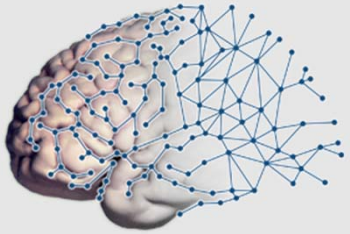

Behavioral and Neural Mechanisms of Trauma Symptomatology in ASD in the ABCD Study

Tarjan Series February 22, 2021

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Shula Green, PhD
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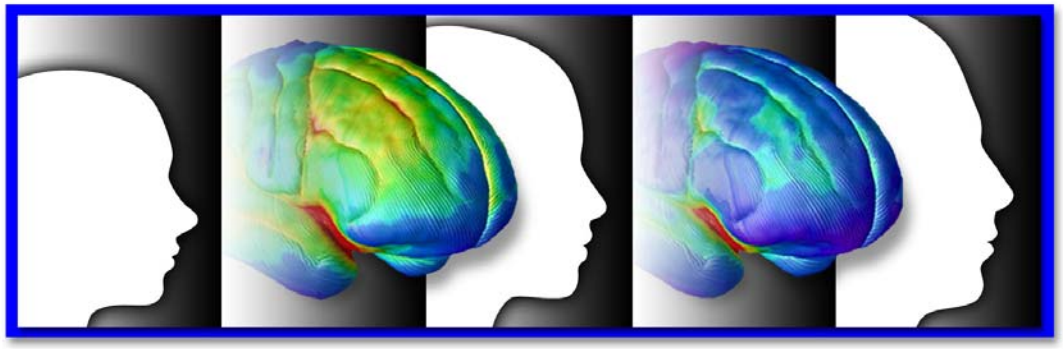
Introduction

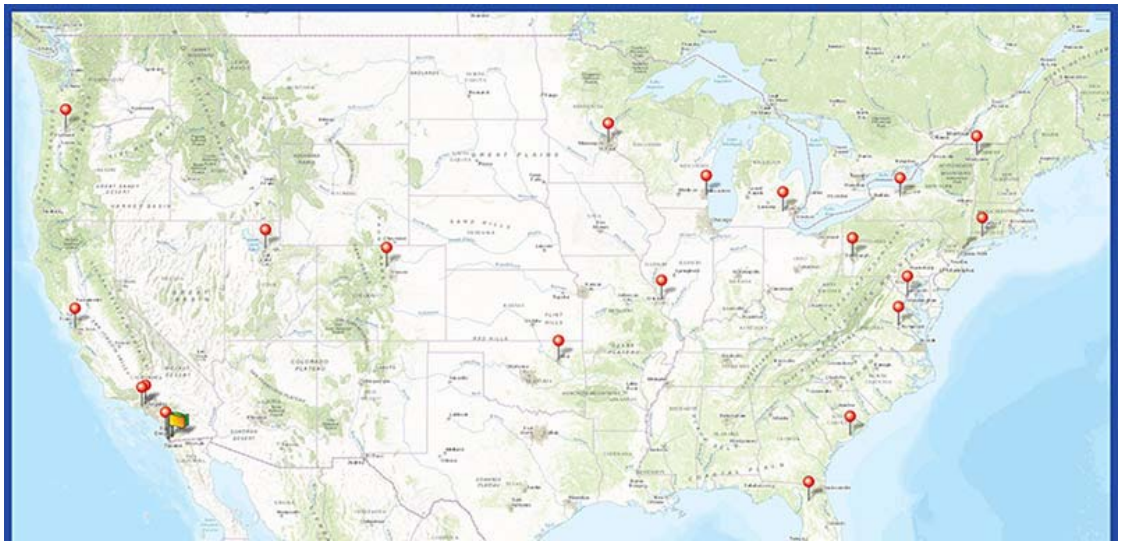
Autism Spectrum Disorder

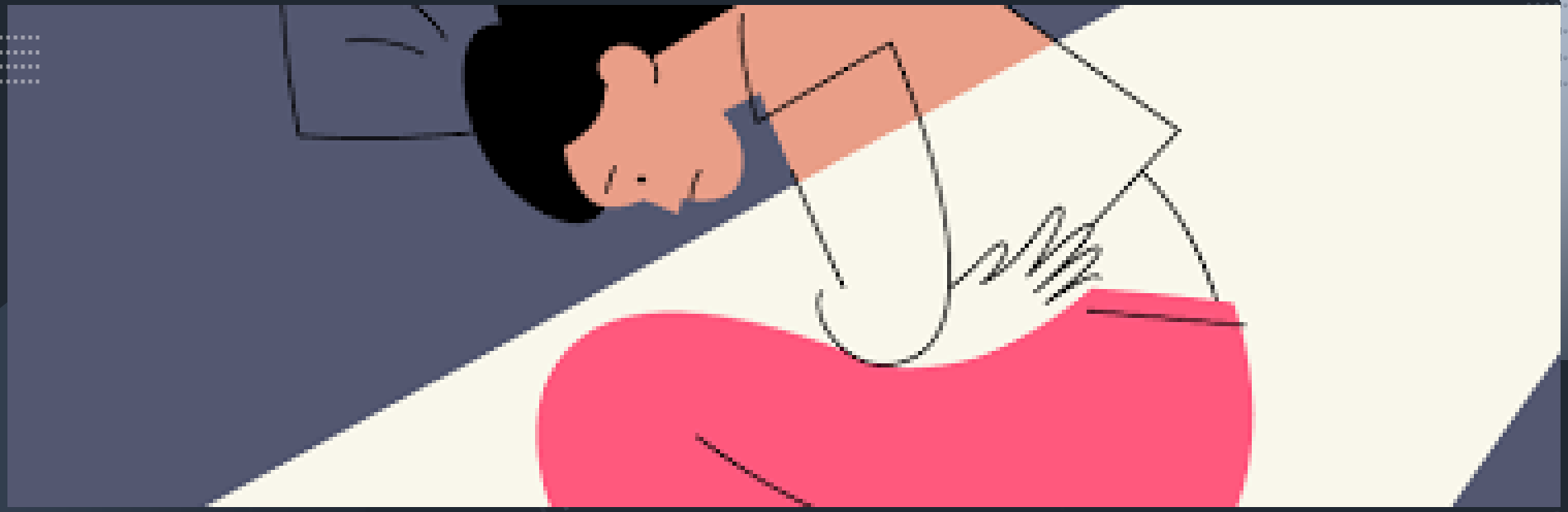
Adverse Childhood Experiences (ACEs)

