

R. JOANNE JAO KEEHN, Ph.D.

**Postdoctoral Research Fellow
San Diego State University (SDSU), San Diego, CA**

Address: Brain Development Imaging Lab, San Diego State University
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Education:

Joint Cognitive Science and Psychological and Brain Sciences, Ph.D.

Concentration: *Cognitive Neuroscience*

Dissertation: *The Neural Development of Visuohaptic Object Processing*

Indiana University (IU), Bloomington, IN

Graduated: May, 2015

Cumulative GPA: 3.93/4.00

Cognitive Science, B.S., and Philosophy, B.A.

University of California San Diego (UCSD), La Jolla, CA

Graduated: June, 2009

Cumulative GPA: 3.78/4.00

Honors/Awards: Magna Cum Laude

Phi Beta Kappa 2008

Provost's Honors

Departmental Honors in Cognitive Science

Honors and Awards:

- NSF IGERT Travel Award Summer, 2015
- IU Women in Science Provost Travel Award Summer, 2015
- NSF IGERT Travel Award Summer, 2014
- IU Women in Science Provost Travel Award Summer, 2013
- NSF Graduate Research Fellowship Program: Honorable Mention 2012
- NSF IGERT Training Grant 2011 – 2013
- IU McFall Summer Research Award Summer, 2011
- NIH Developmental Training Grant 2010 – 2011
- IU Graduate Women in Science Award 2010
- UCSD Chancellor's Research Scholarship Summer, 2008

Research Interests:

Autism Spectrum Disorders; Functional neuroimaging; Functional connectivity; Sensorimotor learning; Visuohaptic perception; Multisensory integration; Cognitive and perceptual development.

Research Experience:

Brain Development Imaging Lab (Ralph-Axel Müller) – Postdoctoral Research Fellow
SDSU, Dept. of Psychology 07/2015 – Present

- Implementation of multimodal imaging techniques to examine the neural

development of ASD with a focus on sensory processing and functional connectivity

- Perception and Neuroimaging Lab (Thomas W. James)** – Graduate Student
IU, Dept. of Psychological and Brain Sciences 05/2013 – 05/2015
- Examined human multisensory visual and haptic perception for object processing
 - Implemented functional neuroimaging (fMRI), functional connectivity (PPI), behavioral, and modeling methods and analyses
 - Mentored undergraduate research assistants

- Cognition and Action Neuroimaging Lab (Karin H. James)** – Graduate Student
IU, Dept. of Psychological and Brain Sciences 08/2010 – 05/2015
- Investigated development of multisensory integration and crossmodal processes
 - Created and analyzed fMRI and behavioral experiments for children and adults

- Movement Control Lab (Emanuel Todorov)** – Research Scientist
Univ. of Washington, Dept. of Computer Science 10/2009 – 08/2010
- Studied human motor control via (active; passive) Motion Capture and EMG
 - Created psychophysics experiments to examine sensorimotor control, learning, and adaptation in complex, dynamical systems
 - Performed statistical data analyses and modeling
 - Implemented Matlab for stimulus presentation and data recording

- Interactive Cognition Lab (David Kirsh)** – Lab Asst.; Student Research Asst.
UCSD, Dept. of Cognitive Science 01/2009 – 09/2009
- Coded, annotated, and analyzed behavioral, survey, questionnaire, interview, and video data from human subjects (professional dancers) during sensorimotor processing, learning, and collective group interactions
 - Prepared materials for presentations of research and data at conferences
 - Performed system administration duties
 - Implemented iRODs for confidential data storage onto servers at Calit2, UCSD

- The Neurosciences Institute (Aniruddh Patel)** – Research Asst.
NSI, Theoretical Neurobiology, Music and the Brain 07/2008 – 08/2010
- Coded animal behavioral data (Snowball, *sulphur-crested cockatoo*)
 - Catalogued and analyzed gesture vocabulary for dissemination of research on animal movement, rhythmic entrainment to auditory stimuli, and creativity

