Tanya Wen, PhD

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Research Experience & Training

Research Neuroscientist (2022 – present)
Naval Health Research Center / Leidos, San Diego, U.S.A
Research theme: Studying human performance in healthy and injured warfighters
- Analyze EEG recordings in static and dynamic virtual reality environments in mild traumatic brain injury (mTBI) patients during rest and task.
- Design virtual reality tasks to examine human performance in cold weather environments.

Postdoctoral Associate (2019 – 2022)
Center for Cognitive Neuroscience, Duke University, U.S.A
Research theme: Cognitive flexibility and its adaptation to environmental demands
- Developed a new paradigm that required flexible adaptation based on environmental feedback and examined how volatility changes in the environment affected switch likelihood and learning rate.
- Demonstrated that event boundaries can either impair or enhance temporal order memory depending on whether the original encoding context is absent or present during retrieval.
- Investigated the allocation of attention towards always- and intermittently-irrelevant stimuli when people switch within and between task domains, teasing apart the open-gate and task-set inertia hypotheses.

PhD in Medical Science (2015 – 2019)
MRC Cognition and Brain Sciences Unit, University of Cambridge, United Kingdom
- Scholarship Award: Cambridge Commonwealth, European & International Trust

Research theme: Representational dynamics across multiple timescales in human cortical networks
Link to thesis: https://www.repository.cam.ac.uk/handle/1810/300579
- Used decoding methods on combined MEG/EEG data to quantify the time-course and components of selective attention, including representation of stimulus identity, target position, target identity, behavioral status, and the template of the cue/target.
- Examined the roles of the MD and DMN networks during performance of task episodes, and identified differential time-courses between networks, as well as characterized regions that coded for the representation of full episodes, individual items, and current position within an episode.
- Examined how the MD network responses to task difficulty when it can be offset by increased cognitive resource allocation, compared to when performance is limited by quality of data input.

Bachelor of Science, Double Major in Psychology and Life Sciences (2011 – 2015)
Department of Psychology, National Cheng Kung University, Taiwan
- Rank: #1; GPA: Overall 3.97/4.00; Psychology Major: 4.00/4.00; Life Sciences Major: 3.90/4.00

Undergraduate Research Assistant
- Lead fMRI study investigating the neural correlates of the Flashed Face Distortion Effect illusion (supported with my undergraduate research grant).
- Used network-based statistics to characterize functional connections related to internet addiction.

Technical Skills

Examples representative of my work can be found on and http://people.duke.edu/~tw260/ and https://github.com/tanya-wen

Amazon Mechanical Turk: designed and collected multiple behavioral experiments using the MTurk platform (approx. 800 workers total), familiar with both requester and worker interfaces, used the Developer Sandbox to pilot experiments, used Unique Turker to limit the number of times a worker can do an experiment, used bonus reward features, and can assign qualifications to certain workers (e.g., for compensation HITs).

Web Development: written webpages using JavaScript, CSS, and HTML to collect data for online behavioral experiments in cognitive psychology, which include programming and recording timed responses. I have also written a customized PHP script to allow data to be saved on to our lab's server. **Current experiments can be found here: http://people.duke.edu/~tw260/** I am currently taking The Complete 2023 Web Development Bootcamp to learn more about full-stack web development, including Node.js, Express, APIs, EJS, databases including SQL and MongoDB, and the React framework.

Python: wrote Python scripts for fMRI analysis, including a script to detect participants with extraneous head motion and scripts using Nipype to perform 1st and 2nd level analyses on the preprocessed data. I have also utilized python libraries including pandas, numpy, and matplotlib.

Reinforcement Learning (R and Stan): write simulations, implemented reinforcement learning through R and RStan, using the Rescorla–Wagner model and its variants (e.g., two learning rates, state inference, and choice-autocorrelation). I used hierarchical Bayesian models to estimate subject and population parameters.

