

# Towards Precision Treatments for Autism Spectrum Disorder(s)

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**THE GEORGE  
WASHINGTON  
UNIVERSITY**

WASHINGTON, DC



**Children's  
National...**

[www.autism.gwu.edu](http://www.autism.gwu.edu)

# Disclosures of Potential Conflicts

Source	Research Funding	Advisor/ Consultant	Employee	Speakers' Bureau	Books, Intellectual Property	In-kind Services (travel)	Stock or Equity
NIMH	x						
NICHD	x						
NINDS	x						
Carbonell Family	x						
Autism Speaks	x						
Autism Science Foundation	x						
Simons Foundation	x						
John Merck Scholars	x						
Johnson & Johnson		x					
Lynnhaven Oyster Company							x

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# Translational Research at the Virginia Science & Technology Campus Ashburn, Virginia

Soft Opening, March 15<sup>th</sup> 2018

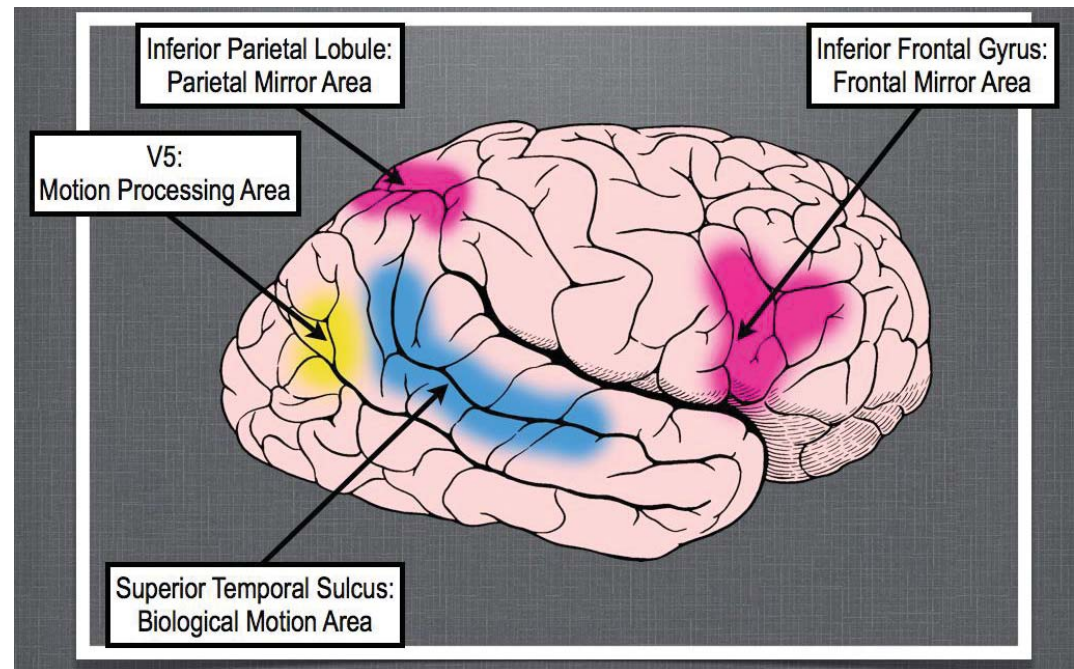
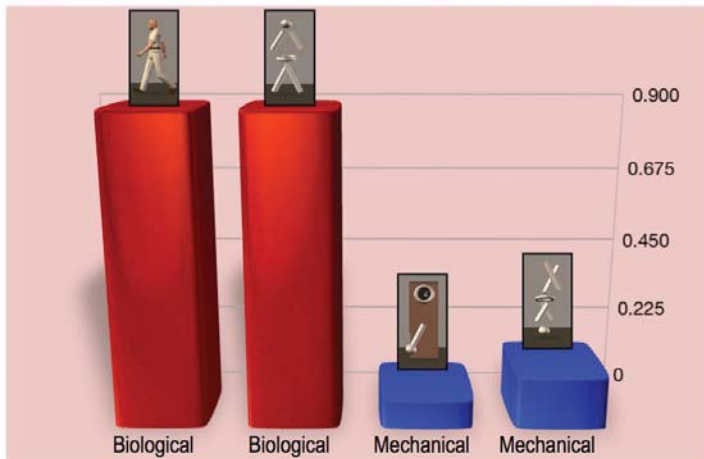
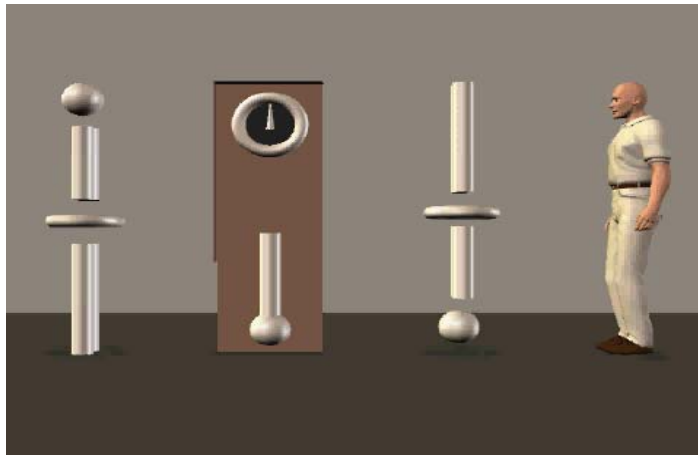


**Problem:** Lack of predictive biomarkers perpetuates the *status quo* of imprecise treatments, wasted time and resources, failures to optimize progress for our children and their families.

## **Biomarkers should be:**

- 1) grounded in an understanding of basic mechanisms;
- 2) sensitive, reliable measures of targeted atypical processes;
- 3) useful at the individual level;
- 4) predictive of response and informative of mechanism(s);
- 5) useful as levers to improve treatment response;
- 6) practical for implementation...

# 1) Mechanisms of understanding others actions & intentions



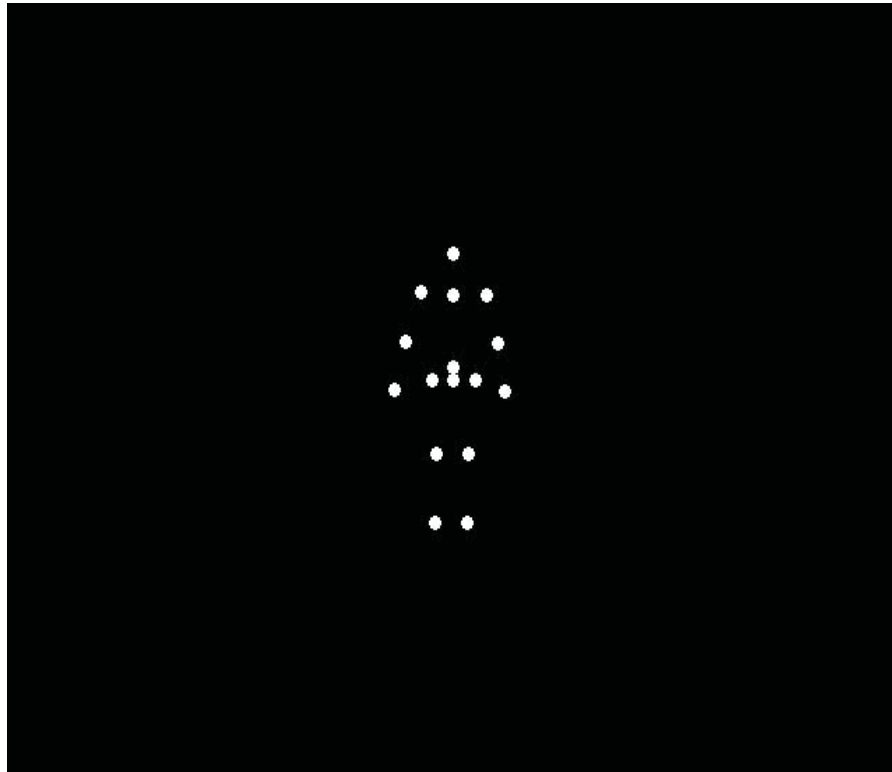
Pelphrey et al. (2003) *Journal of Neuroscience*