- Cognitive Development Lab (Gedeon Deak)** – Student Research Asst.
UCSD, Dept. of Cognitive Science 10/2007 – 08/2010
- Studied longitudinal infant behavior to model the emergence of shared attention
 - Examined the development of visuomotor skills and responses to social cues
 - Developed questionnaire and video coding schemes, and analysis methodologies
 - Trained lab members in coding and video analysis
 - Honors Thesis: *Infant comprehension of visual obstruction and referential gaze following from 14 to 18 months*

Teaching Experience:

- P433** – Laboratory in Neuroimaging Methods (Teaching Assistant)
IU, Dept. of Psychological and Brain Sciences Spring, 2015; Spring, 2014
- P349** – Cognitive Neuroscience (Teaching Assistant)
IU, Dept. of Psychological and Brain Sciences Fall, 2014
- P335** – Cognitive Psychology (Teaching Assistant)
IU, Dept. of Psychological and Brain Sciences Summer, 2014
- P211** – Methods of Experimental Psychology (Associate Instructor)
IU, Dept. of Psychological and Brain Sciences Fall, 2013

Guest Lectures:

- P433** – Normalization and Coregistration; Functional Specialization 02/2015
- P349** – Brain and Cognition 11/2014
- P349** – Social Cognitive Neuroscience 11/2014
- P349** – Higher Perceptual Functions 10/2014
- P349** – Object Recognition 10/2014

Posters & Published Abstracts:

- Jao Keehn, R. J.**, Sanchez, S. S., Stewart, C. R., Zhao, W., Grenesko-Stevens, E. L., Keehn, B., & Müller, R. A. (submitted). Children with ASD Fail to Downregulate Visual Cortex during Auditory Processing. International Meeting for Autism Research.
- Zhao, W., Fishman, I., **Jao Keehn, R. J.**, & Müller, R. A. (submitted). Atypical intrinsic functional connectivity of core face perception system is associated with symptom severity in ASD. International Meeting for Autism Research.
- Jao, R. J.**, James, K. H., & James, T. W. (2015). The development and organization of visuohaptic modality-biased signals in the LOC. *Journal of Vision*, 15(12), 860. doi:10.1167/15.12.860
- Jao, R. J.**, James, K. H., & James, T. W. (2014, July). Development of dorsal and ventral stream connectivity: A visuohaptic psychophysiological interaction study. Poster presented at the 1st Vision Science Expo at Indiana University. Bloomington, IN.
- Jao, R. J.**, James, K. H., & James, T. W. (2014, May). Functional connectivity analysis shows developmental changes in visuohaptic brain networks. Poster presented at the 26th Association for Psychological Science Annual Convention, San Francisco, CA.
- Jao, R. J.**, James, K. H., & James, T. W. (2014). Development of dorsal and ventral stream connectivity: A visuohaptic psychophysiological interaction study. *Journal of Vision*, 14 (10), 1104; doi:10.1167/14.10.1104
- Jao, R. J.**, James, K. H., & James, T. W. (2014, April). Developmental changes in functional connectivity: A visuohaptic psychophysiological interaction study. Poster presented at the 5th Annual IGERT Showcase at Indiana University. Bloomington, IN.
- Jao, R. J.**, James, T. W., & James, K. H. (2013, October). Crossmodal visuohaptic recognition: A look at (and feel for) objects. Poster presented at the 3rd Indiana Neuroimaging Symposium at Indiana University. Bloomington, IN.
- Jao, R. J.**, James, T. W., & James, K. H. (2013, October). The neural development of crossmodal processing as measured by fMRI. Poster presented at the Center of

Excellence for Women in Technology Research and Technology Showcase at Indiana University. Bloomington, IN.

