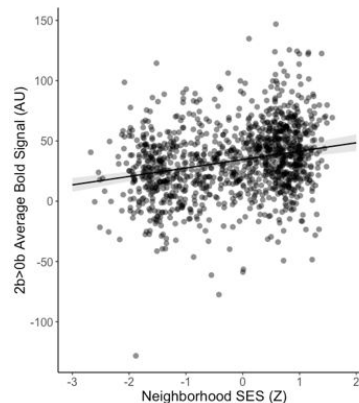
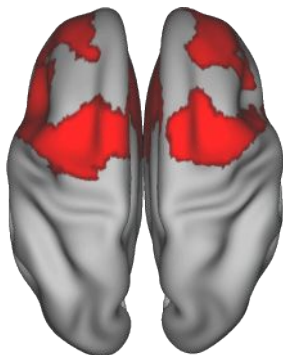
Results

Results: Mass Univariate Voxelwise Analysis

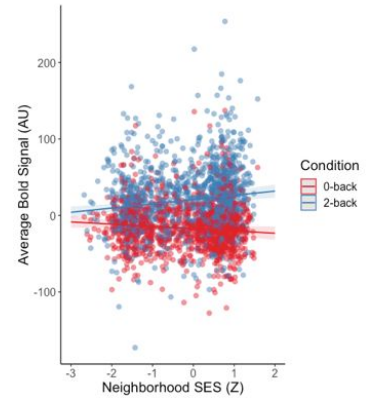
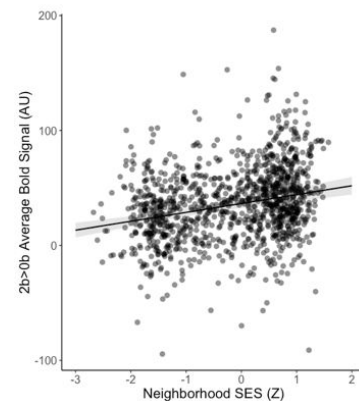
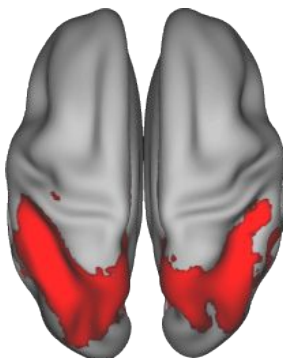


