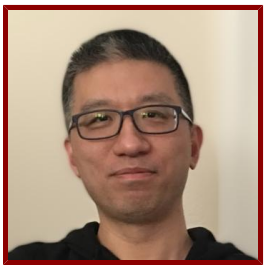
Stanford



Weidong Cai

Clinical Associate Professor, Psychiatry and Behavioral Sciences

Bio

BIO

My research program investigates the neurobiological basis of cognitive dysfunction across the lifespan, focusing on two critical populations: children with neurodevelopmental disorders (e.g., ADHD) and elders with neurodegenerative conditions (e.g., Parkinson's disease). By employing a highly interdisciplinary approach that integrates cognitive science, advanced functional neuroimaging, and computational modeling, I aim to delineate the neurocognitive processes governing both typical and atypical brain development and aging. The ultimate goal is to advance our understanding of the factors contributing to cognitive deficits and translate these findings into improved diagnostic tools and precision treatment strategies.

ACADEMIC APPOINTMENTS

- Clinical Associate Professor, Psychiatry and Behavioral Sciences
- Member, Wu Tsai Human Performance Alliance
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- NARSAD Young Investigator Grant, Brain & Behavior Research Foundation (2020-2022)
- MCHRI Grant, Maternal & Child Health Research Institute (2020-2021)
- Child Health Research Institute (CHRI) Grant, Lucile Packard Foundation for Children's Health (LPFCH) (2017-2018)
- Departmental Innovator Grant, Department of Psychiatry & Behavioral Sciences, Stanford University (2017-2018)
- NIH Research Career Development Award (K01), National Institute of Mental Health (2015-2020)

PROFESSIONAL EDUCATION

- Ph.D., State University of New York at Stony Brook
- M.S., Peking University
- B.S., Shanghai Jiao Tong University

Publications

PUBLICATIONS

- **Nonergodicity and Simpson's paradox in neurocognitive dynamics of cognitive control.** *Nature communications*
  Mistry, P. K., Branigan, N. K., Gao, Z., Cai, W., Menon, V.
  2026; 17 (1)