Haruvi-Lamdan et al., Psychological Trauma: Theory, Research, Practice, and Policy, 2018
Hoffman et al., Neurobiology of Stress 2019
Roberts et al., Child Abuse and Neglect, 2015

(ABCD)
Cohort Size:
11,874 Youth







Post Traumatic Stress Disorder

Diagnostic Criteria

- Exposure to trauma
- Intrusive symptoms
- Avoidance
- Changes in mood and cognition
- Hyperarousal
- Functional impairment

ASD and Trauma

Interpersonal Trauma

Sensory Over-Responsivity

Participants – Matching

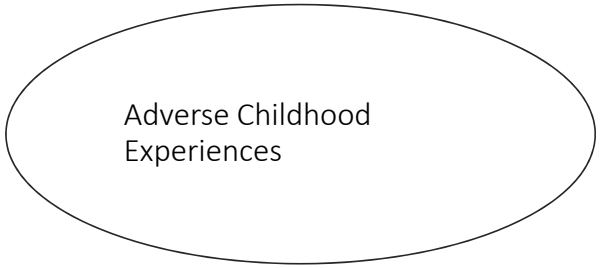
	ASD (n = 192)	TD (n = 960)	P-value
Females (n) (%)	26 (13.5%)	135 (14.0%)	χ^2, p = 0.93
Age (mean ± SD)	120.2 ± 7.4	120.3 ± 7.4	t-test, p = 0.89
IQ Composite (mean ± SD)	45.8 ± 10.9	46.5 ± 13.6	t-test, p = 0.52
SES (% FPL) (mean ± SD)	3.5 ± 3.9	3.9 ± 2.7	t-test, p = 0.74

% FPL (2018 Federal Poverty Level) = Annual Household Income /12,140 + (Household Size -1)*4,320
https://aspe.hhs.gov/2018-poverty-guidelines

Demographics

Group	Asian	Black	Latinx	white	Multi	Other
ASD (n = 192)	5 (2.6%)	42 (21.9%)	5 (2.6%)	111 (57.8%)	29 (15.1%)	0 (0%)
TD (n = 960)	31 (3.2%)	206 (21.5%)	55 (5.7%)	485 (50.5%)	166 (17.3%)	17 (1.2%)

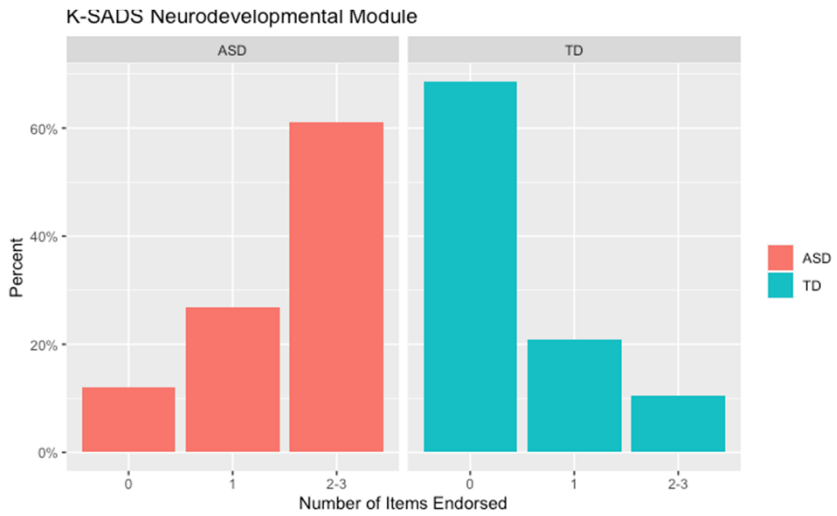
*Participants not matched on race or ethnicity

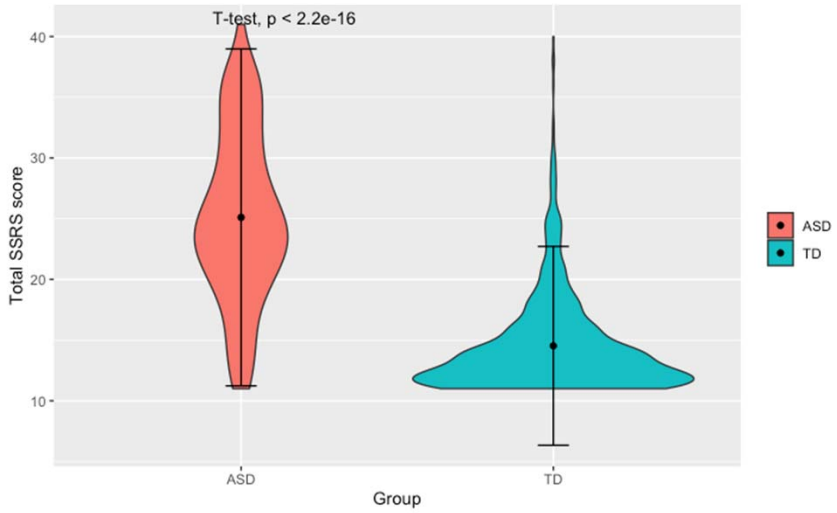


Domains	# items	Visit
Community Violence	2	0
		0
	1	2
	1	1
Discrimination	1	1
Domestic Violence	1	0
Emotional Neglect	1*	2
Family Budget Instability	3	1
	2	1
Family Conflict	1	1
	1	2
Family Delinquency	2	1
		0
Family Mental Illness	1	1
	3	0
	6	0
Family Substance Use	1	1
Family/Friend Illness or Death	5	1
	1	0
Food Insecurity	1	1
Housing Instability	4	1
Low Family Cohesion	1	1
	7	1
Personal Delinquency	1	1
Personal Illness/accident	2	1
	4	0
Personal Violence	1	1
Physical Abuse	4	0
Physical Neglect	1	2
School Instability	1	1
	1	2
Sexual Abuse	3	0