- Jao, R. J.,** James, T. W., & James, K. H. (2013). Visuohaptic crossmodal matching: A developmental fMRI study. *Journal of Vision, 13* (9), 1330.
- Jao, R. J.,** James, T. W., & James, K. H. (2013, April). Visuohaptic crossmodal matching: A developmental fMRI study. Poster presented at the 4th Annual IGERT Spring Research Showcase at Indiana University. Bloomington, IN.
- Jao, R. J.,** & Deak, G. O. (2012, June). The development of referential gaze-following and perspective-taking from 14 to 18 months. Poster presented at the 18th Biennial International Conference on Infant Studies. Minneapolis, MN.
- Jao, R. J.,** James, T. W., & James, K. H. (2012, April). Multisensory convergence of vision and haptics across development. Poster presented at the 19th Annual Meeting of the Cognitive Neuroscience Society. Chicago, IL.
- Jao, R. J.,** James, T. W., & James, K. H. (2012, April). Multisensory convergence of vision and haptics across development. Poster presented at the 3rd Annual IGERT Spring Research Showcase at Indiana University. Bloomington, IN.
- Jao, R. J.,** & Deak, G. O. (2010, August). Infant referential gaze following: When does intentionality begin? Poster presented at the 118th Annual Convention of the American Psychological Association. San Diego, CA.
- Jao, R. J.,** Iversen, J. R., Patel, A. D., Bregman, M. R., & Schulz, I. (2010). Diverse movements in avian dancing to human music. In S. M. Demorest, S. J. Morrison, & P. S. Campbell (Eds.), *Proceedings of the 11th International Conference on Music Perception and Cognition* (p. 54). Adelaide: Causal Productions.
- Jao, R. J.,** & Deak, G. O. (2009, October). Infant comprehension of visual obstruction and referential gaze following from 14- to 18-months. Poster presented at the Conference of Joint Attention: Developments in Philosophy of Mind, Developmental and Comparative Psychology, and Cognitive Science at Bentley University. Waltham, MA.

Peer-Reviewed Publications:

- Jao Keehn, R. J.,** Sanchez, S. S., Stewart, C. R., Zhao, W., Grenesko-Stevens, E. L., Keehn, B., & Müller, R. A. (under revision). Impaired downregulation of visual cortex during auditory processing is associated with autism symptomatology in children and adolescents with autism spectrum disorder.
- Jao Keehn, R. J.,** James, K. H., & James, T. W. (under revision). Developmental changes in visuohaptic functional connections between the dorsal and ventral streams.
- Jao, R. J.,** & Deak, G. O. (in preparation). Seeing through obstructions: A longitudinal study of referential gaze following in 14 to 18 month olds.
- Jao, R. J.,** Iverson, J. R., Patel, A. D., & Schulz, I. (in preparation). Avian movement repertoire and rhythmic entrainment.
- Jao, R. J.,** James, T. W., & James, K. H. (2015). Crossmodal enhancement in the LOC for visuohaptic object recognition over development. *Neuropsychologia, 77,* 76-89.
- James, K. H., **Jao, R. J.,** & Berninger, V. (2015). The development of multi-leveled writing brain systems: Brain lessons for writing instruction. In MacArthur, C. A., Graham, S., & Fitzgerald, J. (Eds.), *Handbook of writing research*, 2nd edition. New York: Guilford.
- Jao, R. J.,** James, T. W., & James, K. H. (2014). Multisensory convergence of visual and haptic object preference across development. *Neuropsychologia, 56,* 381-392.

Jao, R. J., Robledo, M., & Deak, G. O. (2010). The emergence of referential gaze and perspective-taking in infants. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society* (pp. 284-289). Austin, TX: Cognitive Science Society.

Kirsh, D., Muntanyola, D., **Jao, R. J.,** Lew, A., & Sugihara, M. (2009). Choreographic methods for creating novel, high quality dance. *Proceedings of the 5th International Conference on Design and Semantics of Form and Movement* (pp. 188-195). Taipei, Taiwan.

Book Review:

Jao, R. J. (2008). [Review of the book *The Neurobehavioral and Social-Emotional Development of Infants and Children* by E. Tronick]. *Milton H. Erickson Foundation Newsletter*, 28(3), 18.

Invited Talk (Conference):

Jao, R. J., James, K. H., & James, T. W. (2014, May). Development of visuohaptic functional connectivity. In T. W. James (Chair), *Multisensory Convergence*. Invited Symposium conducted at the 26th Association for Psychological Science Annual Convention. San Francisco, CA.

Presentations:

Jao, R. J., James, T. W., & James, K. H. (2012, November). A developmental fMRI look at (and feel for) crossmodal processing. Presentation at the Indiana University Developmental Seminar. Bloomington, IN.

Jao, R. J., James, T. W., & James, K. H. (2011, January). Multisensory convergence of vision and haptics across development. Presentation at the Indiana University Neuroimaging Group Seminar. Bloomington, IN.

