Accurate head models for cortical source analysis of face processing in infants at high risk of autism spectrum disorders

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http://jerlab.psych.sc.edu/jerpdf/srcd2017headmodels.pdf

Abstract

The aim of this study was to develop realistic head models for use with infants at high risk of autism spectrum disorders (ASD). The optimal approach for source analysis uses realistic head models based upon individual participants' structural MRIs, however, this is not always feasible. Careful selection of alternative head models may be satisfactory for accurate source localization. Head models created from a group of high-risk, same neurodevelopmental disorder, MRIs were a good match to infants' own MRIs. Greater heterogeneity in the brains of infants at high risk of ASD may account of the improved fit from the group-specific MRIs.

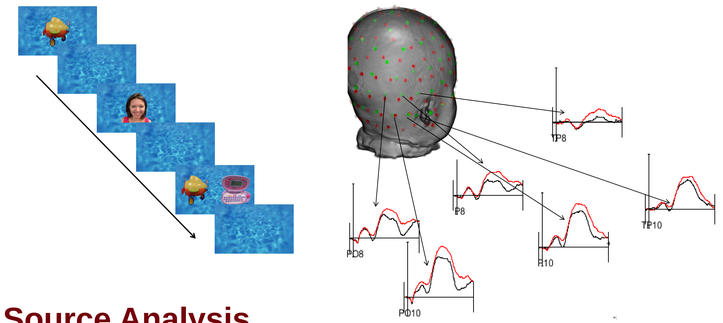
Head Model Comparison

- Infant's own MRI
- Study & group-specific average template (ASIB N = 8, FXS N = 12)
- Group-specific average template from MRI database, Infant Brain Imaging Study (IBIS; ASIB N = 53, FXS N = 24)
- Typically developing 12-month-old infants average template
- Older children (12 years) or adults (20-24 years) average template

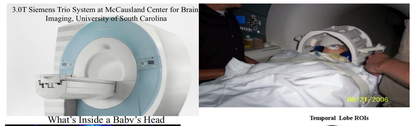
Participants

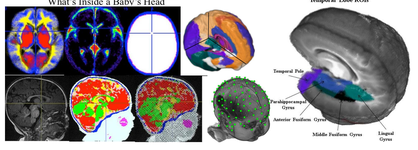
12-month-old infants: 21 low-risk control (LRC), 21 siblings of children with autism (ASIB), 15 with fragile X syndrome (FXS)[1]

