Stanford

Daniel Arthur Abrams

Clinical Assistant Professor, Psychiatry and Behavioral Sciences

Curriculum Vitae available Online

Bio

BIO

Dr. Abrams is a Clinical Assistant Professor in the Department of Psychiatry and Behavioral Sciences at Stanford University where he conducts research investigating the brain bases of social communication impairments in children with autism spectrum disorders (ASD). Dr. Abrams research focuses on understanding why children with ASD often "tune out" from the social world around them and how this impacts social and brain development. His research employs a combination of psychophysical, cognitive, and brain imaging techniques, with the goal of identifying key neural features underlying social deficits in children with ASD.

Dr. Abrams received his undergraduate degree from University of Arizona followed by a period in industry as an acoustical engineer in the San Francisco Bay Area. He subsequently completed his graduate degree from Northwestern University and joined the Stanford University community as a postdoctoral researcher in 2008. Dr. Abrams joined the Stanford faculty in 2014 and was promoted to Clinical Assistant Professor in 2018.

Dr. Abrams’s research program has been supported by multiple funding agencies including the NIH, NARSAD, and the National Organization for Hearing Research Foundation.

Dr. Abrams lives in the Bay Area with his wife, children, and gifted Labrador retriever, Meatball.

ACADEMIC APPOINTMENTS

- Clinical Assistant Professor, Psychiatry and Behavioral Sciences

HONORS AND AWARDS

- Sex differences in voice processing systems in autism, Brain and Behavior Research Foundation (NARSAD) (2019–2021)
- Connectivity of voice processing brain networks in female children with autism, Stanford Women and Sex Differences in Medicine (2017–2018)
- CHRI Pilot Early Career Award, Lucile Packard Foundation for Children’s Health (2017)
- K01 Research Scientist Development Award, NIMH, NIH/NIMH (2014-2017)
- Postdoctoral National Research Service Award, NIH/NIDCD (2010-2012)
- Independence Blue Cross Grant in Auditory Science Award, National Organization for Hearing Research Foundation (2006)
- Research Training in Neuroscience, NIH/NIDCD (2002-2003)
- Graduate Fellowship, Northwestern University (2000-2001)

PROFESSIONAL EDUCATION

- Ph.D., Northwestern University , Auditory Cognitive Neuroscience (2008)

- B.F.A., University of Arizona (1994)

LINKS

- Stanford Cognitive and Systems Neuroscience Laboratory: http://stanford.edu/group/scsnl/cgi-bin/drupal_scsnl/
- Center for Computer Research in Music and Acoustics (CCRMA): https://ccrma.stanford.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Autism spectrum disorders (ASD) are among the most pervasive neurodevelopmental disorders and are characterized by significant deficits in social communication. A common observation in children with ASD is that affected individuals often “tune out” from social interactions, which likely impacts the development of social, communication, and language skills. My primary research goals are to understand why children with ASD often tune out from the social world and how this impacts social skill and brain development, and to identify remediation strategies that motivate children with ASD to engage in social interactions. The theoretical framework that guides my work is that social impairments in ASD stem from a primary deficit in identifying social stimuli, such as human voices and faces, as rewarding and salient stimuli, thereby precluding children with ASD from engaging with these stimuli.

My program of research has provided important information regarding the brain circuits underlying social deficits in ASD. Importantly, these findings have consistently implicated key structures of the brain’s reward and salience processing systems, and support the hypothesis that impaired reward attribution to social stimuli is a critical aspect of social difficulties in ASD. The first study produced by this program of research was published in the Proceedings of the National Academy of Sciences and showed that children with ASD have weak brain connectivity between voice processing regions of cortex and the distributed reward circuit and amygdala. Moreover, the strength of these speech-reward brain connections predicted social communication abilities in these children. A second study, which was recently published in eLife, examined neural processing of mother’s voice, a biologically salient and implicitly rewarding sound which is associated with cognitive and social development, in children with ASD. Results from this study identified a relationship between social communication abilities in children with ASD and brain activation in reward and salience processing regions during mother’s voice processing. A third study, published in Proceedings of the National Academy of Sciences, showed that mother’s voice activates an extended voice processing network, including reward and salience processing regions, in typically developing children. Moreover, the strength of brain connectivity between voice-selective and reward and salience processing regions predicted social communication abilities in these neurotypical children. Together, results provide novel support for the hypothesis that deficits in representing the reward value of social stimuli, including the human voice, impede children with ASD from actively engaging with these stimuli and consequently impair social skill development.