Matlab: I am proficient in Matlab, with nine years of experience. I have utilized various toolboxes, including Psychtoolbox, SPM12, FieldTrip, EEGLAB, LIBSVM, the RSA toolbox, The Decoding Toolbox, EEGLAB, DPARSF, Neuroelf, etc. I have written multiple programs using Matlab Psychtoolbox to collect data for in-lab behavioral and fMRI experiments. Some of these codes have been adapted to respond to triggers sent from the MRI scanner and to external button boxes. I am also proficient in writing novel codes for analyses depending on specific needs.

fMRIPrep: pioneered in setting up a new fMRI analysis protocol in my postdoc lab, using fMIRPrep and the Nipype interface in Python. I have run fMRIPrep in a Docker container locally, as well as in a Singularity container on the Duke Compute Cluster with parallelly submitted jobs using SLURM and shell scripting.

Machine Learning: split data into training and test sets, performed leave-one-out and k-fold cross-validation, done classification analysis with LIBSVM and linear discriminant analysis on multivariate data, performed representational similarity analysis and used multidimensional scaling to visualize similarity structure.

Virtual Reality: worked with EEG recordings collected on the Computer Assisted Rehabilitation Environment (CAREN) system. Has basic programming skills using Unity and C# to create virtual reality games.

Additional Skills: Microsoft Office, Adobe Illustrator, Adobe Photoshop, SPSS, GitHub for version control, graph theory metrics, Windows/Mac/Linux operating systems, Qualtrics online survey, pair programming, participant recruitment and communication, grant proposal writing, IRB (ethics committee) application writing, manuscript preparation. Native English and Mandarin Chinese writing/speaking.

Publications

Wen, T., & Egner, T. (2023). Context-independent scaling of neural responses to task difficulty in the multiple-demand network. *Cerebral Cortex*, bhac479

Wen, T., Geddert, R.M., Madlon-Kay, S., & Egner, T. (2023). Transfer of learned cognitive flexibility to novel stimuli and task sets. *Psychological Science*, doi: 10.1177/09567976221141854

Wen, T. & Egner (2022). Retrieval context determines whether event boundaries impair or enhance temporal order memory. *Cognition, 225,* 105145

Wen, T., Duncan, J., & Mitchell, D.J. (2020). Hierarchical representation of multistep tasks in multiple-demand and default mode networks. *Journal of Neuroscience*, *40*(40), 7724-7738

Wen, T., Mitchell, D.J. & Duncan, J. (2020). The functional convergence and heterogeneity of social, episodic, and self-referential thought in the default mode network. *Cerebral Cortex*, *30*(11), 5915-5929

Wen, T., Duncan, J., & Mitchell, D. J. (2019). The time-course of component processes of selective attention. *NeuroImage*, 199, 396-407.

Wen, T., Mitchell, D. J., & Duncan, J. (2018). Response of the multiple-demand network during simple stimulus discriminations. *NeuroImage*, 177, 79-87.

Wen, T., Liu, D. C., & Hsieh, S. (2018). Connectivity patterns in cognitive control networks predict naturalistic multitasking ability. *Neuropsychologia*, 114, 195-202.

Lee, K. J., Hsieh, S., & **Wen, T.** (2017). Spatial Bayesian hierarchical model with variable selection to fMRI data. *Spatial Statistics*. doi: 10.1016/j.spasta.2017.06.002

Wen, T. & Hsieh, S. (2016). Network-based analysis reveals functional connectivity related to internet addiction tendency. *Front. Hum. Neurosci.* 10:6. doi: 10.3389/fnhum.2016.00006

Wen, T. & Hsieh, S. (2015). Neuroimaging of the joint Simon effect with believed biological and non-biological co-actors. *Front. Hum. Neurosci.* 9:483. doi: 10.3389/fnhum.2015.00483

Wen, T. & Kung, C. C. (2014). Using functional magnetic resonance imaging to explore the flashed face distortion effect. *Journal of Vision*, *14*(12), 29. doi:10.1167/14.12.29

International Conference Presentations

Wen, T., Geddert R.M., Madlon-Kay S., & Egner, T. (2022). Transfer of learned cognitive flexibility to novel stimuli and task sets. Poster presentation at *the 29th Cognitive Neuroscience Society Annual Meeting*, San Francisco, California, U.S.A.