ERP Procedure & Analyses

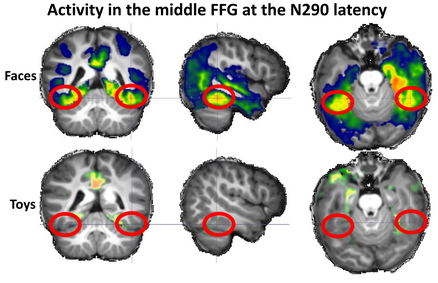


Source Analysis

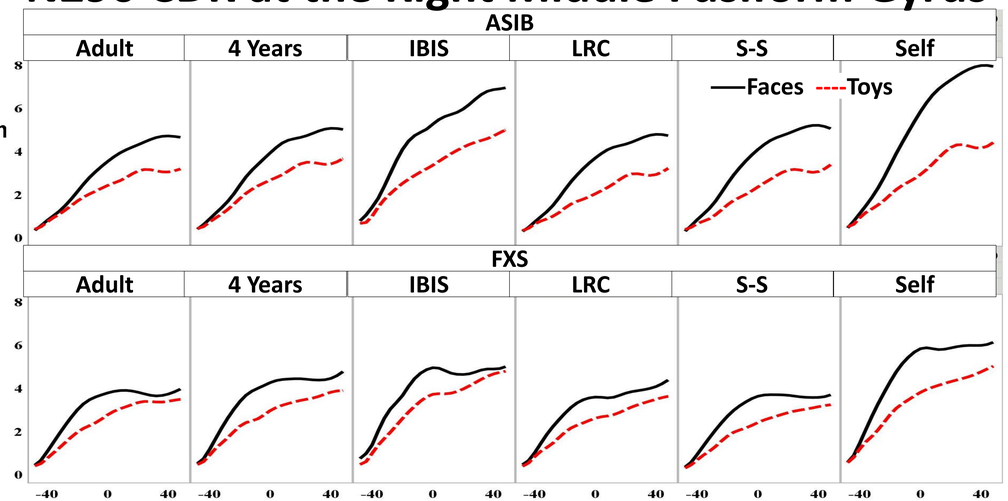




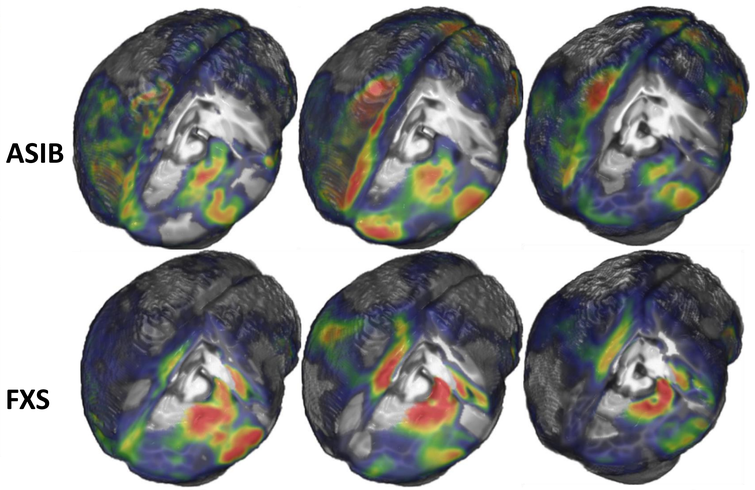
Activity in the middle FFG at the N290 latency



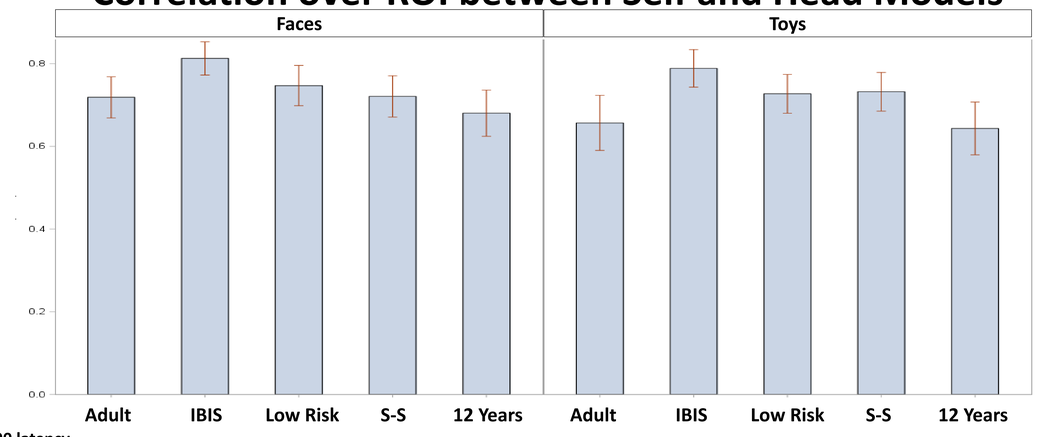
N290 CDR at the Right Middle Fusiform Gyrus



Peak N290 CDR to Faces



Correlation over ROI between Self and Head Models



Mean CDR Activation

	ROI	Self	S-S	IBIS	LRC
ASIB	L anterior fusiform	3.88	3.39	4.37	3.43
	R anterior fusiform	4.37	3.80	4.75	3.78
	L middle fusiform	3.92	2.40	3.61	2.63
	R middle fusiform	4.38	3.20	4.32	2.85
	L lingual gyrus	4.15	2.47	3.31	2.66
	R lingual gyrus	4.13	2.50	3.61	2.47
	Orbital frontal gyrus	3.21	2.48	4.21	2.79
	L parahippocampal	4.21	3.16	4.22	3.35
	R parahippocampal	4.71	3.69	4.64	3.71
	Posterior cingulate	3.60	2.67	3.80	2.46
	L temporal pole	3.25	3.16	3.98	3.26
	R temporal pole	3.17	3.17	4.25	3.37
	Ventral anterior cingulate	2.98	2.56	3.68	2.65
FXS	L anterior fusiform	4.21	3.09	4.29	4.52
	R anterior fusiform	5.14	3.71	4.79	4.48
	L middle fusiform	3.52	2.54	3.39	3.34
	R middle fusiform	4.72	2.98	4.14	3.06
	L lingual gyrus	2.98	2.23	2.76	2.62
	R lingual gyrus	3.76	1.95	3.10	2.34
	Orbital frontal gyrus	3.82	2.42	3.38	3.26
	L parahippocampal	4.41	3.14	4.57	4.42
	R parahippocampal	5.51	3.78	5.04	4.58
	Posterior cingulate	3.36	2.81	3.71	2.77
	L temporal pole	3.80	2.84	4.04	4.46
	R temporal pole	4.00	3.07	4.04	3.83
	Ventral anterior cingulate	4.00	2.63	3.54	3.28

Acknowledgements

[1]Guy, M. W., Richards, J. E., Tonnsen, B. L., & Roberts, J. E. (2017). Neural correlates of etiologically-distinct 12-month-old infants at high-risk of autism spectrum disorder. *Developmental Cognitive Neuroscience.*

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