Substantiating ASD Diagnosis

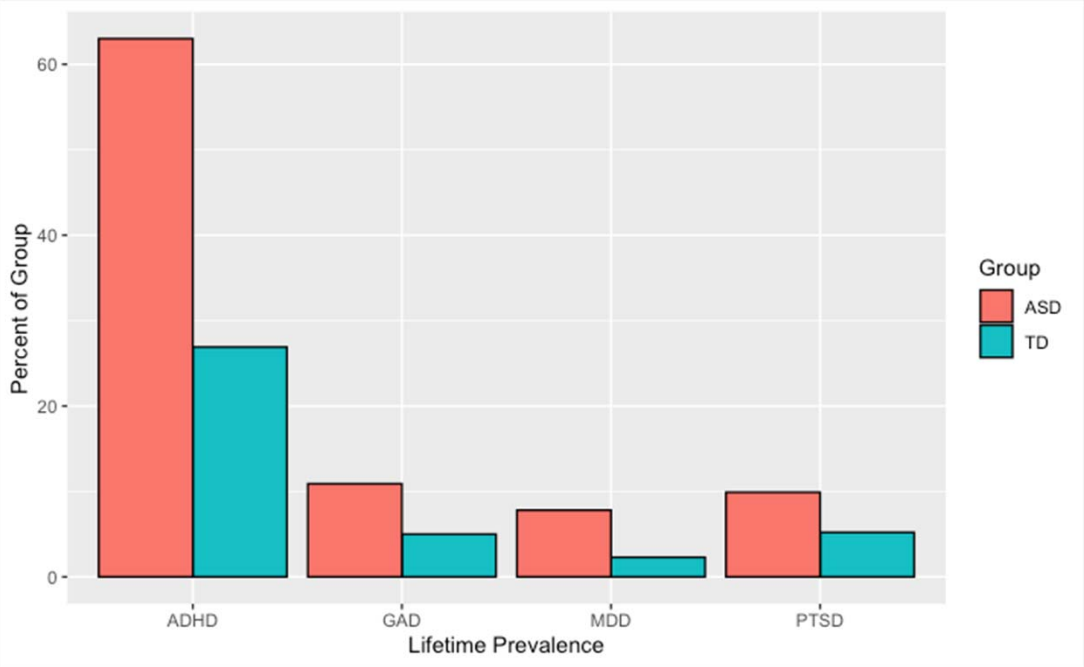
- **KSADS Neurodevelopmental Module**
  - Unusual body movements
  - Strict Routines
  - Poor Eye Contact
- **Short Social Responsiveness Scale (SSRS)**
- 11-item parent-reported survey taken from the 65-item Social Responsiveness Scale-2 (SRS-2; Constantino, 2003)
- Identifies and measures the severity of impairment across social domains in ASD individuals





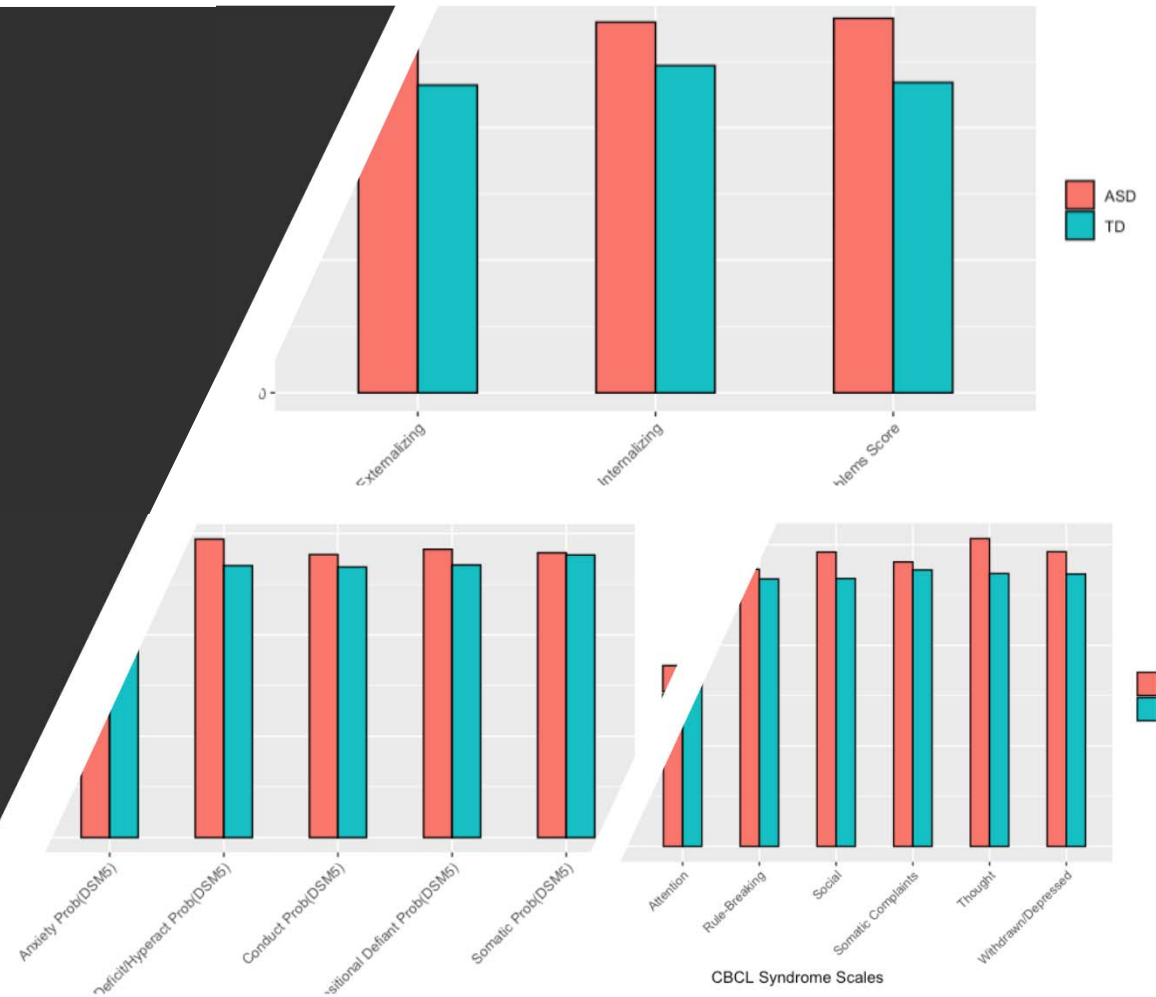
Comorbidities

Group	ADHD	GAD	MDD	PTSD
ASD (n = 192)	121 (63%)	21 (10.9%)	15 (7.81%)	19 (9.9%)
TD (n = 960)	258 (26.9%)	48 (5%)	22 (2.29%)	50 (5.21%)
ChiSq-value (p-value)	93.1 (5.06E-22)	8.99 (0.00271)	14 (0.000187)	5.44 (0.0197)