My future research will leverage these findings by examining several important questions related to social information processing in children with ASD. First, we aim to study longitudinal development of social brain circuitry in minimally verbal children with ASD, a severely affected subpopulation that has been vastly underrepresented in the ASD literature. Second, we aim to examine the efficacy of naturalistic developmental behavioral interventions, such as Pivotal Response Treatment, for children with ASD and their relation to changes in social brain and reward circuitry. Third, we aim to examine distinct neural profiles in female children with ASD who, on average, have better social communication abilities compared to their male counterparts.

Publications

PUBLICATIONS

- **Impaired voice processing in reward and salience circuits predicts social communication in children with autism.** *eLife*
  Abrams, D. A., Padmanabhan, A., Chen, T., Odriozola, P., Baker, A. E., Kochalka, J., Phillips, J. M., Menon, V.
  2019; 8
- **Neural circuits underlying mother's voice perception predict social communication abilities in children** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Abrams, D. A., Chen, T., Odriozola, P., Cheng, K. M., Baker, A. E., Padmanabhan, A., Ryali, S., Kochalka, J., Feinstein, C., Menon, V.

2016; 113 (22): 6295-6300

- **Underconnectivity between voice-selective cortex and reward circuitry in children with autism** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Abrams, D. A., Lynch, C. J., Cheng, K. M., Phillips, J., Supekar, K., Ryali, S., Uddin, L. Q., Menon, V.
  2013; 110 (29): 12060-12065
- **A Pivotal Response Treatment Package for Children With Autism Spectrum Disorder: An RCT.** *Pediatrics*
  Gengoux, G. W., Abrams, D. A., Schuck, R., Millan, M. E., Libove, R., Ardel, C. M., Phillips, J. M., Fox, M., Frazier, T. W., Hardan, A. Y.
  2019
- **Quantitative Analysis of Heterogeneity in Academic Achievement of Children With Autism** *CLINICAL PSYCHOLOGICAL SCIENCE*
  Chen, L., Abrams, D. A., Rosenberg-Lee, M., Iuculano, T., Wakeman, H. N., Prathap, S., Chen, T., Menon, V.
  2019; 7 (2): 362–80
- **The visual word form area (VWFA) is part of both language and attention circuitry.** *Nature communications*
  Chen, L., Wassermann, D., Abrams, D. A., Kochalka, J., Gallardo-Diez, G., Menon, V.
  2019; 10 (1): 5601
- **Neural signatures of co-occurring reading and mathematical difficulties.** *Developmental science*
  Skeide, M. A., Evans, T. M., Mei, E. Z., Abrams, D. A., Menon, V.
  2018: e12680
- **Population responses in primary auditory cortex simultaneously represent the temporal envelope and periodicity features in natural speech** *HEARING RESEARCH*
  Abrams, D. A., Nicol, T., White-Schwoch, T., Zecker, S., Kraus, N.
  2017; 348: 31-43
- **Individual Differences in Human Auditory Processing: Insights From Single-Trial Auditory Midbrain Activity in an Animal Model.** *Cerebral cortex (New York, N.Y. : 1991)*
  White-Schwoch, T., Nicol, T., Warrier, C. M., Abrams, D. A., Kraus, N.
  2017; 27 (11): 5095–5115
- **Brain State Differentiation and Behavioral Inflexibility in Autism†.** *Cerebral cortex*
  Uddin, L. Q., Supekar, K., Lynch, C. J., Cheng, K. M., Odriozola, P., Barth, M. E., Phillips, J., Feinstein, C., Abrams, D. A., Menon, V.
  2015; 25 (12): 4740-4747
- **Neurobiological Underpinnings of Math and Reading Learning Disabilities** *JOURNAL OF LEARNING DISABILITIES*
  Ashkenazi, S., Black, J. M., Abrams, D. A., Hoeft, F., Menon, V.
  2013; 46 (6): 549-569
- **Reply to Brock: Renewed focus on the voice and social reward in children with autism.** *Proceedings of the National Academy of Sciences of the United States of America*
  Abrams, D. A., Uddin, L. Q., Menon, V.
  2013; 110 (42): E3974-?
- **Multivariate Activation and Connectivity Patterns Discriminate Speech Intelligibility in Wernicke's, Broca's, and Geschwind's Areas** *CEREBRAL CORTEX*
  Abrams, D. A., Ryali, S., Chen, T., Balaban, E., Levitin, D. J., Menon, V.
  2013; 23 (7): 1703-1714
- **Inter-subject synchronization of brain responses during natural music listening.** *European journal of neuroscience*
  Abrams, D. A., Ryali, S., Chen, T., Chordia, P., Khouzam, A., Levitin, D. J., Menon, V.
  2013; 37 (9): 1458-1469
- **Inferior colliculus contributions to phase encoding of stop consonants in an animal model** *HEARING RESEARCH*
  Warrier, C. M., Abrams, D. A., Nicol, T. G., Kraus, N.
  2011; 282 (1-2): 108-118
- **Decoding Temporal Structure in Music and Speech Relies on Shared Brain Resources but Elicits Different Fine-Scale Spatial Patterns** *CEREBRAL CORTEX*