## 2) Sensitive, reliable measures of targeted atypical processes

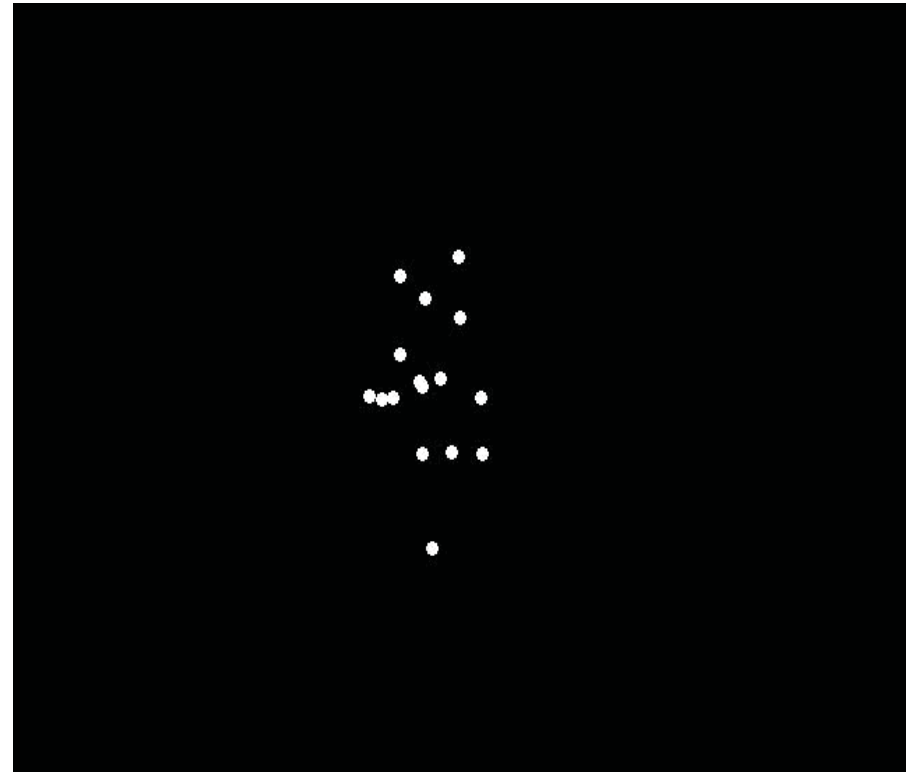


# Social vs. Non-Social Motion

Coherent Biological  
(BIO)



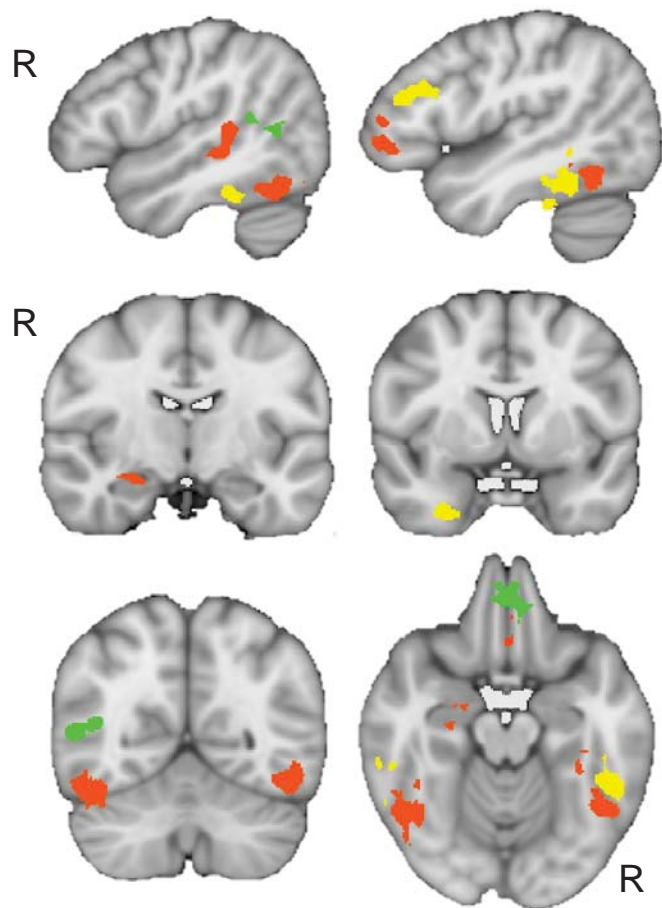
Scrambled Biological  
(SCRAM)



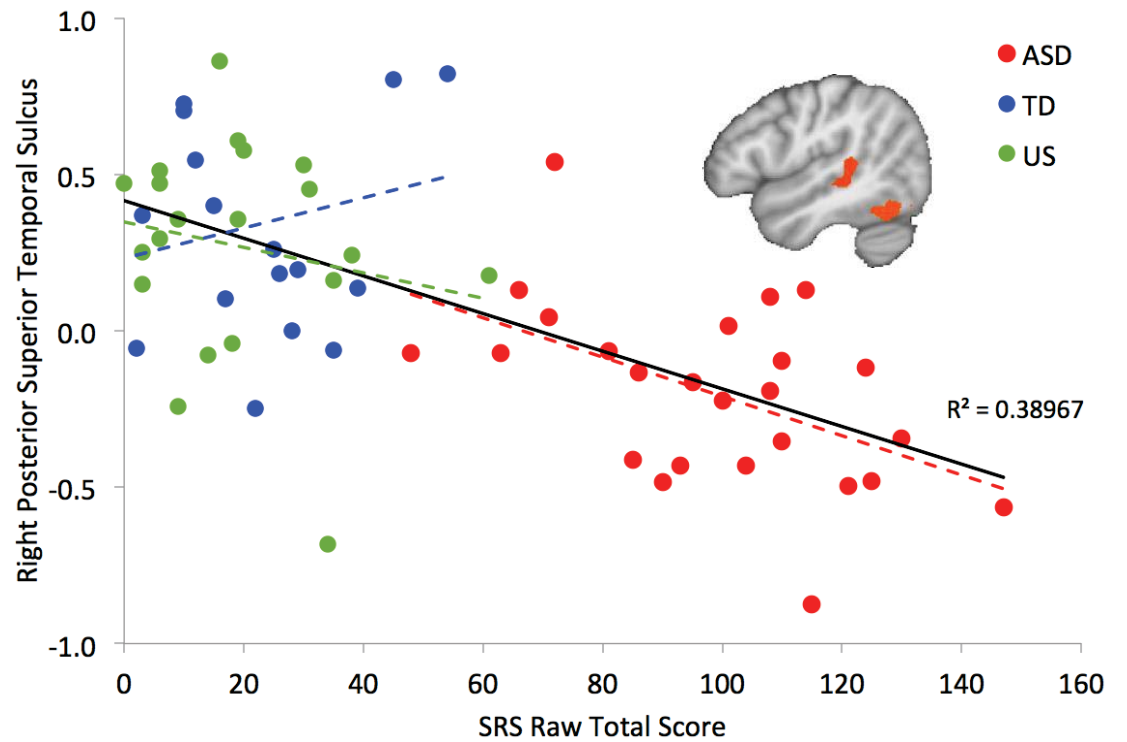
Kaiser et al. (2010) *Proceedings of the National Academy of Sciences*