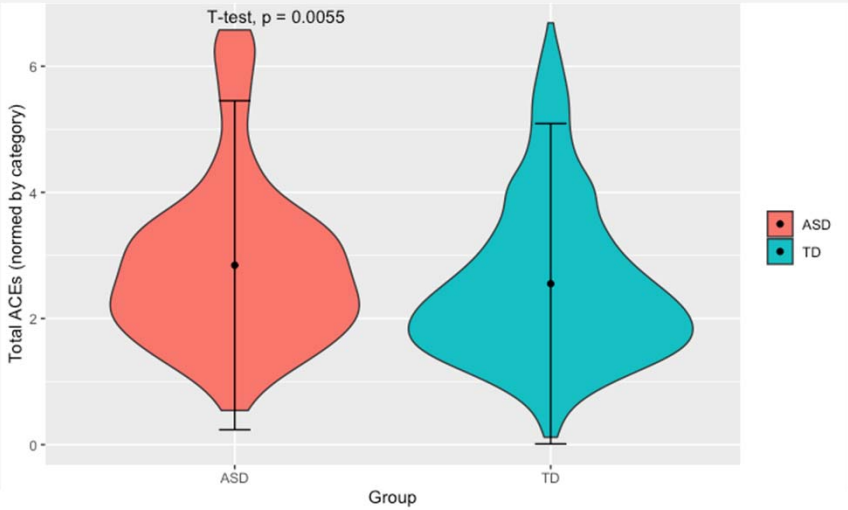


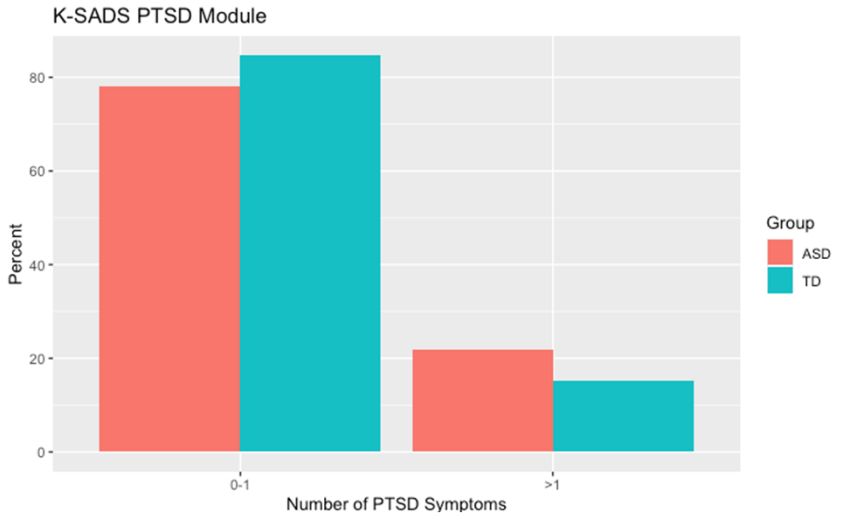
Child Behavior Checklist

- **Syndrome scales** reflect sets of co-occurring problems and each scale does not map onto a DSM diagnostic category.
- **DSM-Oriented scales** reflect a broad emotional or behavioral problem that correspond to a broad DSM diagnostic category