- **Latent brain state dynamics predict early amyloid accumulation and cognitive impairment.** *bioRxiv : the preprint server for biology*
  Gao, Z., Young, C. B., Lee, B., Roush, R. E., Kotulsky, J., Cisneros, G., Mormino, E., Cohen, A. D., Menon, V., Cai, W.
  2026
- **Dynamic modeling in neurocognitive frameworks of childhood ADHD: a review of inhibitory control and reward systems.** *Translational psychiatry*
  Cai, W., Mizuno, Y.
  2026
- **Heterogeneity of human insular cortex: five principles of functional organization across multiple cognitive domains.** *Brain structure & function*
  Cai, W., Menon, V.
  2025; 230 (8): 161
- **State-space modeling uncovers brain-behavior dynamics of inhibitory control.** *Cerebral cortex (New York, N.Y. : 1991)*
  Yun, X., Cai, W., Fun, J., Zhu, X., Zhao, X.
  2025; 35 (7)
- **Dopaminergic modulation and dosage effects on brain state dynamics and working memory component processes in Parkinson's disease.** *Nature communications*
  Lee, B., Young, C. B., Cai, W., Yuan, R., Ryman, S., Kim, J., Yang, L., Henderson, V. W., Poston, K. L., Menon, V.
  2025; 16 (1): 2433
- **Reduced temporal and spatial stability of neural activity patterns predict cognitive control deficits in children with ADHD.** *Nature communications*
  Gao, Z., Duberg, K., Warren, S. L., Zheng, L., Hinshaw, S. P., Menon, V., Cai, W.
  2025; 16 (1): 2346
- **A brief review of MRI studies in patients with attention-deficit/hyperactivity disorder and future perspectives.** *Brain & development*
  Mizuno, Y., Yamashita, M., Shou, Q., Hamatani, S., Cai, W.
  2025; 47 (2): 104340
- **Reduced temporal and spatial stability of neural activity patterns predict cognitive control deficits in children with ADHD.** *bioRxiv : the preprint server for biology*
  Gao, Z., Duberg, K., Warren, S. L., Zheng, L., Hinshaw, S. P., Menon, V., Cai, W.
  2024
- **Subthalamic nucleus-language network connectivity predicts dopaminergic modulation of speech function in Parkinson's disease.** *Proceedings of the National Academy of Sciences of the United States of America*
  Cai, W., Young, C. B., Yuan, R., Lee, B., Ryman, S., Kim, J., Yang, L., Levine, T. F., Henderson, V. W., Poston, K. L., Menon, V.
  2024; 121 (22): e2316149121
- **Increased Temporal and Spatial Variability of TrialEvoked Brain Responses During Dynamic Inhibitory Control in Children With ADHD**
  Gao, Z., Zheng, L., Huynh, H., Kammer, E., Menon, V., Cai, W.
  ELSEVIER SCIENCE INC.2024: S133
- **A multi-demand operating system underlying diverse cognitive tasks.** *Nature communications*
  Cai, W., Taghia, J., Menon, V.
  2024; 15 (1): 2185
- **Bayesian dynamical system analysis of the effects of methylphenidate in children with attention-deficit/hyperactivity disorder: a randomized trial.** *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*
  Cai, W., Mizuno, Y., Tomoda, A., Menon, V.
  2023
- **Both reactive and proactive control are deficient in children with ADHD and predictive of clinical symptoms.** *Translational psychiatry*
  Cai, W., Warren, S. L., Duberg, K., Yu, A., Hinshaw, S. P., Menon, V.
  2023; 13 (1): 179
- **Methylphenidate Normalizes Aberrant Latent State Dynamics in Children With ADHD**
  Cai, W., Mizuno, Y., Tomoda, A., Menon, V.

ELSEVIER SCIENCE INC.2023: S115-S116

- **The Effects of Methylphenidate on Spontaneous Fluctuations in Reward and Cognitive Control Networks in Children With Attention-Deficit/ Hyperactivity Disorder -Randomized Controlled Studies in Two Independent Cohorts**
  Mizuno, Y., Cai, W., Supekar, K., Makita, K., Takiguchi, S., Silk, T. J., Tomoda, A., Menon, V.
  ELSEVIER SCIENCE INC.2023: S103

- **Methylphenidate Enhances Spontaneous Fluctuations in Reward and Cognitive Control Networks in Children With Attention-Deficit/ Hyperactivity Disorder.** *Biological psychiatry. Cognitive neuroscience and neuroimaging*
  Mizuno, Y., Cai, W., Supekar, K., Makita, K., Takiguchi, S., Silk, T. J., Tomoda, A., Menon, V.
  2022

- **Methylphenidate remediates aberrant brain network dynamics in children with attention-deficit/hyperactivity disorder: a randomized controlled trial.** *NeuroImage*
  Mizuno, Y., Cai, W., Supekar, K., Makita, K., Takiguchi, S., Tomoda, A., Menon, V.
  2022: 119332

- **Methylphenidate Enhances Spontaneous Fluctuations in Reward and Cognitive Control Networks in Children With Attention-Deficit/ Hyperactivity Disorder: A Randomized Control Trial**
  Mizuno, Y., Cai, W., Supekar, K., Makita, K., Takiguchi, S., Tomoda, A., Menon, V.
  ELSEVIER SCIENCE INC.2022: S110

- **Insights from an autism imaging biomarker challenge: promises and threats to biomarker discovery.** *NeuroImage*
  Traut, N., Heuer, K., Lemaître, G., Beggiato, A., Germanaud, D., Elmaleh, M., Bethegnies, A., Bonnasse-Gahot, L., Cai, W., Chambon, S., Cliquet, F., Ghriss, A., Guigui, et al
  2022: 119171