Results: Mass Univariate Voxelwise Analysis

Prefrontal Cluster



Parietal Cluster



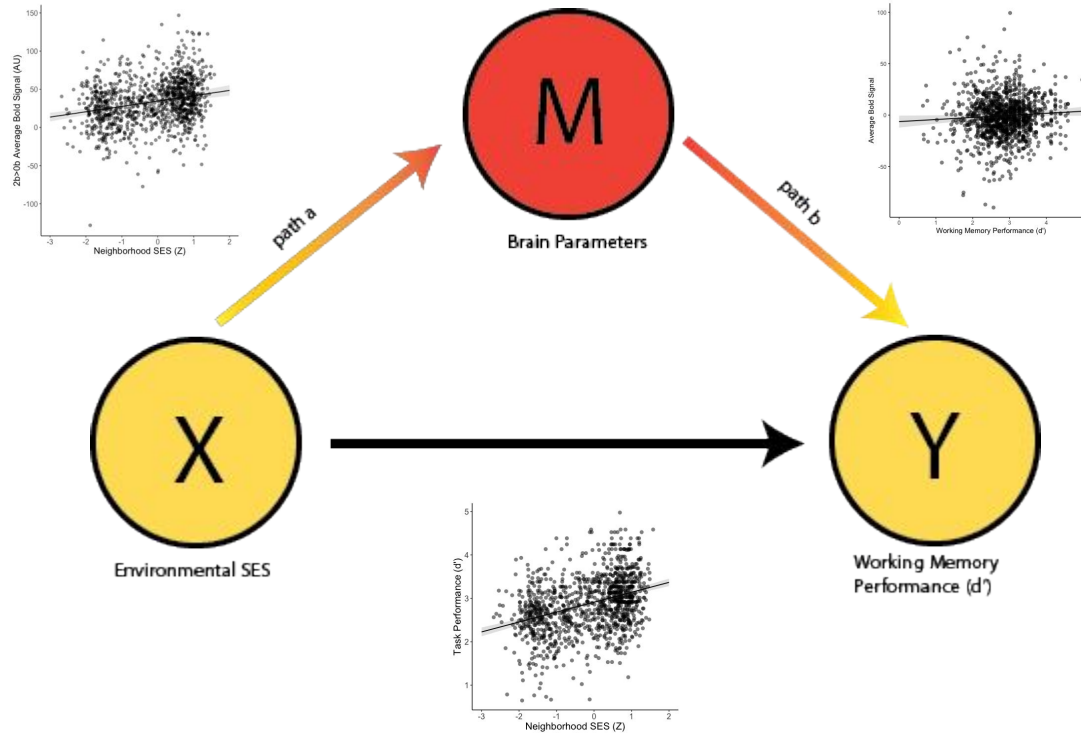
Results: Sensitivity Analysis

- Additional Covariates
 - Maternal Education
 - Paternal Education
 - Exposure to Traumatic stress
 - Task performance (d')

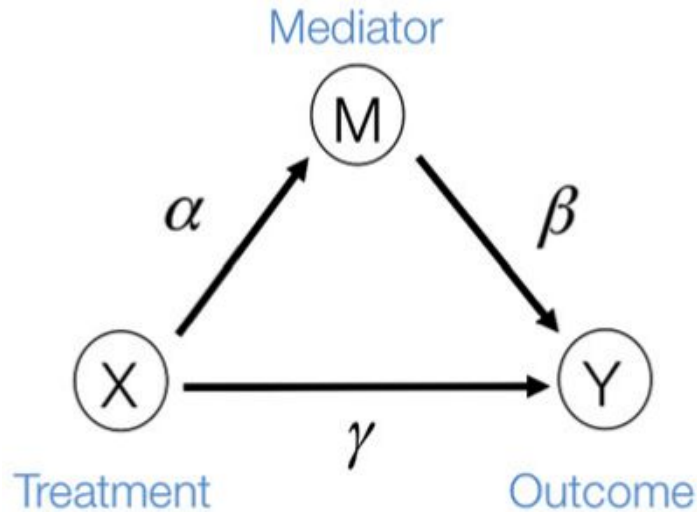
Table 1: Sensitivity Analysis (n=1059); avg voxel height=3.09, cluster probability $p < 0.05$, reported RAI.

Cluster Region	Voxels	p	Max	Peak	Peak	Peak
				X (mm)	Y (mm)	Z (mm)
Large parietal cluster, including bilateral superior parietal cortex and precuneus	1568	<0.0001	5.99	8	-66	64
Left Prefrontal Cluster	977	<0.0001	5.16	-30	-4	66
Right Prefrontal Cluster	694	<0.001	4.84	30	2	68
Left DLPFC	485	0.0021	4.89	-30	46	42

Current Study



Methods: Multivariate Mediation Analysis



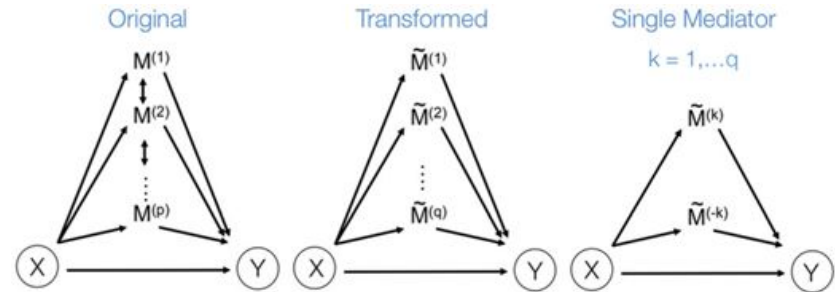
[Chen et al., 2017](#)



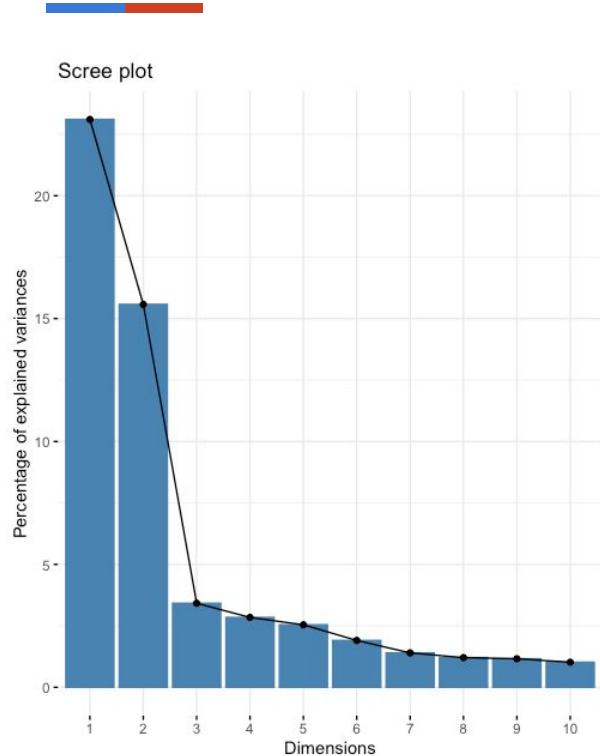
Cognitive and Affective Neuroscience Laboratory