# Social vs. Non-Social Motion



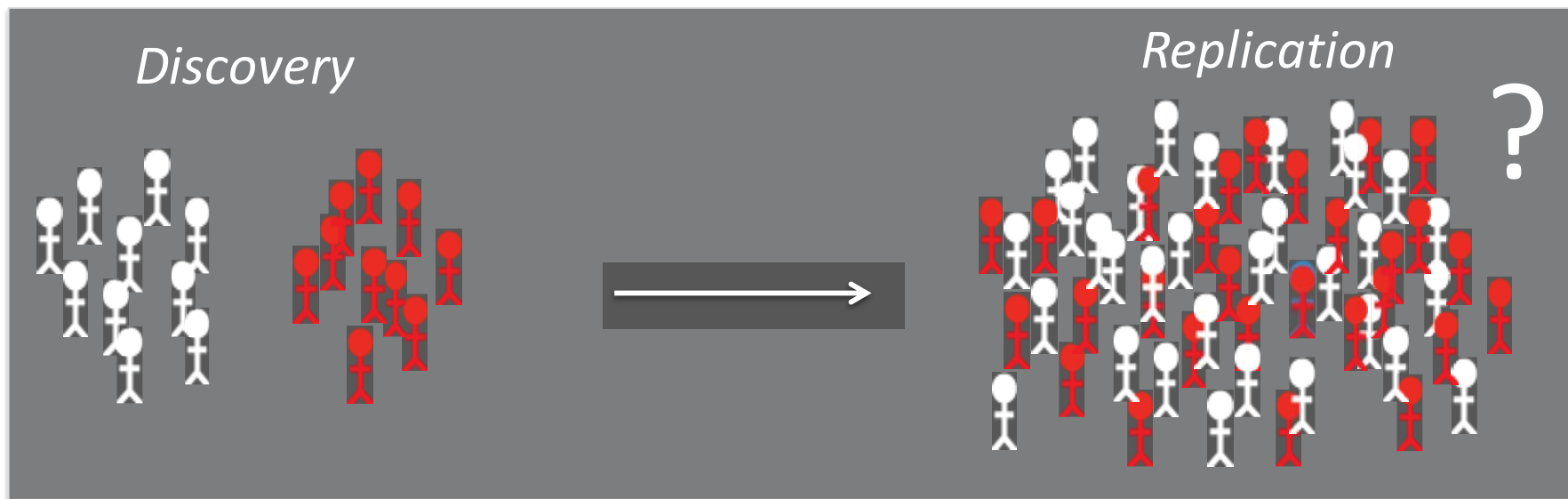
- State: ASD < TD & ASD < US
- Trait: US < TD & ASD < TD
- Compensatory: US > TD & US > ASD



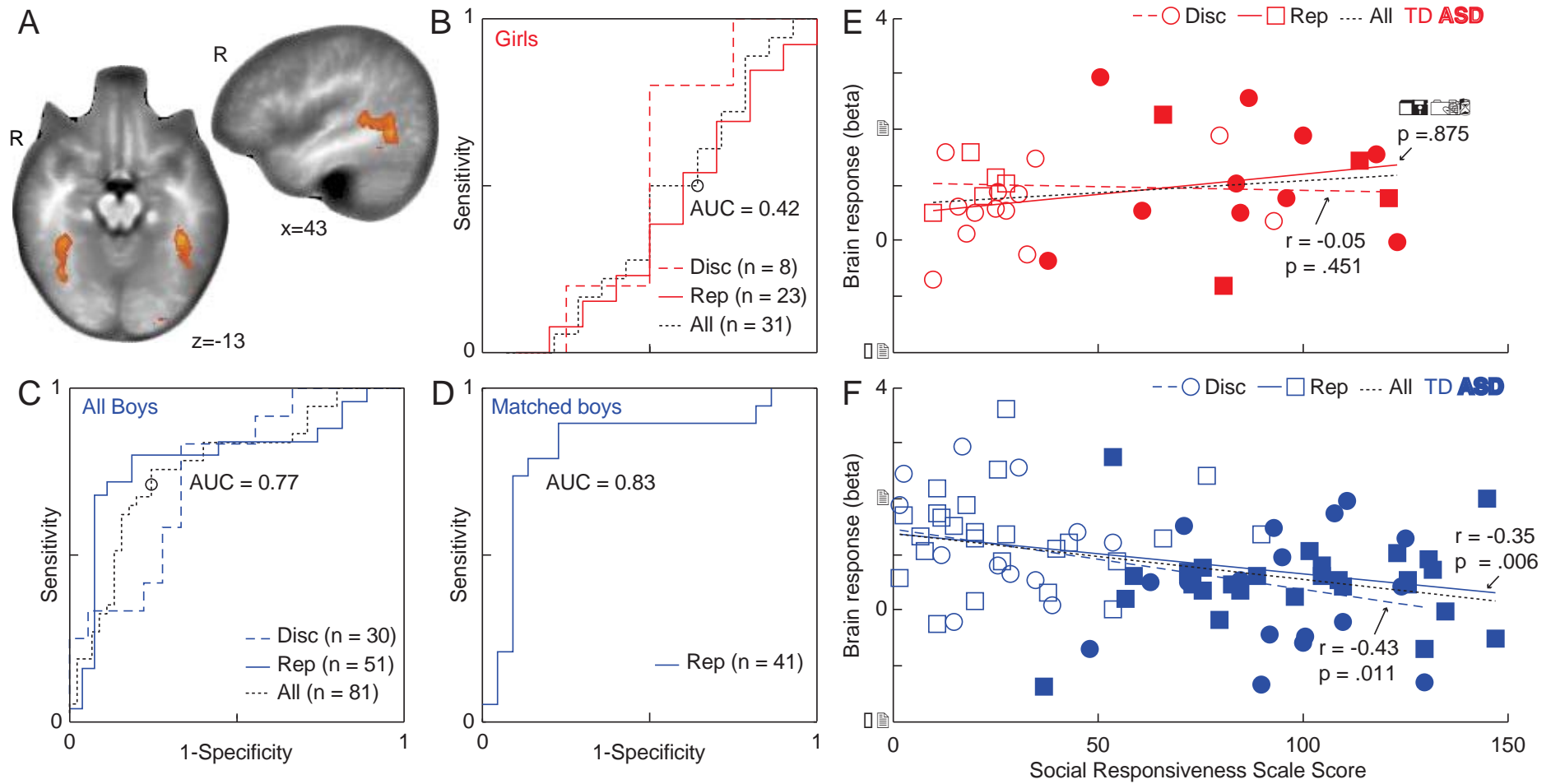
### 3) Informative at the level of the individual child?