- **Dopaminergic medication normalizes aberrant cognitive control circuit signalling in Parkinson's disease.** *Brain : a journal of neurology*
  Cai, W., Young, C. B., Yuan, R., Lee, B., Ryman, S., Kim, J., Yang, L., Henderson, V. W., Poston, K. L., Menon, V.
  2022

- **Developmental Maturation of Causal Signaling Hubs in Voluntary Control of Saccades and Their Functional Controllability.** *Cerebral cortex (New York, N.Y. : 1991)*
  Zhang, Y., Ryali, S., Cai, W., Supekar, K., Pasumarthy, R., Padmanabhan, A., Luna, B., Menon, V.
  1800

- **Latent brain state dynamics and cognitive flexibility in older adults.** *Progress in neurobiology*
  Lee, B., Cai, W., Young, C. B., Yuan, R., Ryman, S., Kim, J., Santini, V., Henderson, V. W., Poston, K. L., Menon, V.
  2021: 102180

- **Dynamic causal brain circuits during working memory and their functional controllability.** *Nature communications*
  Cai, W., Ryali, S., Pasumarthy, R., Talasila, V., Menon, V.
  2021; 12 (1): 3314

- **Effects of Methylphenidate on Aberrant Brain Network Dynamics in Children With Attention-Deficit/Hyperactivity Disorder: A Randomized Controlled Clinical Trial**
  Mizuno, Y., Cai, W., Spekar, K., Makita, K., Takiguchi, S., Tomoda, A., Menon, V.
  ELSEVIER SCIENCE INC.2021: S108

- **Latent brain state dynamics distinguish behavioral variability, impaired decision-making, and inattention.** *Molecular psychiatry*
  Cai, W., Warren, S. L., Duberg, K., Pennington, B., Hinshaw, S. P., Menon, V.
  2021

- **Seeing It Is Like Touching It: Unraveling the Effective Product Presentations on Online Apparel Purchase Decisions and Brain Activity (An fMRI Study)** *JOURNAL OF INTERACTIVE MARKETING*
  Jai, T., Fang, D., Bao, F. S., James, R. N., Chen, T., Cai, W.
  2021; 53: 66–79

- **Microstructural organization of human insula is linked to its macrofunctional circuitry and predicts cognitive control.** *eLife*
  Menon, V. n., Gallardo, G. n., Pinsk, M. A., Nguyen, V. D., Li, J. R., Cai, W. n., Wassermann, D. n.
  2020; 9