Jao, R. J., Kalagher, H., James, T. W., Jones, S. S., & James, K. H. (2010, October). Multisensory Integration of vision and haptics across development. Presentation at the Indiana University Developmental Seminar. Bloomington, IN.

Jao, R. J. (2010, August). Infant referential gaze following and intentionality. Symposium presentation at the 118th Annual Convention of the American Psychological Association. San Diego, CA.

Jao, R. J. (2009, June). Infant comprehension of visual obstruction and referential gaze following from 14- to 18-months [Honors Thesis]. Paper presented at the Cognitive Science Undergraduate Honors Thesis Presentations at UCSD. San Diego, CA.

Jao, R. J. (2009, April). Infant comprehension of visual obstruction and referential gaze following from 14- to 18-months. Paper presented at the 22nd Annual Undergraduate Research Conference at UCSD. San Diego, CA.

Professional Organizations and Conference Memberships:

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| • International Society for Autism Research | 2015 – 2016 |
| • Vision Sciences Society | 2013 – 2015 |
| • Association for Psychological Science | 2014 |
| • Cognitive Neuroscience Society | 2012 |
| • American Psychological Association | 2010 |
| • Cognitive Science Society | 2010 |
| • International Conference on Music Perception and Cognition | 2010 |

Coursework:

- Advanced Statistics in Psychology
- Brain and Cognition
- Cortical Control of Human Movement
- Developmental Cognitive Neuroscience
- Embodied Approaches to the Development of Brain and Behavior
- Embodied Cognitive Science
- Math and Logic for Cognitive Science
- Models in Cognitive Science
- Networks of the Brain
- Neural Science – Molecular Neuroscience
- Neural Science – Systems and Cognitive Neuroscience
- Neuroimaging Theory and Methods
- Neurophysiological Techniques
- Philosophical Foundations of Cognitive and Information Science
- Teaching of Psychology

Skills and Qualifications:

Statistics & programming

- SPSS, Excel, Matlab, R

Neuroimaging

- Functional Magnetic Resonance Imaging (fMRI)
- Functional connectivity (PPI – Psychophysiological Interactions)
- Data collection, preprocessing, and analysis in BrainVoyager QX™
- Sequential, crossmodal, and simultaneous presentations of visual and haptic stimuli
- UCSD Center for Functional MRI Scanner Operator (3T GE Signa)

Experimental design

- Matlab, SuperLab
- Visual and haptic presentations of object and texture stimuli
- Double Factorial Paradigm and Systems Factorial Technology for assessing cognitive processing mechanisms for multiple sources of information
- Behavioral experiments on sensorimotor control and learning, visuomotor development and joint attention, movement diversity in a non-human animal, and social collaborations for creativity

Subject populations

- TD and ASD children aged 4 to 17 years (neuroimaging and behavior)
- Infants aged 3 to 24 months (behavior)
- Adults (neuroimaging and behavior)
- Professional dancers (behavior)
- Sulphur-crested cockatoo (behavior)

Additional skills

- Neuropsychological test administration, ASD assessment (ADOS-2)
- Diverse background in research methodology and design for laboratory and field environments
- Applied knowledge of statistical analyses of human subject data
- Proficiency in Mac OS, Windows, Linux, Microsoft Office
- Experience with grant writing/editing, IRB human subjects applications
- Motion capture (active: Phase Space; passive: Vicon) data collection, analysis, and modeling
- Electromyography data collection

Research Trainees:

- Rachel Crum - B.S. Neuroscience, 2017
- Grant Callen, Cox Research Scholar - B.S. Neuroscience, B.S. Psychology, 2015
- Laura Wright - B.S. Neuroscience, 2012
- Rachel Winchell - B.S. Neuroscience, B.A. Psychology, 2011
- Anna Bogun - B.A. Biochemistry, B.S. Neuroscience, 2011
- Heidi Treacy - B.A. Human Dev. & Family Studies, B.A. Psychology, 2011

Service:

- South Central Indiana Regional Science Fair Judge 2014 – 2015
- Ad-hoc reviewer for *Neuropsychologia*