Malin Björnsdotter, PhD

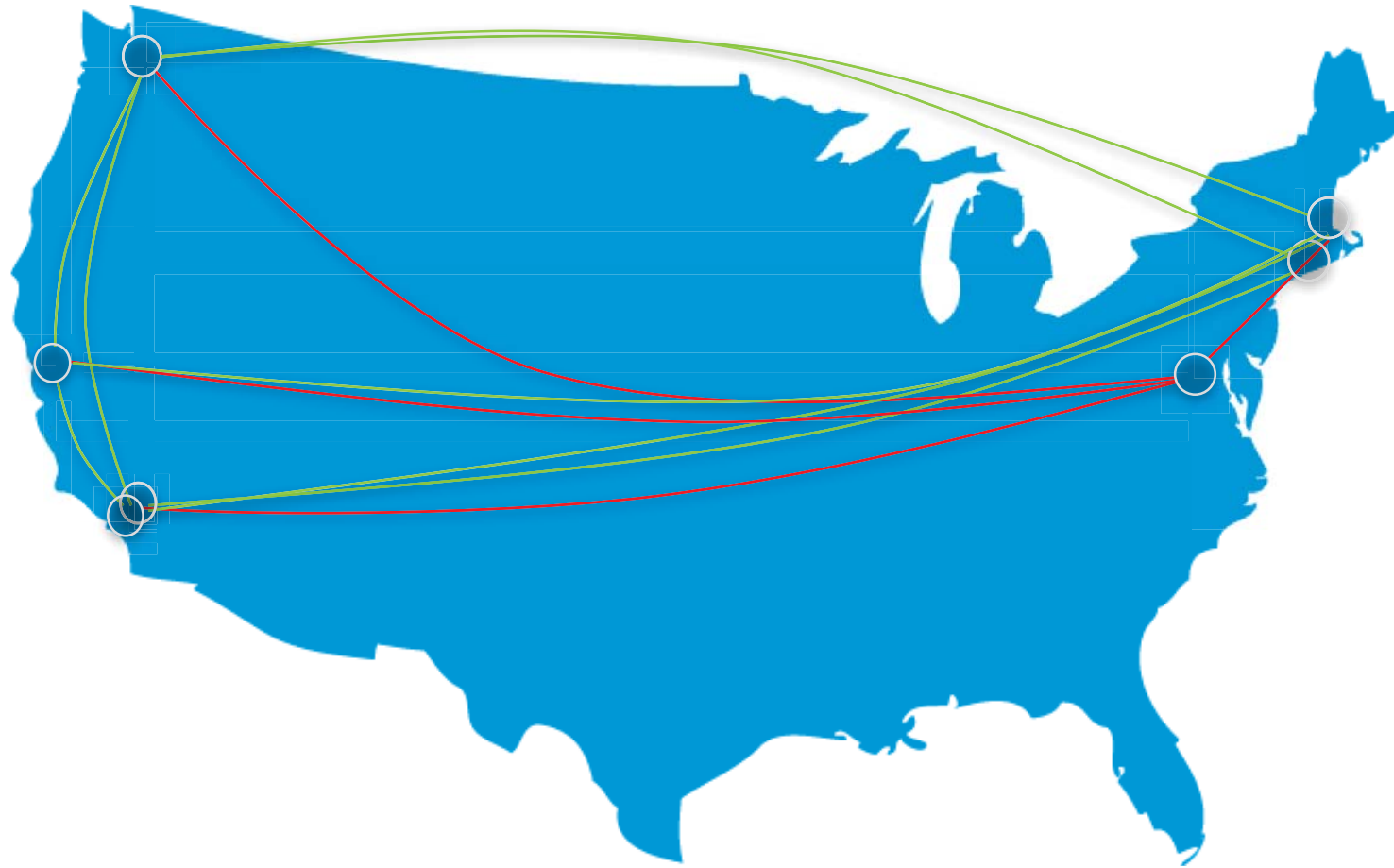


Björnsdotter et al. *JAMA: Psychiatry*, 2016

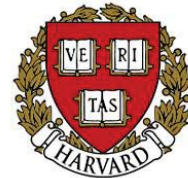


Björnsdotter et al., *JAMA: Psychiatry*, 2016

# NIH Autism Center of Excellence: Girls' (Women's) Neurogenetics Network



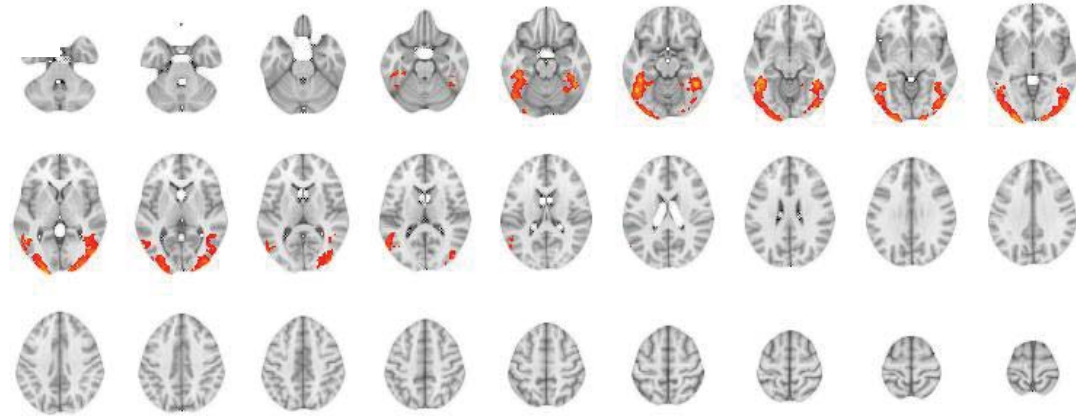
THE GEORGE  
WASHINGTON  
UNIVERSITY  
WASHINGTON, DC