CANlab and friends: Analysis tools for neuroimaging and beyond

📍 Hanover, NH 🌐 <http://canlab.github.io>



Methods: Multivariate Mediation Analysis



Step 1: Initial Principal Component Analysis in R

Step 2: Split Data into testing and training sets

Step 3: Run Mediation Analysis on training data

Step 4: Apply PDM to testing data



Results

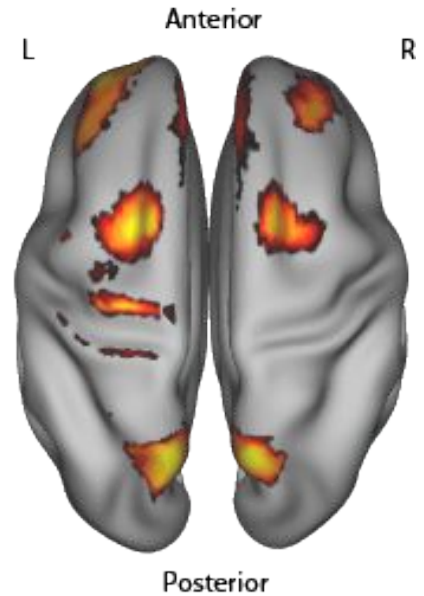
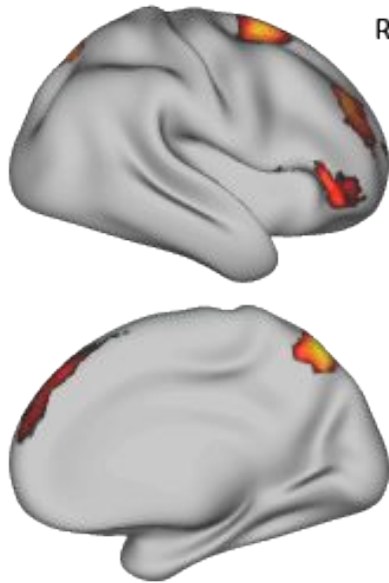
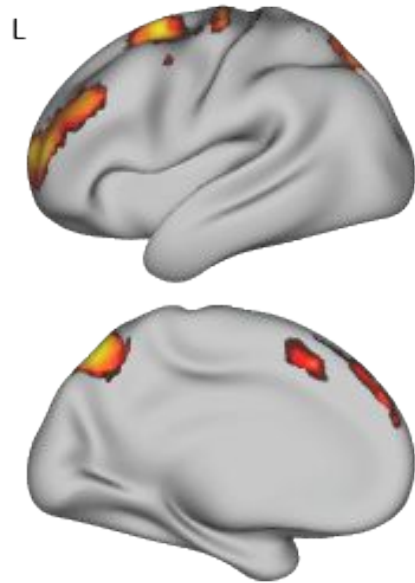
Results: Mediation



