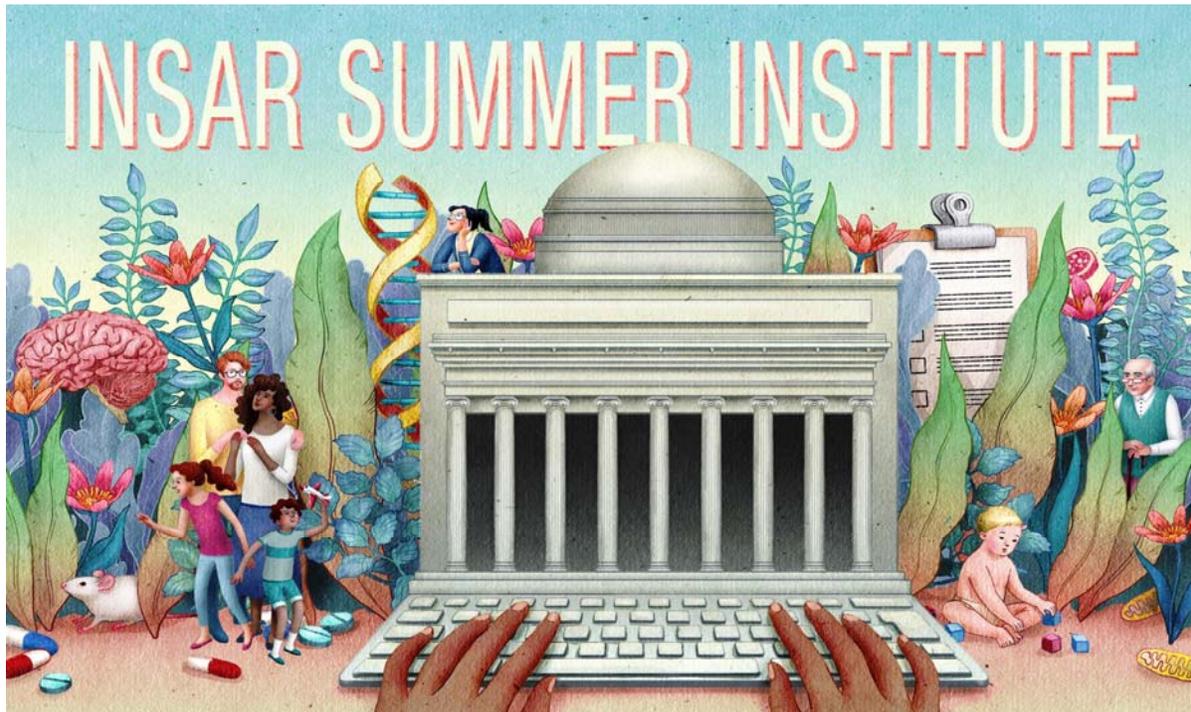


# INSAR

International Society  
for Autism Research



## INSAR 2016 Summer Institute

### Session II: Infant Siblings of Children with ASD

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2:00 pm ET

#### Course Materials

In collaboration with Dr. Piven, these materials were developed by the trainee group for this session: **Ashley Stevens** (Doctoral candidate, University of Utah, [ashley.l.stevens@utah.edu](mailto:ashley.l.stevens@utah.edu)), **Robert Emerson** (Postdoc, University of North Carolina at Chapel Hill, [remerson@med.unc.edu](mailto:remerson@med.unc.edu)), and **Meghan Swanson** (Postdoc, University of North Carolina at Chapel Hill, [meghan.swanson@cidd.unc.edu](mailto:meghan.swanson@cidd.unc.edu)). Feel free to contact us with questions/comments.

Register for this course and other sessions in this series at <http://www.autism-insar.org/research-opportunities/summer-institute2016>

## Learning Objectives

The overall objective of the current session, infant siblings of children with ASD, is to provide the trainee with insights into the early development of ASD through the study of younger siblings of children with ASD. The main objectives of this course are to:

1. To understand why researchers study infants siblings of children with ASD.
2. To link familial risk with the early behavioral profile of infant siblings of children with ASD.
3. To learn how the brain develops in infant siblings of children with ASD.