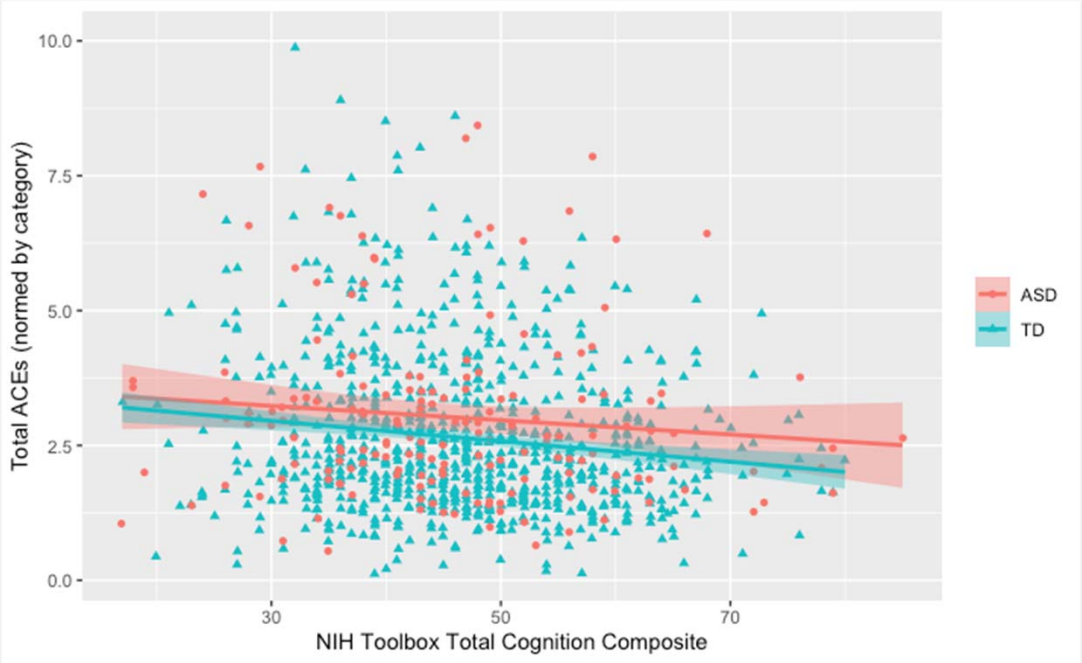
ACEs and PTSD symptoms between groups



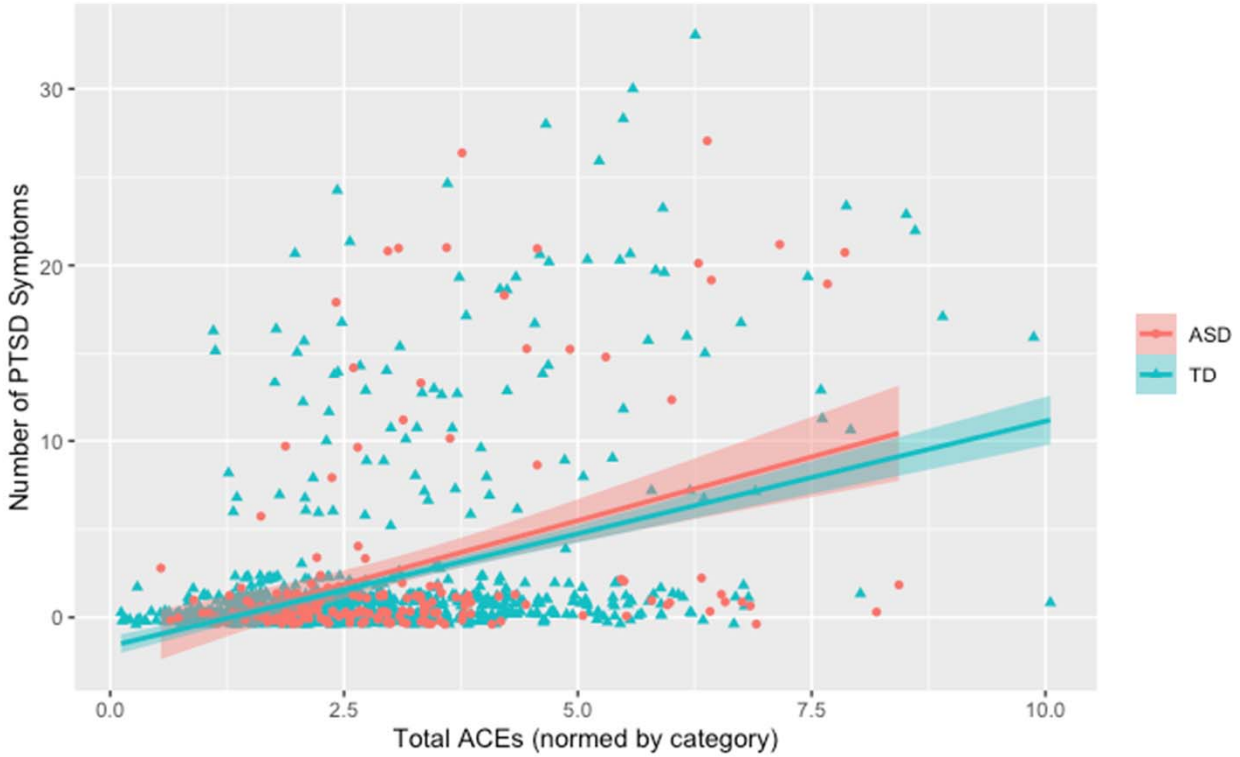


IQ & ACEs

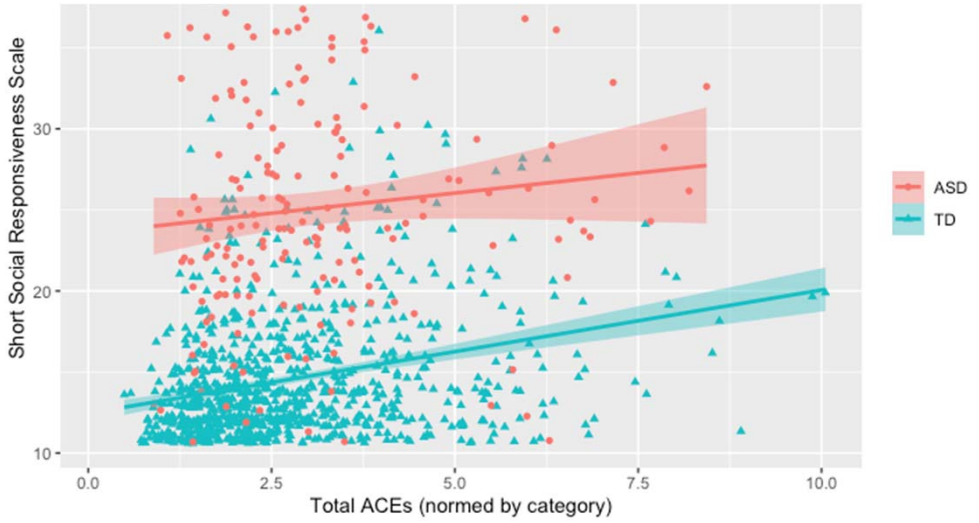
- NIHTBX Total used as covariate in all ACEs analyses



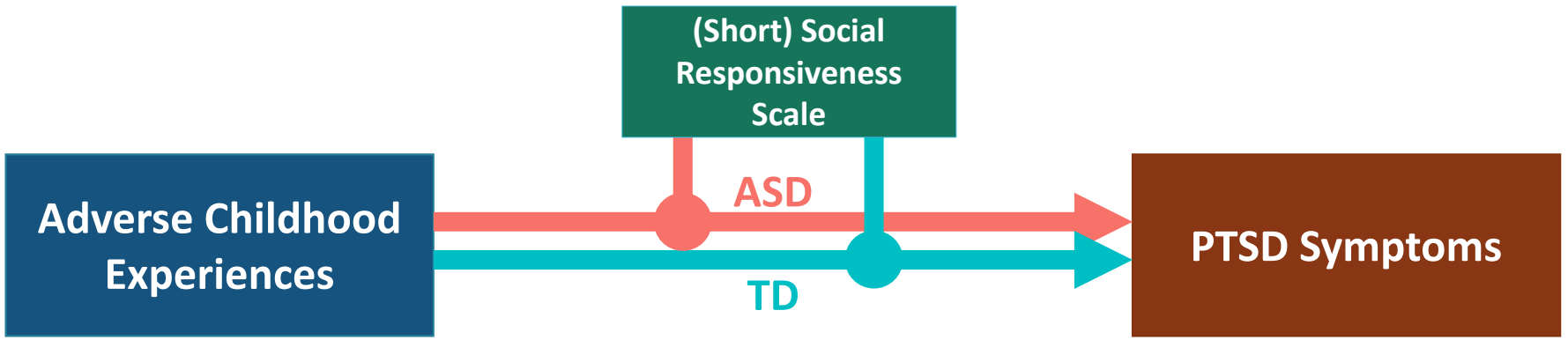
More ACEs is associated with more PTSD Symptoms