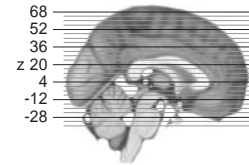
Allison Jack, PhD

**ASD ♀ (n = 46)**

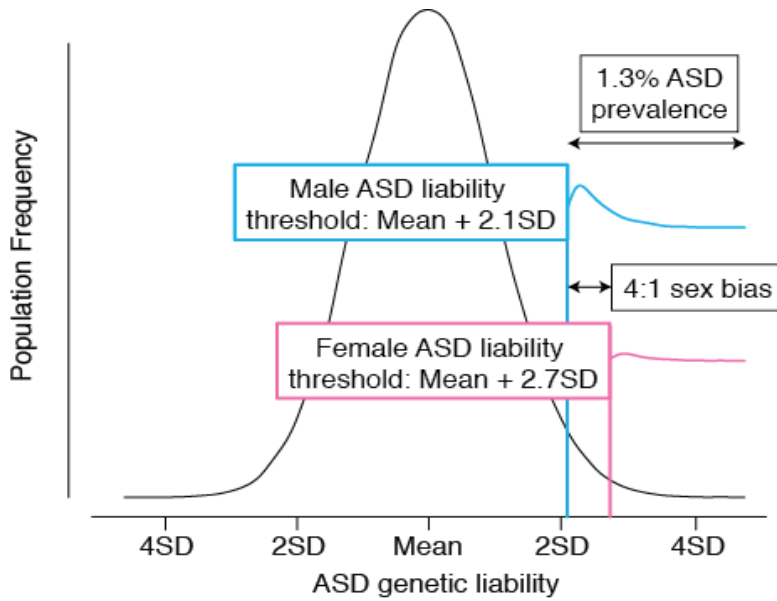
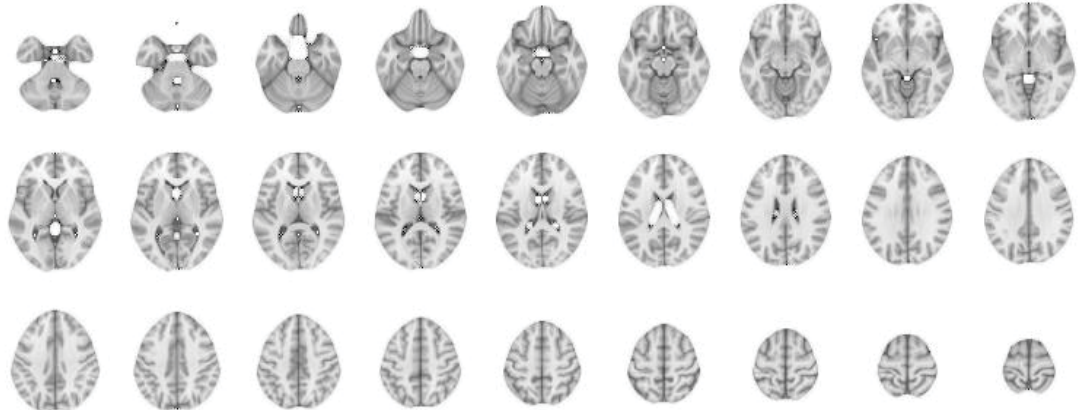


Displayed in neurological convention  
(right hemisphere displayed on right).