Wen, T., Duncan, J., & Mitchell, D.J. (2019). The time-course of component processes of selective attention. Poster presentation and Data Blitz oral presentation at *the 26th Cognitive Neuroscience Society Annual Meeting*, San Francisco, California, U.S.A.

Wen, T., Mitchell, D.J., & Duncan, J. (2018). Representation of task episodes in human cortical networks. Poster presented at the *Society for Neuroscience Annual Meeting*, San Diego, California, U.S.A.

Wen, T., Liu, D.C., Hsieh, S. (2018). Connectivity patterns in hierarchical cascade of prefrontal networks predict multitasking ability. Poster presented at *the 25th Cognitive Neuroscience Society Annual Meeting*, Boston, Massachusetts, U.S.A.

Wen, T., Mitchell, D.J., & Duncan, J. (2017). Response of the multiple-demand network during simple perceptual discriminations. Poster presented at *the 40th European Conference on Visual Perception*, Berlin, Germany.

Wen, T. & Kung, C. C. (2014). Using functional magnetic resonance imaging to explore the flashed face distortion effect. Poster presented at *the 2014 Vision Science Society Annual Meeting*, St. Pete Beach, Florida, U.S.A.

Invited Talks

Invited speaker at Ghent University Center for Cognitive Neuroscience meeting (2021)

Invited by Senne Braem to give a talk about “Transfer of learned cognitive flexibility to novel stimuli and task sets”

Fellowships & Awards

Duke Interdisciplinary Behavioral Research Center (IBRC) Mini-Grant (2019-2020). Awarded funding to conduct a behavioral experiment I designed to be collected at the IBRC.

Medical Research Council PhD Studentship (2018-2019). Full scholarship for a year.

Taiwan Cambridge Scholarship from the Cambridge Commonwealth, European & International Trust (2015 – 2018). Full scholarship; awarded to up to 5 students each year.

Guarantors of Brain Travel Grant (2018 & 2019). Awarded to assist attendance of the 2018 and 2019 Cognitive Neuroscience Annual Meeting.

Seton Cavendish Fund from Downing College (2018). Awarded to assist attendance of the 2018 Cognitive Neuroscience Annual Meeting.

Percy Lander Studentship in Preventive Medicine from Downing College (2017 & 2018). Additional PhD funding: £1500/year. Wrote research statement and attended interview.

Phi Tau Phi Scholastic Honor Society of the Republic Of China Membership (2015). Awarded to top 1% of graduating undergraduate students with highest average GPA in each college of the university.

Ministry of Science and Technology Undergraduate Research Grant (2014-2015; $47,000 Taiwan Dollars). Awarded based on research proposal: Can Perceptual Expertise with Greebles Aid Visual Processing During Continuous Flash Suppression?

Foundation for the Advancement of Outstanding Scholarship – Outstanding Students Conference Travel Grant (2014; $62,944 Taiwan Dollars). Awarded to around 20 applicants nationally each year. Awarded to attend the 2014 Vision Science Society Annual Meeting.

National Science Council Undergraduate Research Grant (2013-2014; $47,000 Taiwan Dollars). Awarded based on research proposal: Using Functional Magnetic Resonance Imaging to Explore the Flashed Face Distortion Effect.

Summer/Winter School and Workshops

CIFAR Winter School on the Neuroscience of Consciousness; Montebello, Quebec, Canada (2018).

FSL course; organized by the Wellcome Centre For Integrative Neuroimaging, University of Oxford (2018).

MEG UK workshop and annual conference, University of Oxford (2017).
York Centre for Vision Research (CVR) Vision Science Summer School (2014).

Ad hoc reviewing for academic journals

Neuroimage, Journal of Neuroscience, Human Brain Mapping, Neuroscience & Biobehavioral Reviews, Scientific Reports, European Psychiatry, Frontiers in Psychology, Neurobiology of Learning and Memory