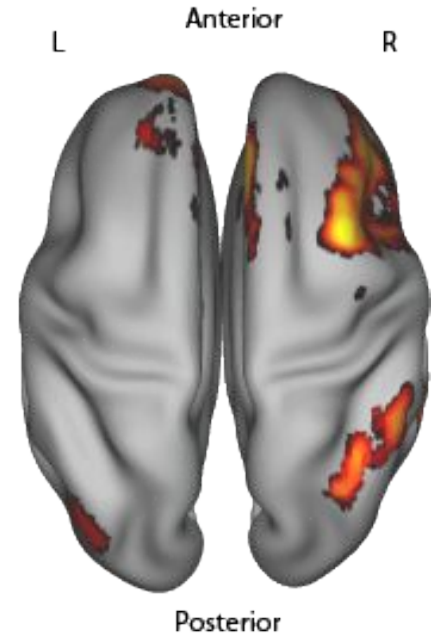
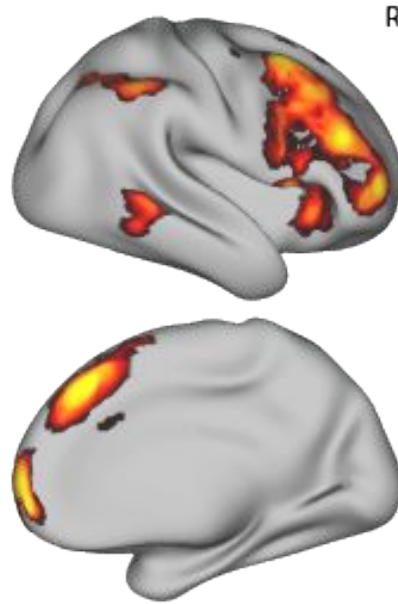
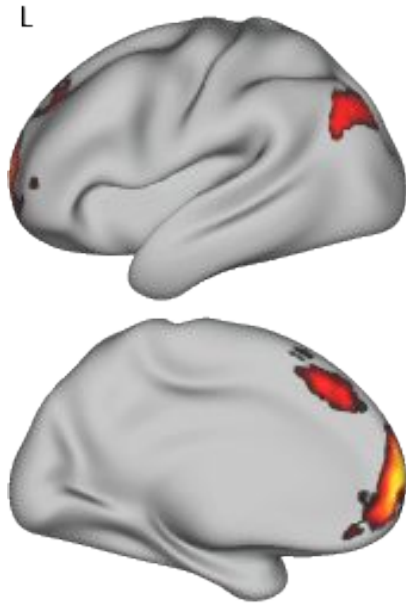
Table 4: significance of ab' path after FDR correction in testing and training datasets

	PDM1	PDM2	PDM3	PDM4	PDM5	PDM6	PDM7	PDM8	PDM9
Train	0.0013	0.0013	0.0368	0.0214	0.0368	0.2811	0.4740	0.6860	0.6860
Test	<0.001	<0.001	0.2419	0.0612	0.2136	0.7950	0.6195	0.9786	0.6905

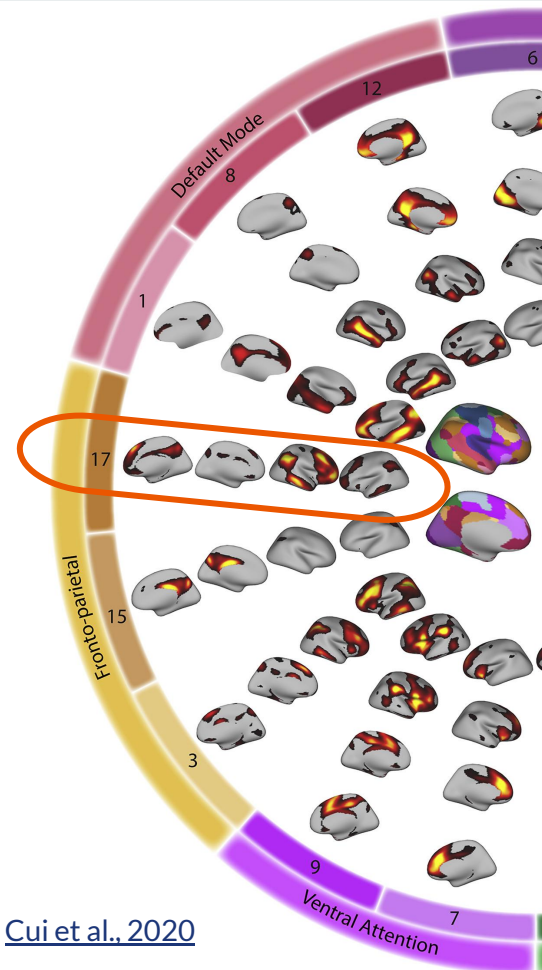
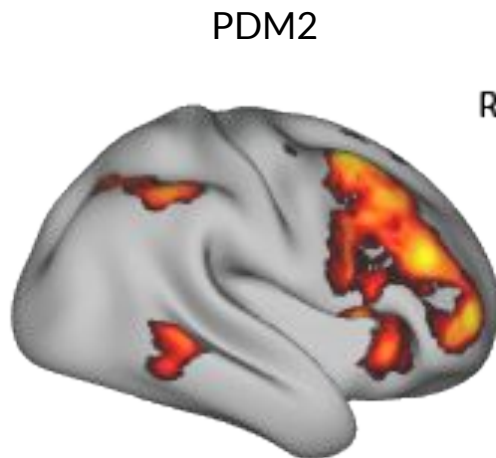
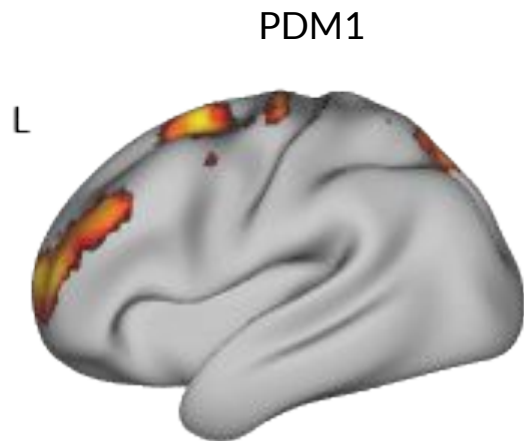
Results: Mediation