z = 2.3 5.0  
Cluster-corrected p < .001

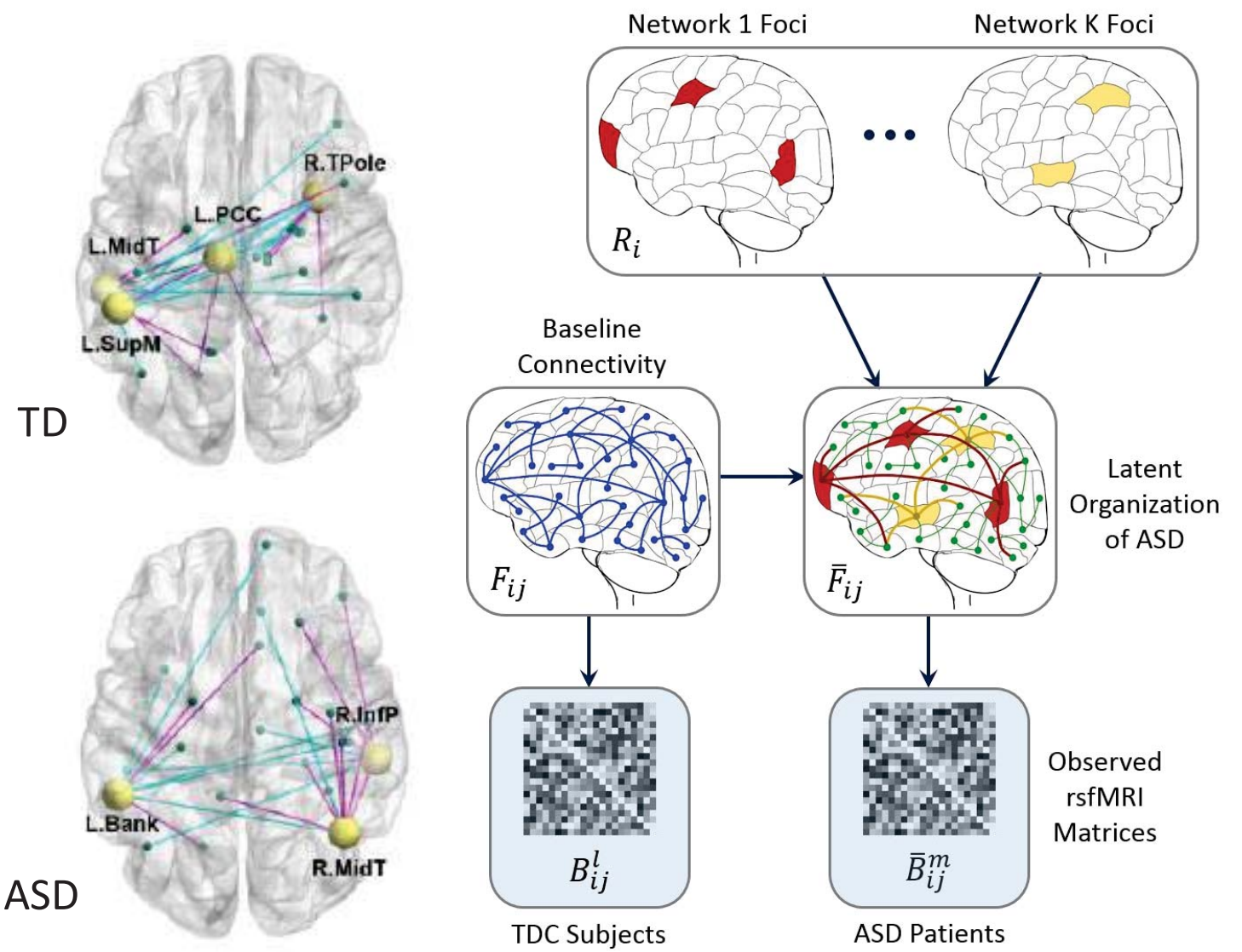


**ASD ♂ (n = 48)**





Archana Venkataraman, PhD



Girls –  
Network to  
Construct  
mapping



Boys –  
Network to  
Construct  
mapping

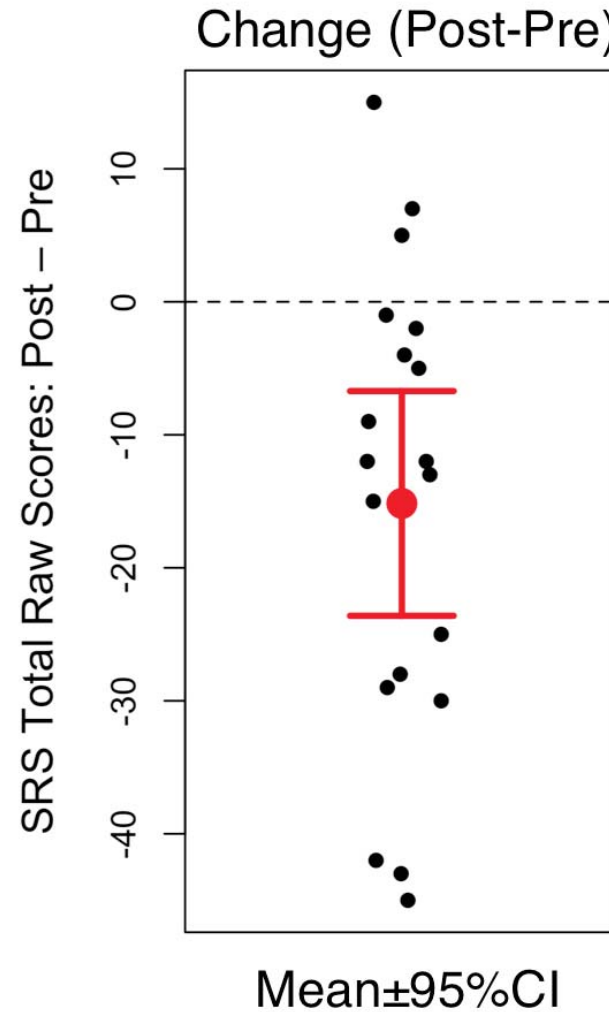
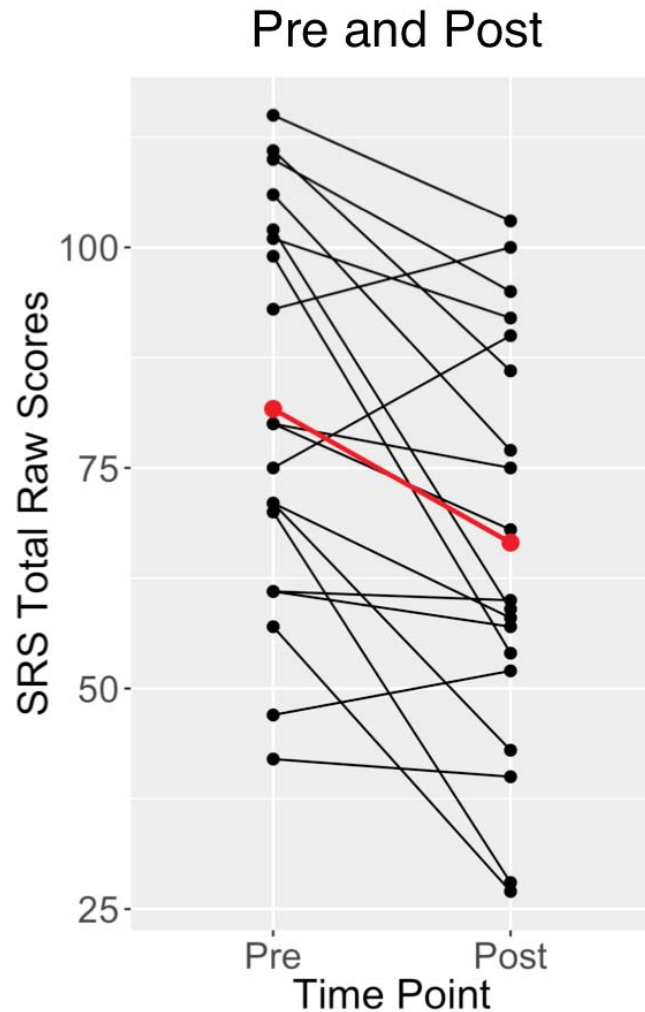


## 4) Predictive of treatment response & informative of mechanism

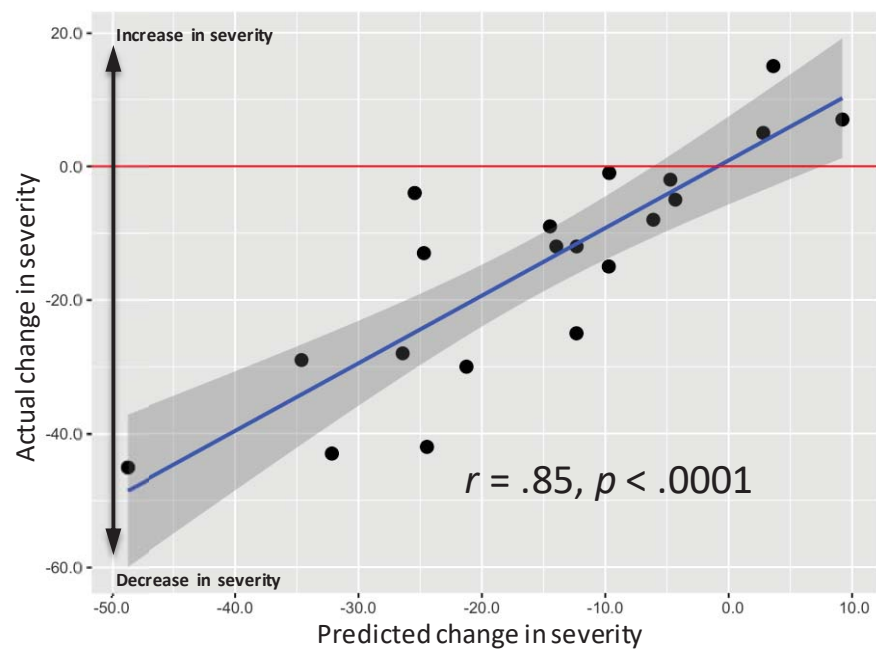
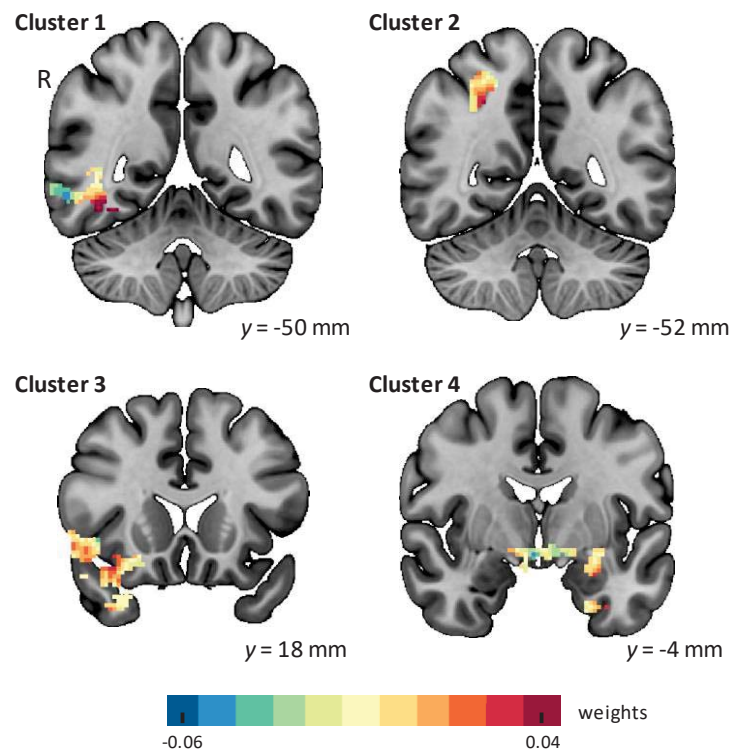