- **Anxiety and Stress Alter Decision-Making Dynamics and Causal Amygdala-Dorsolateral Prefrontal Cortex Circuits During Emotion Regulation in Children.** *Biological psychiatry*
  Warren, S. L., Zhang, Y. n., Duberg, K. n., Mistry, P. n., Cai, W. n., Qin, S. n., Bostan, S. N., Padmanabhan, A. n., Carrion, V. G., Menon, V. n.
  2020
- **Inhibition-related modulation of salience and frontoparietal networks predicts cognitive control ability and inattention symptoms in children with ADHD.** *Molecular psychiatry*
  Cai, W., Griffiths, K., Korgaonkar, M. S., Williams, L. M., Menon, V.
  2019
- **Hyperdirect insula-basal-ganglia pathway and adult-like maturity of global brain responses predict inhibitory control in children.** *Nature communications*
  Cai, W., Duberg, K., Padmanabhan, A., Rehert, R., Bradley, T., Carrion, V., Menon, V.
  2019; 10 (1): 4798
- **Dysregulated Brain Dynamics in a Triple-Network Saliency Model of Schizophrenia and Its Relation to Psychosis** *BIOLOGICAL PSYCHIATRY*
  Supekar, K., Cai, W., Krishnadas, R., Palaniyappan, L., Menon, V.
  2019; 85 (1): 60–69
- **Dopamine-related dissociation of cortical and subcortical brain activations in cognitively unimpaired Parkinson's disease patients OFF and ON medications** *NEUROPSYCHOLOGIA*
  Kim, J., Zhang, K., Cai, W., YorkWilliams, S., Cruadhlaoich, M., Llanes, S., Menon, V., Poston, K. L.
  2018; 119: 24–33
- **Uncovering hidden brain state dynamics that regulate performance and decision-making during cognition.** *Nature communications*
  Taghia, J., Cai, W., Ryali, S., Kochalka, J., Nicholas, J., Chen, T., Menon, V.
  2018; 9 (1): 2505
- **Aberrant Time-Varying Cross-Network Interactions in Children With Attention-Deficit/Hyperactivity Disorder and the Relationto Attention Deficits.** *Biological psychiatry. Cognitive neuroscience and neuroimaging*
  Cai, W., Chen, T., Szegletes, L., Supekar, K., Menon, V.
  2018; 3 (3): 263–73
- **Aberrant Time-Varying Cross-Network Interactions in Children With Attention-Deficit/Hyperactivity Disorder and the Relation to Attention Deficits** *BIOLOGICAL PSYCHIATRY-COGNITIVE NEUROSCIENCE AND NEUROIMAGING*
  Cai, W., Chen, T., Szegletes, L., Supekar, K., Menon, V.
  2018; 3 (3): 263–73
- **Bayesian Switching Factor Analysis for Estimating Time-varying Functional Connectivity in fMRI.** *NeuroImage*
  Taghia, J., Ryali, S., Chen, T., Supekar, K., Cai, W., Menon, V.
  2017
- **Temporal Dynamics and Developmental Maturation of Salience, Default and Central-Executive Network Interactions Revealed by Variational Bayes Hidden Markov Modeling** *PLOS COMPUTATIONAL BIOLOGY*
  Ryali, S., Supekar, K., Chen, T., Kochalka, J., Cai, W., Nicholas, J., Padmanabhan, A., Menon, V.
  2016; 12 (12)
- **Multivariate dynamical systems-based estimation of causal brain interactions in fMRI: Group-level validation using benchmark data, neurophysiological models and human connectome project data** *JOURNAL OF NEUROSCIENCE METHODS*
  Ryali, S., Chen, T., Supekar, K., Tu, T., Kochalka, J., Cai, W., Menon, V.
  2016; 268: 142-153
- **Dissociable Fronto-Operculum-Insula Control Signals for Anticipation and Detection of Inhibitory Sensory Cue.** *Cerebral cortex*
  Cai, W., Chen, T., Ide, J. S., Li, C. R., Menon, V.
  2016: -?
- **Distinct Global Brain Dynamics and Spatiotemporal Organization of the Salience Network** *PLOS BIOLOGY*
  Chen, T., Cai, W., Ryali, S., Supekar, K., Menon, V.
  2016; 14 (6)