Abrams, D. A., Bhatara, A., Ryali, S., Balaban, E., Levitin, D. J., Menon, V.
2011; 21 (7): 1507-1518

- **A possible role for a paralemniscal auditory pathway in the coding of slow temporal information** *HEARING RESEARCH*
  Abrams, D. A., Nicol, T., Zecker, S., Kraus, N.
  2011; 272 (1-2): 125-134
- **Sparse logistic regression for whole-brain classification of fMRI data** *NEUROIMAGE*
  Ryali, S., Supekar, K., Abrams, D. A., Menon, V.
  2010; 51 (2): 752-764
- **Rapid acoustic processing in the auditory brainstem is not related to cortical asymmetry for the syllable rate of speech** *Clinical Neurophysiology*
  Abrams DA, Nicol T, Zecker S, Kraus N
  2010; 121: 1343-1350
- **Abnormal Cortical Processing of the Syllable Rate of Speech in Poor Readers** *JOURNAL OF NEUROSCIENCE*
  Abrams, D. A., Nicol, T., Zecker, S., Kraus, N.
  2009; 29 (24): 7686-7693
- **Relating Structure to Function: Heschl's Gyrus and Acoustic Processing** *JOURNAL OF NEUROSCIENCE*
  Warrier, C., Wong, P., Penhune, V., Zatorre, R., Parrish, T., Abrams, D., Kraus, N.
  2009; 29 (1): 61-69
- **Right-hemisphere auditory cortex is dominant for coding syllable patterns in speech** *JOURNAL OF NEUROSCIENCE*
  Abrams, D. A., Nicol, T., Zecker, S., Kraus, N.
  2008; 28 (15): 3958-3965
- **Sensory-based learning disability: Insights from brainstem processing of speech sounds** *INTERNATIONAL JOURNAL OF AUDIOLOGY*
  Banai, K., Abrams, D., Kraus, N.
  2007; 46 (9): 524-532
- **Auditory brainstem timing predicts cerebral asymmetry for speech** *JOURNAL OF NEUROSCIENCE*
  Abrams, D. A., Nicol, T., Zecker, S. G., Kraus, N.
  2006; 26 (43): 11131-11137