# Change in Behavior: Social Responsiveness Scale (SRS)

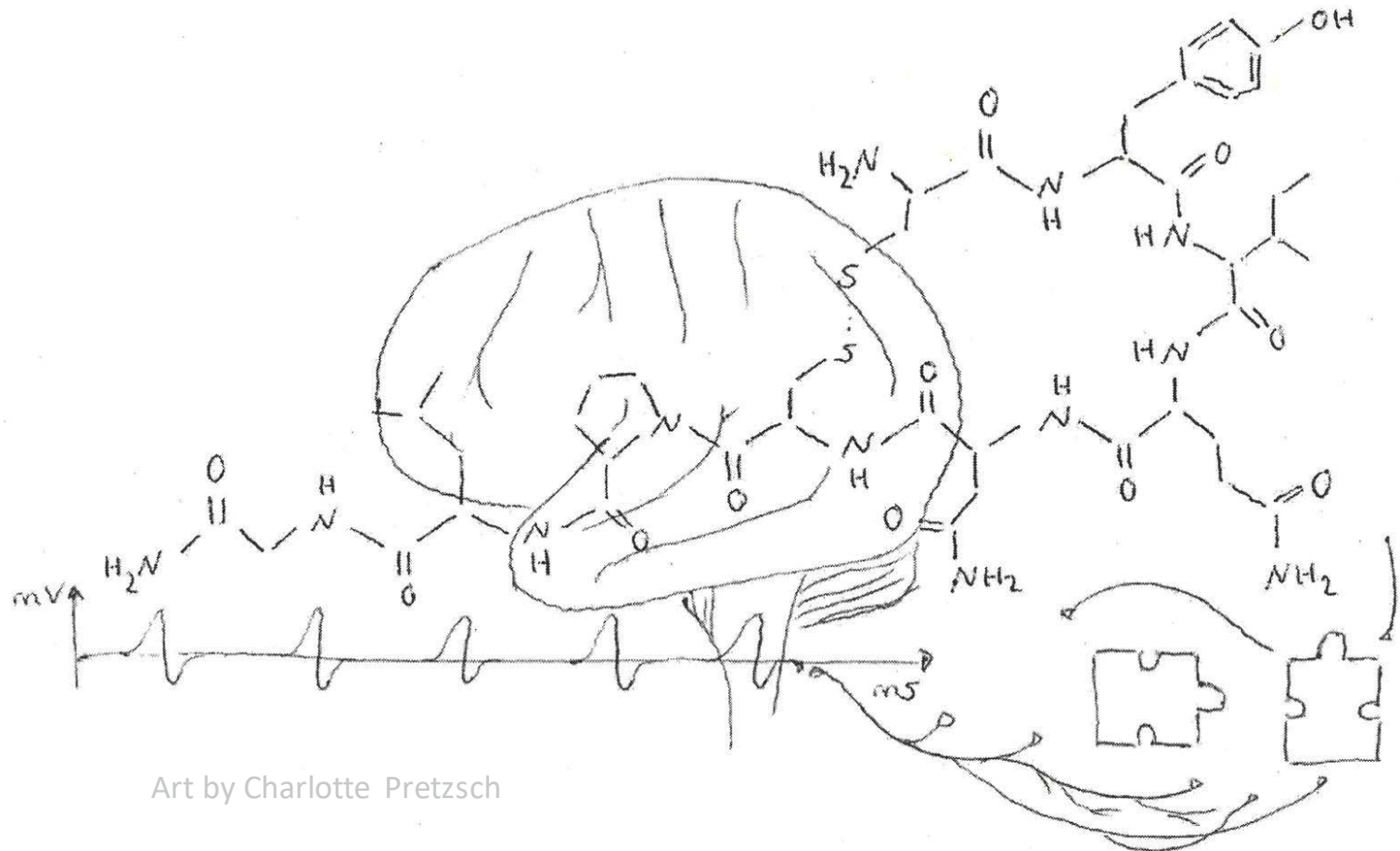


# Neuro-prediction of treatment response

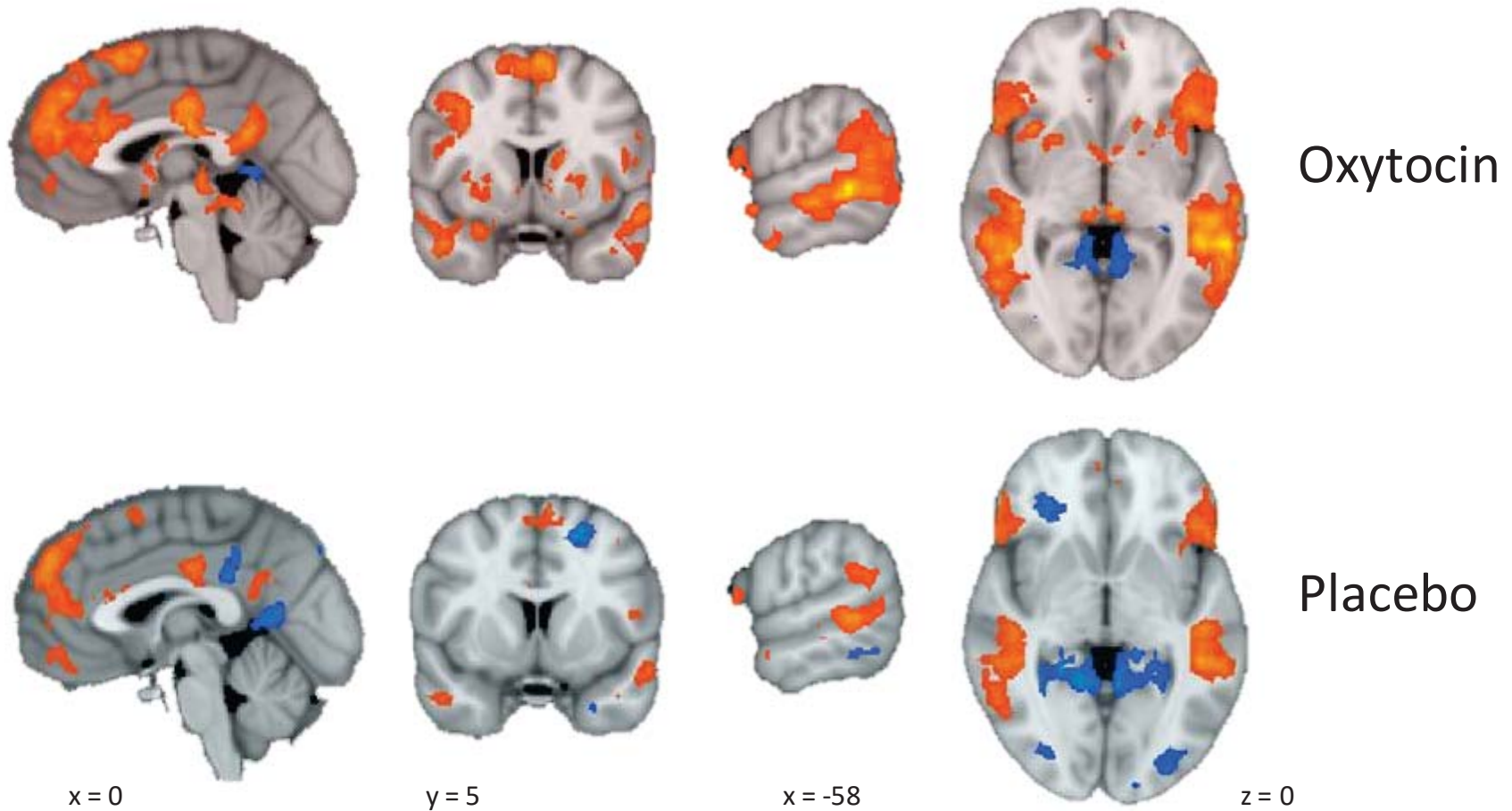


Yang et al. (2016)  
*Translational Psychiatry*

# 5) Levers to improve treatment response?



# Intranasal Oxytocin



Gordon et al. (2013) *Proceedings of the National Academy of Sciences*

## 6) Very nice, but is it practical?



but



So maybe?



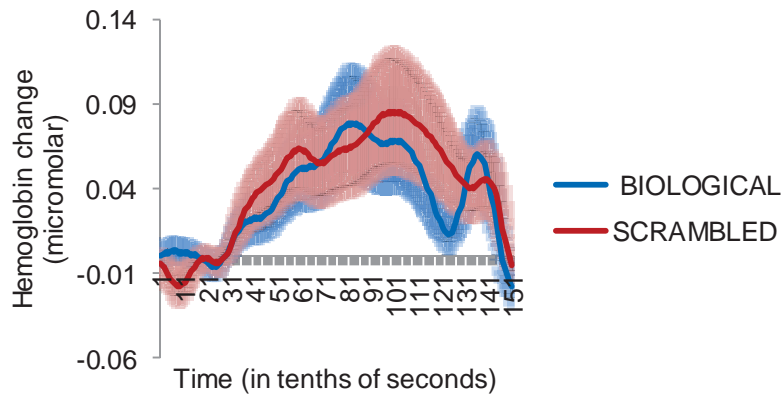
Linking genes, brain,  
& behavior in the  
longitudinal study of  
infants social brain  
development



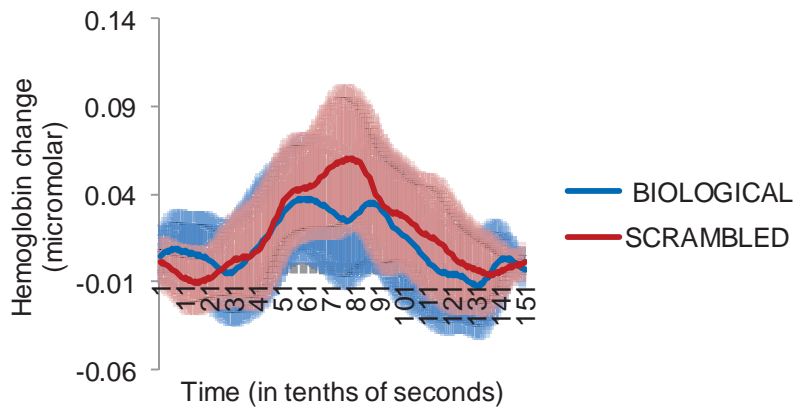


# Results: fNIRS (LR and HR 3-Month-Old Infants)

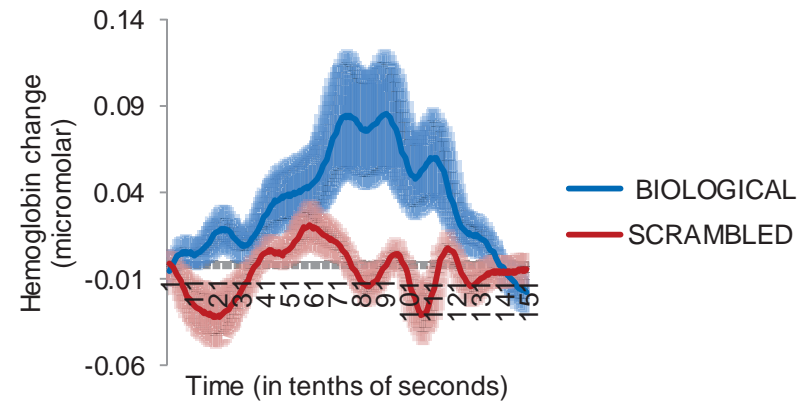
LEFT



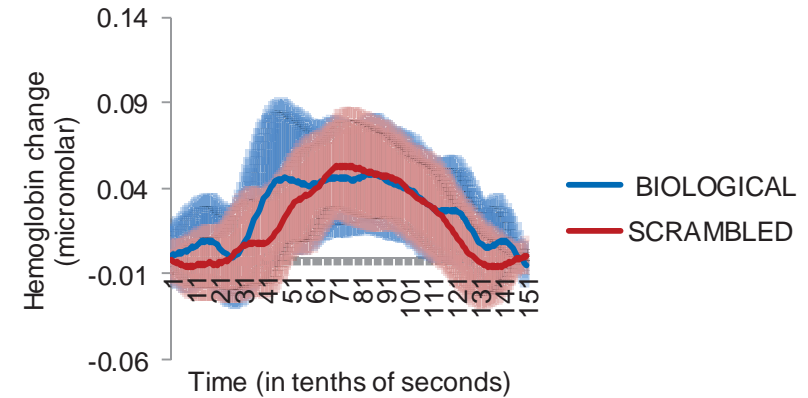
High Risk



RIGHT



High Risk





# Universal Screening?



Ashley Darcy-Mahoney, PhD,  
NNP, FAAN

3,600 births per year  
representing all ethnicities,  
classes, backgrounds – a  
population-based sample



# Acknowledgments

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Esme Usdan & Family

The Dwek Family

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Hilibrand Foundation

John Merck Scholars Fund

Autism Science Foundation

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Research, GW

Children's Research Institute, CNHS

Women's Health Research at Yale

Binational Science Foundation

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We thank our colleagues who make this work so much fun.

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