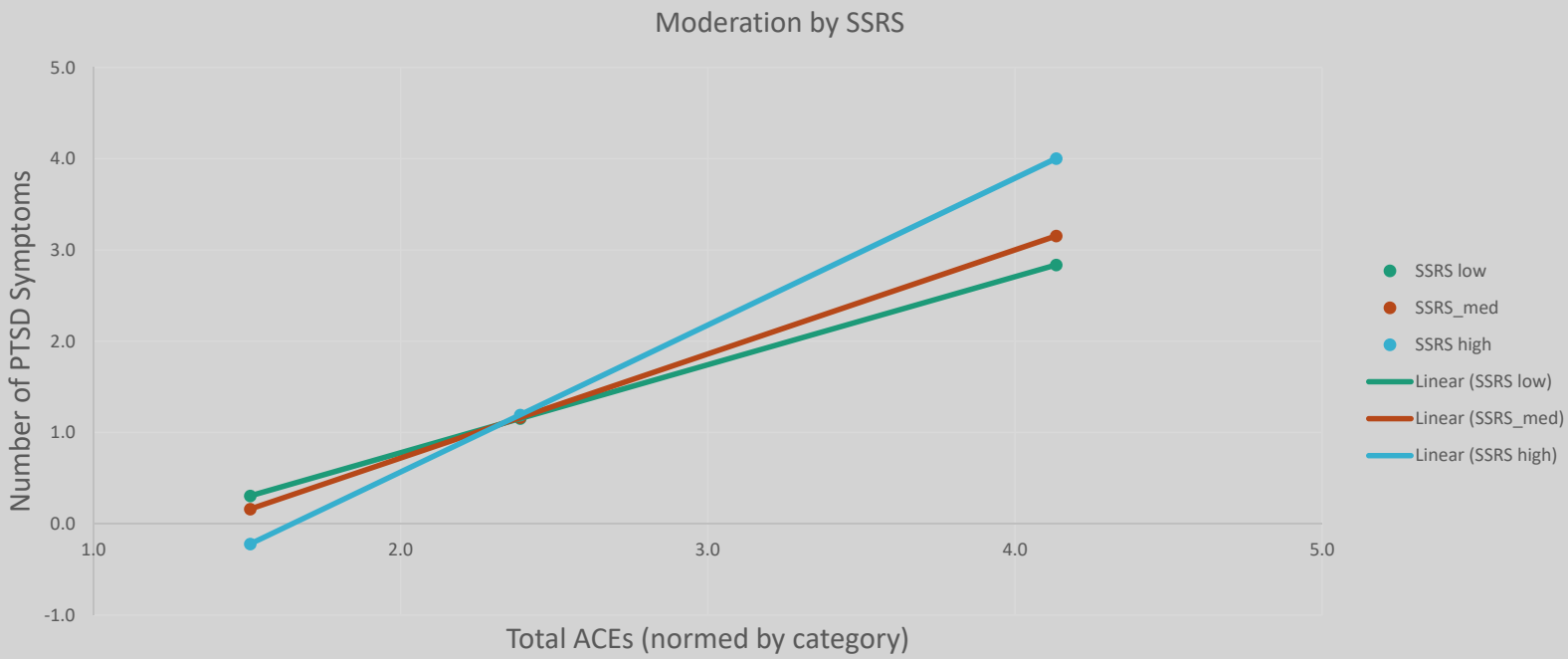
Short Social Responsiveness Scale



Moderating the relationship between ACEs and PTSD Symptoms



Moderation by SSRS

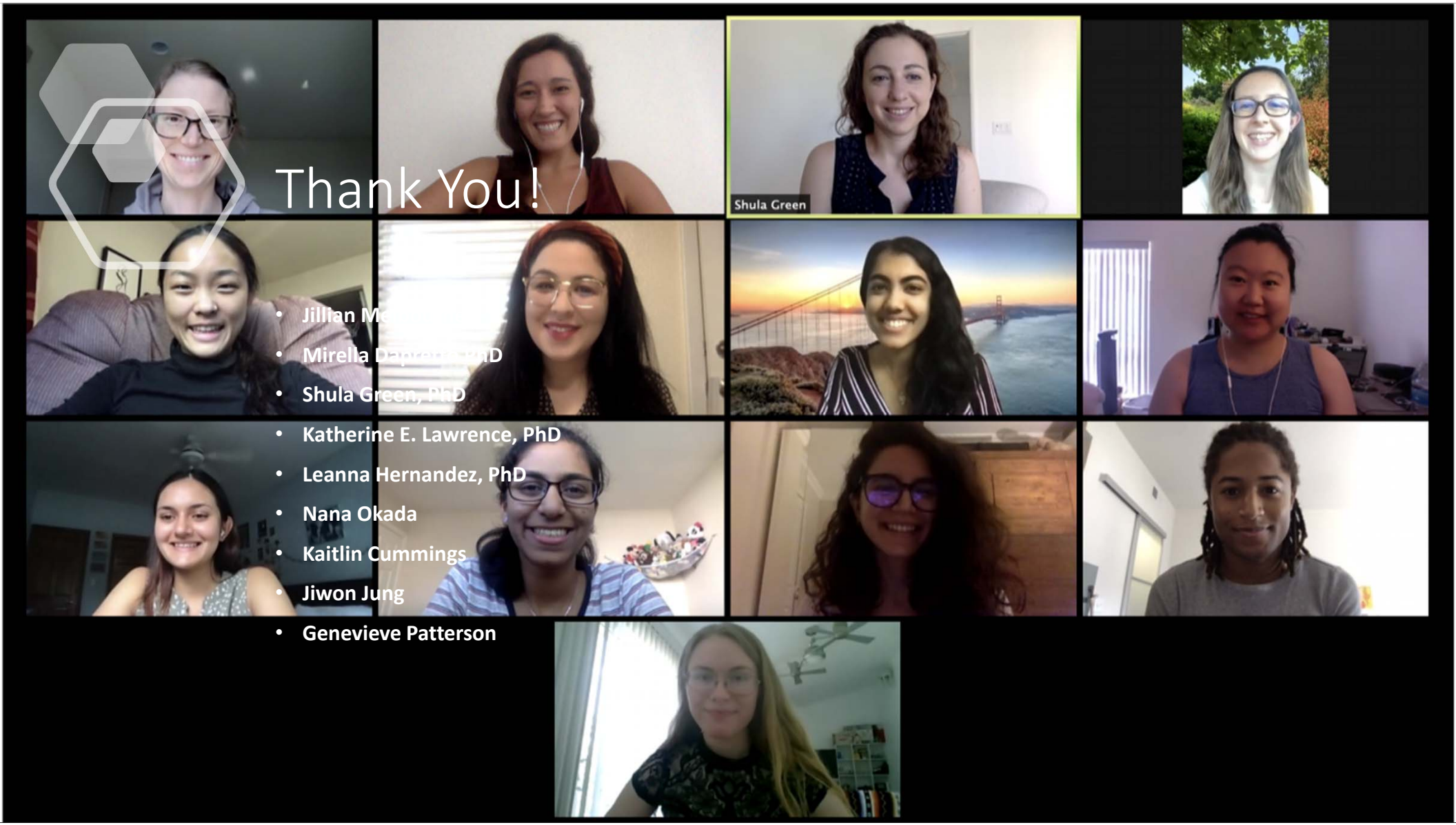


Conclusions

- The ABCD dataset confirms previous findings of more Adverse Childhood Experiences and more PTSD symptoms in individuals with ASD compared to matched TD youth.
- Overall, the relationship between ACEs and PTSD symptoms is similar between ASD and TD youth.
- In TD youth, ADHD problems partially mediates the relationship between ACEs and PTSD.
- In ASD and TD youth, social responsiveness moderates the relationship such that lower social skills is associated with greater PTSD symptoms per ACE