## Glossary of Terms/Key Concepts

- **Structural MRI.** Structural magnetic resonance imaging (MRI) is a non-invasive technique for examining the physical structure of the brain such as the shape, size, and structural integrity of grey and white matter structures in the brain. Many structural MRI scan sequences are volumetric, meaning that measurements can be made of specific brain structures to calculate volumes of tissue, but some measurement techniques also look at cortical thickness, or surface area of the cerebral cortex. [*See Further Suggested Reading: Qureshi et al, 2014*]
- **Cortical Thickness.** A structural MRI morphometric measure used to describe the combined thickness of the layers of the cerebral cortex.
- **Surface Area.** A structural MRI morphometric measure of the exterior surface area of the cortex.
- **Functional MRI.** Functional magnetic resonance imaging (fMRI) is a non-invasive technique for measuring brain activity by detecting changes associated with blood flow. In general, this method relies on the metabolic process of neurons using oxygen and measures the amount of oxygen present in the blood. This allows researchers to calculate a blood oxygen level dependant (BOLD) response that is used as a correlate of neural activity.
- **Functional Connectivity.** Functional connectivity magnetic resonance imaging (fcMRI) is an analysis technique that uses the correlation between the BOLD response in different regions of the brain to assess how synchronized those regions are. For example, if the bold response in two regions are coordinated over time, those regions are thought to be functionally connected.
- **Diffusion Tensor Imaging.** DTI is a type of MRI scan that measures the movement (or diffusion) of water molecules in the brain. Water molecules move in a coherent direction (anisotropic diffusion) when physically constrained in brain tissue such as along white matter (WM) tracts. In contrast, water molecules move in a more random way (isotropic diffusion) when unconstrained in tissue (such as in cerebrospinal fluid or in grey matter). The extent of anisotropic diffusion in WM can be quantitatively measured, with values that indicate a more coherent and well-organized WM tract. These diffusion values can then be compared between different WM tracts, ages in development, or groups of individuals (e.g., children with ASD vs. typical development).
- **Fractional Anisotropy.** Fractional Anisotropy (FA) is an index measuring the degree of anisotropy of local diffusion. Values for FA are scalar, ranging from 0 for isotropic diffusion to 1, for anisotropic, or strongly directional diffusivity in highly structured axonal bundles.

- **Neuroplasticity.** Neuroplasticity describes how experiences result in cortical remapping or reorganized neural pathways. Developmental plasticity is specific to the change in neuron organization as a result of developmental processes (e.g., environmental effects, learning during infancy or childhood).
- **High Familial Risk.** Individuals are considered at high familial risk in most “baby-sibling” research studies by virtue of having an older siblings with an autism spectrum disorder.
- **Prodromal.** Prodromal may refer to a time period between the appearance of core symptoms of the disorder. Prodromal symptoms are early symptoms that may indicate the start of the disorder and occur before characteristic features of the disorder are present.
- **Recurrence Rate.** The chance that a disease/disorder that is present in a family will occur in that same family again, affecting another person. For example, It is estimated that 10-20% of younger siblings of children with ASD will develop the disorder themselves (Ozonoff et al., 2011; Sandin et al., 2014).
- **Mullen Scales of Early Learning.** The Mullen is a normed developmental assessment applicable to children from birth through 68 months. Scoring of the Mullen generates an Early Learning Composite (Mullen ELC), as well as five subscales (visual reception, fine motor, gross motor, receptive language, expressive language). (Mullen, 1995).
- **Autism Observation Scale for Infants (AOSI).** The AOSI was developed to examine and monitor features of autism during infancy. The AOSI is a direct observational measure appropriate for infants 6-18 months. Example items include: orientation to name, social babbling, coordination of gaze and action, atypical motor behavior. (Bryson et al., 2008)

### Recommended Background Reading

- Wolff, J. J., Gu, H., Gerig, G., Elison, J. T., Styner, M., Gouttard, S., ... Piven, J. (2012). Differences in white matter fiber tract development present from 6 to 24 months in infants with autism. *American Journal of Psychiatry*, 169(6), 589–600.  
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doi:10.1016/j.dcn.2010.07.003  
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## Further Suggested Readings

- Ozonoff, S., Iosif, A., Baguio, F., Cook, I. C., Hill, M. M., Hutman, T., ... Young, G. S. (2010). A prospective study of the emergence of early behavioral signs of autism. *Journal of the American Academy of Child and Adolescent Psychiatry*, 49(3), 256–66.e1–2.  
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- Elison, J. T., Paterson, S. J., Wolff, J. J., Reznick, J. S., Sasson, N. J., Gu, H., ... Piven, J. (2013). White matter microstructure and atypical visual orienting in 7-month-olds at risk for autism. *American Journal of Psychiatry*, 170(8), 899–908.  
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- Lehtinen, M. K., Zappaterra, M. W., Chen, X., Yang, Y. J., Hill, A. D., Lun, M., ... Walsh, C. A. (2011). The cerebrospinal fluid provides a proliferative niche for neural progenitor cells. *Neuron*, 69(5), 893–905. doi:10.1016/j.neuron.2011.01.023  
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