- **Causal Interactions Within a Frontal-Cingulate-Parietal Network During Cognitive Control: Convergent Evidence from a Multisite-Multitask Investigation.** *Cerebral cortex*
  Cai, W., Chen, T., Ryali, S., Kochalka, J., Li, C. R., Menon, V.
  2016; 26 (5): 2140-2153
- **Compensatory neural mechanisms in cognitively unimpaired Parkinson disease.** *Annals of neurology*
  Poston, K. L., YorkWilliams, S., Zhang, K., Cai, W., Everling, D., Tayim, F. M., Llanes, S., Menon, V.
  2016; 79 (3): 448-463
- **Development and validation of consensus clustering-based framework for brain segmentation using resting fMRI.** *Journal of neuroscience methods*
  Ryali, S., Chen, T., Padmanabhan, A., Cai, W., Menon, V.
  2015; 240: 128-140
- **Evidence Supports Specific Braking Function for Inferior PFC.** *Trends in cognitive sciences*
  Aron, A. R., Cai, W. n., Badre, D. n., Robbins, T. W.
  2015
- **Dissociable Roles of Right Inferior Frontal Cortex and Anterior Insula in Inhibitory Control: Evidence from Intrinsic and Task-Related Functional Parcellation, Connectivity, and Response Profile Analyses across Multiple Datasets** *JOURNAL OF NEUROSCIENCE*
  Cai, W., Ryali, S., Chen, T., Li, C. R., Menon, V.
  2014; 34 (44): 14652-14667
- **Sensorimotor-independent prefrontal activity during response inhibition** *HUMAN BRAIN MAPPING*
  Cai, W., Cannistraci, C. J., Gore, J. C., Leung, H.
  2014; 35 (5): 2119-2136
- **Proactive Selective Response Suppression Is Implemented via the Basal Ganglia** *JOURNAL OF NEUROSCIENCE*
  Majid, D. S., Cai, W., Corey-Bloom, J., Aron, A. R.
  2013; 33 (33): 13259-13269
- **The role of the right presupplementary motor area in stopping action: two studies with event-related transcranial magnetic stimulation** *JOURNAL OF NEUROPHYSIOLOGY*
  Cai, W., George, J. S., Verbruggen, F., Chambers, C. D., Aron, A. R.
  2012; 108 (2): 380-389
- **Stimulating deep cortical structures with the batwing coil: How to determine the intensity for transcranial magnetic stimulation using coil-cortex distance** *JOURNAL OF NEUROSCIENCE METHODS*
  Cai, W., George, J. S., Chambers, C. D., Stokes, M. G., Verbruggen, F., Aron, A. R.
  2012; 204 (2): 238-241
- **Stopping speech suppresses the task-irrelevant hand** *BRAIN AND LANGUAGE*
  Cai, W., Oldenkamp, C. L., Aron, A. R.
  2012; 120 (3): 412-415
- **Roles for the pre-supplementary motor area and the right inferior frontal gyrus in stopping action: Electrophysiological responses and functional and structural connectivity** *NEUROIMAGE*
  Swann, N. C., Cai, W., Conner, C. R., Pieters, T. A., Claffey, M. P., George, J. S., Aron, A. R., Tandon, N.
  2012; 59 (3): 2860-2870
- **Transcranial Magnetic Stimulation Reveals Dissociable Mechanisms for Global Versus Selective Corticomotor Suppression Underlying the Stopping of Action** *CEREBRAL CORTEX*
  Majid, D. S., Cai, W., George, J. S., Verbruggen, F., Aron, A. R.
  2012; 22 (2): 363-371
- **Rule-Guided Executive Control of Response Inhibition: Functional Topography of the Inferior Frontal Cortex** *PLOS ONE*
  Cai, W., Leung, H.
  2011; 6 (6)
- **A Proactive Mechanism for Selective Suppression of Response Tendencies** *JOURNAL OF NEUROSCIENCE*
  Cai, W., Oldenkamp, C. L., Aron, A. R.

2011; 31 (16): 5965-5969

- **Deep Brain Stimulation of the Subthalamic Nucleus Alters the Cortical Profile of Response Inhibition in the Beta Frequency Band: A Scalp EEG Study in Parkinson's Disease** *JOURNAL OF NEUROSCIENCE*
  Swann, N., Poizner, H., Houser, M., Gould, S., Greenhouse, I., Cai, W., Strunk, J., George, J., Aron, A. R.
  2011; 31 (15): 5721-5729

- **Cortical activity during manual response inhibition guided by color and orientation cues** *BRAIN RESEARCH*
  Cai, W., Leung, H.
  2009; 1261: 20-28

- **Common and differential ventrolateral prefrontal activity during inhibition of hand and eye movements** *JOURNAL OF NEUROSCIENCE*
  Leung, H., Cai, W.
  2007; 27 (37): 9893-9900