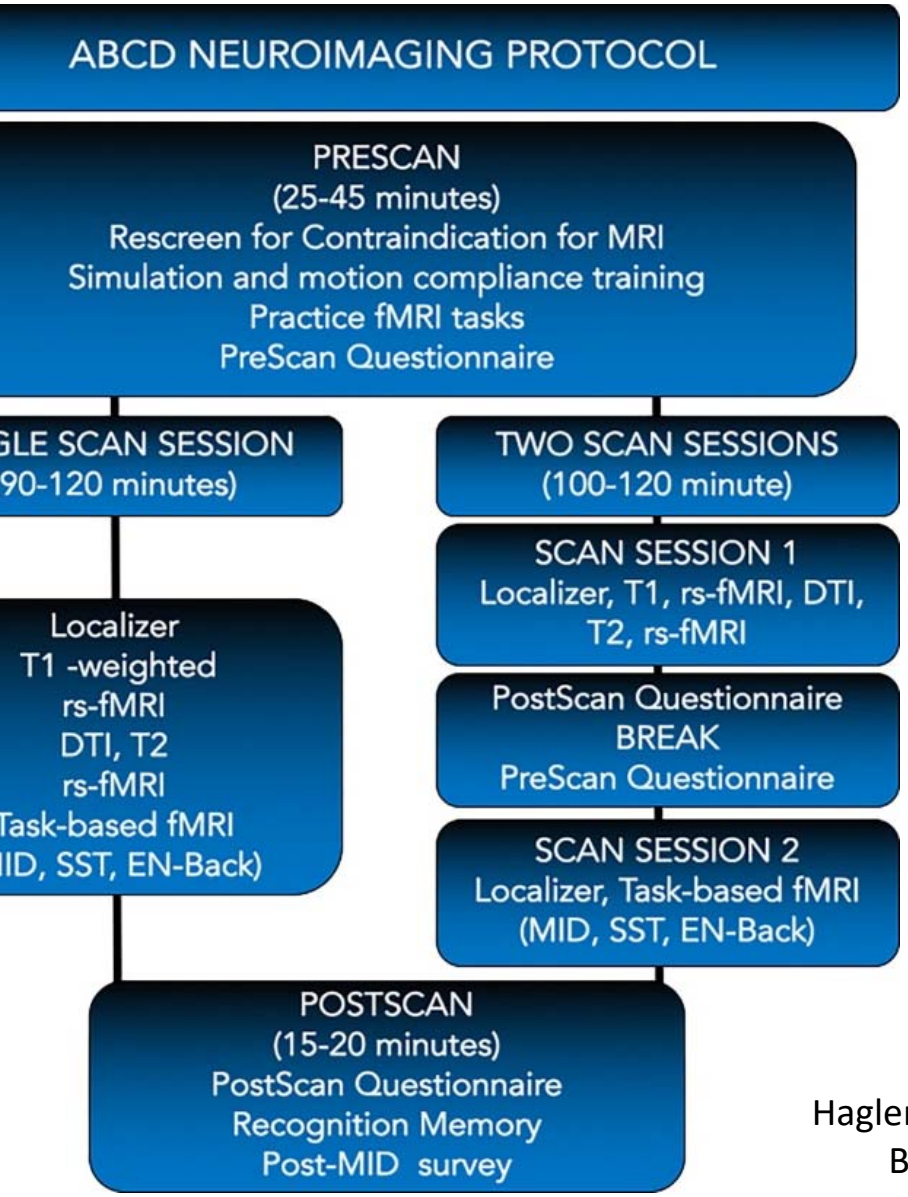
Future Direction

Explore	Explore bullying measures
Examine	Examine fcMRI measures provided by the ABCD study in areas of interest
Follow	Follow sample longitudinally
Use	Use local data to better understand sensory component



Thank You!

- Jillian M[illegible]
- Mirella D[illegible], PhD
- Shula Green, PhD
- Katherine E. Lawrence, PhD
- Leanna Hernandez, PhD
- Nana Okada
- Kaitlin Cummings
- Jiwon Jung
- Genevieve Patterson



ABCD MRI Protocol

Structural MRI : T1-weighted and T2-weighted (T2w) structural MRI (sMRI),

Diffusion MRI (dMRI),

Functional MRI (fMRI)

Resting-State fMRI (rs-fMRI)

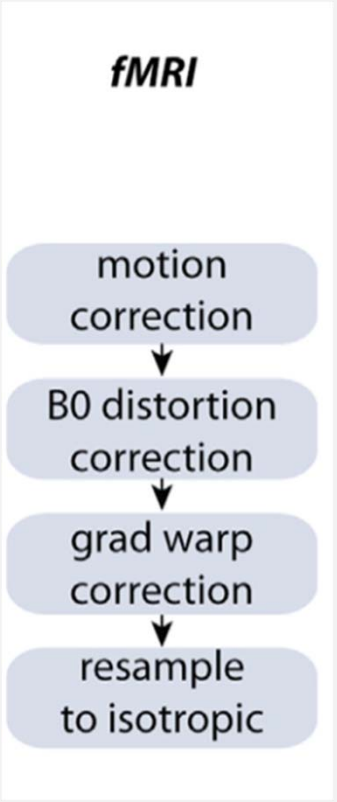
Task-fMRI The fMRI

- Modified Monetary Incentive Delay Task (MID)
- Stop Signal Task (SSTemotional)
- N-Back Task (EN-back)

Hagler, D. J. *et al.* Image processing and analysis methods for the Adolescent Brain Cognitive Development Study. *NeuroImage* **202**, 116091 (2019).

rsfMRI Pre-Processing

- Removal of initial frames
- Normalization of voxel time series
- Regression
- Temporal Filtering
- Calculation of ROI-average time courses