Results: Mediation



Results: Mediation



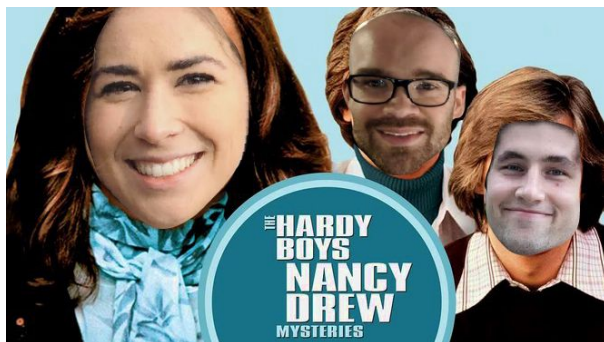
Conclusion + Next Steps

- Findings emphasize the importance of environment in shaping executive system function
- Next steps:
 - Multimodal
 - Longitudinal
 - Theoretical
 - Study for the GRE

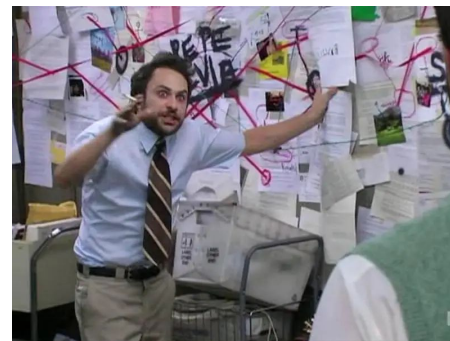
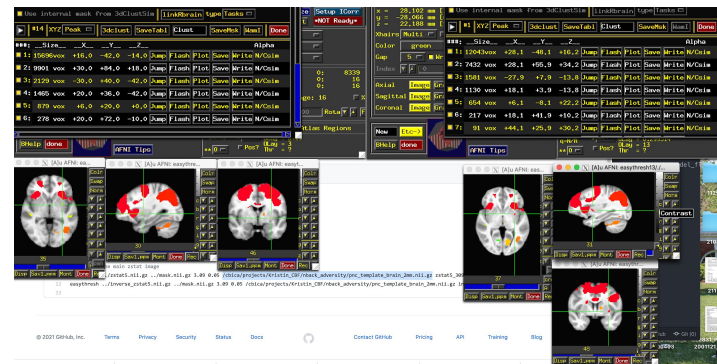
	β	<i>SE</i>	<i>p</i>
Deprivation			
Parental education ^b			
Inhibition	0.21**	0.38	.01
Working memory	0.10	0.42	.236
Global EF	0.01	2.28	.982
Neglect ²			
Inhibition	0.25**	0.09	.008
Working memory	0.14	0.10	.152
Global EF	0.25**	0.57	.007
Threat			
Community violence ^c			
Inhibition	0.04	0.17	.638
Working memory	0.04	0.18	.609
Global EF	0.01	0.98	.851
Abuse ^c			
Inhibition	0.07	0.07	.424
Working memory	0.01	0.07	.902
Global EF	0.01	0.39	.953

[Sheridan et al., 2017](#)

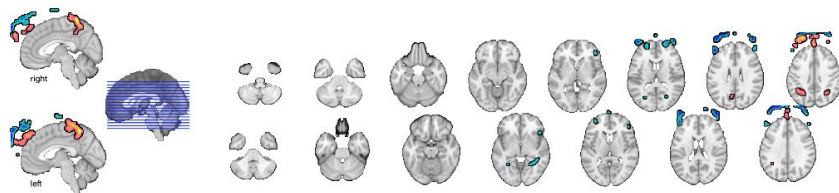
THANK YOU!



How it
looked



How
it felt



```
Message from sys-bergman@cubic-login1 on pts/25 at 12:14 ...  
Your Matlab process is using 75+GB of RAM. That is excessive on a shared interactive node. Please kill it and run it as an SGE job with dedicated  
resources  
EOF
```