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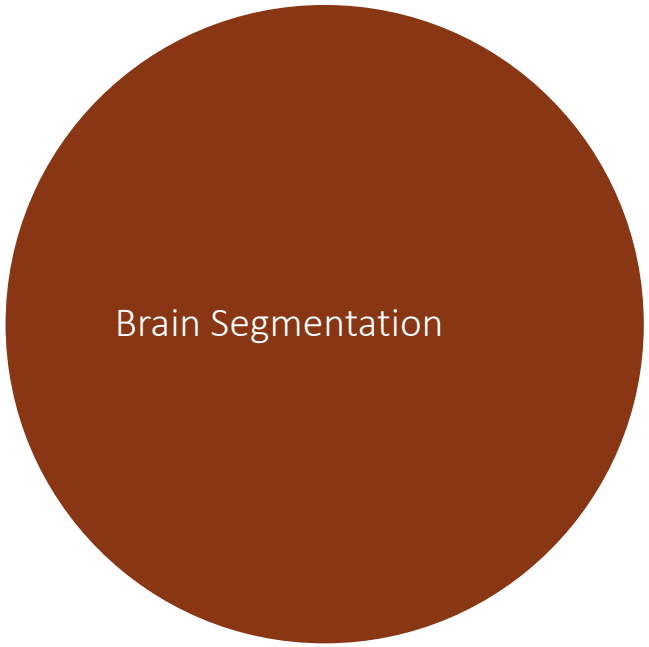
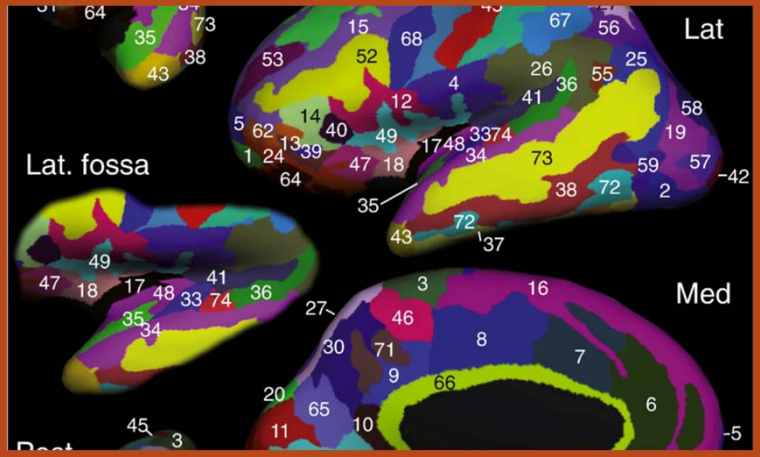
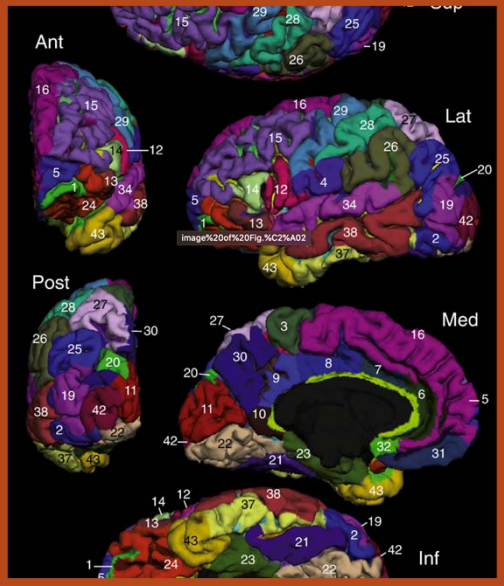
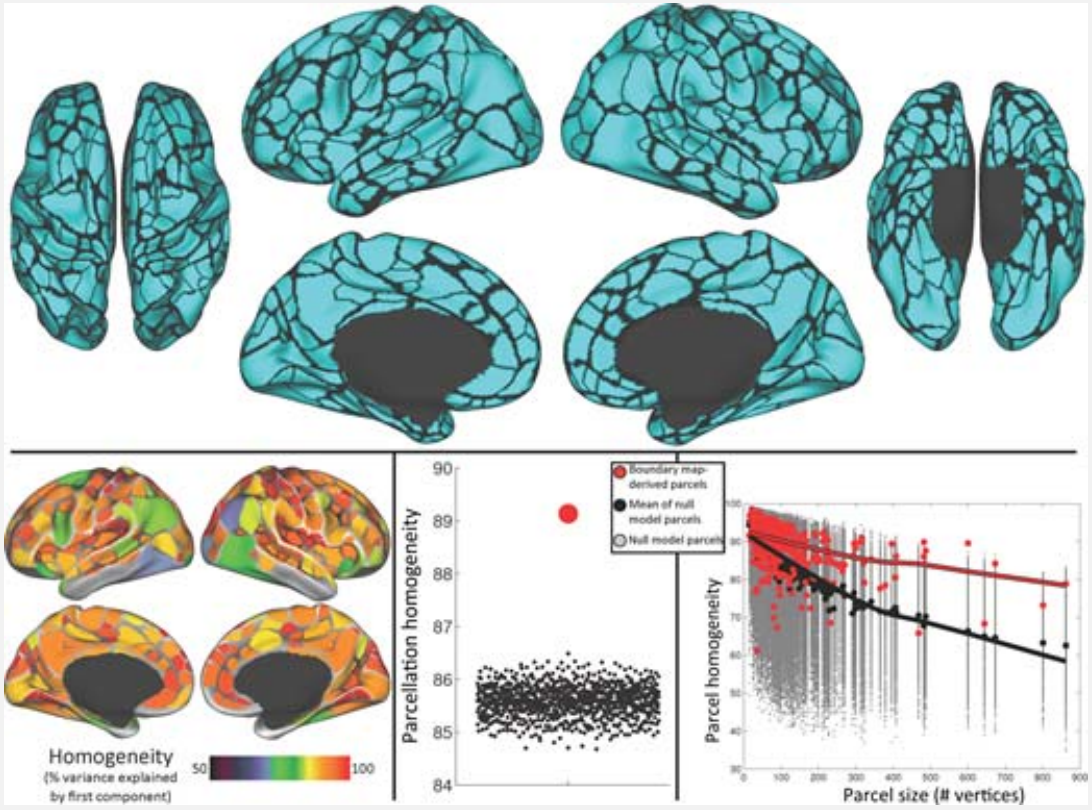


- Subcortical structures are labelled using an automated, atlas-based, volumetric segmentation procedure (Fischl et al., 2002)
- Cortical gray matter and underlying white matter voxels are assigned based on surface-based nonlinear registration to the atlas based on cortical folding patterns (Fischl et al., 1999b) and Bayesian classification rules (Desikan et al., 2006; Destrieux et al., 2010)
- Functionally-defined parcels, based on resting-state correlations in fMRI (Gordon et al., 2016), are resampled from atlas-space to individual subject-space, and used for resting-state fMRI analysis





Destrieux et al., 2010



RSFC Post-Processing

- Network Correlation Analysis
  - Different regions of interest (ROIs) were defined using Free Surfer's anatomically defined parcellations and Gordon Parcellations
  - ROI's correlated pair-wise using Fisher to z-statistic averaged within or between networks

Gordon, E. M. *et al.* Generation and Evaluation of a Cortical Area Parcellation from Resting-State Correlations. *Cereb. Cortex* **26**, 288–303 (2016).

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