

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: **Laura Thi Germine, PhD**

eRA COMMONS USER NAME (credential, e.g., agency login): LGERMINE

POSITION TITLE: Associate Professor, Harvard Medical School; Neuroscientist, McLean Hospital

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of California, Berkeley: Berkeley, CA	BA	08/2004	Molecular and Cell Biology
Harvard University: Cambridge, MA	PhD	05/2012	Experimental Psychopathology
Massachusetts General Hospital: Boston, MA	Research Fellowship	07/2016	Psychiatric and Neurodevelopmental Genetics

A. Personal Statement

I am an Associate Professor of Psychiatry at Harvard Medical School and Director of the Laboratory for Brain and Cognitive Health Technology at McLean Hospital as well as Co-Director of the McLean Institute for Technology in Psychiatry. My research program is oriented around developing and validating methods for assessment using digital technology towards a better understanding cognitive variation in health and disease. Towards that end, I am Creator and Director of TestMyBrain.org, a not-for-profit *citizen science* research initiative begun in 2008 to conduct participant-centered behavioral research and scalable web-based cognitive assessment. Through TestMyBrain.org, I have collected data from over 3 million participants worldwide and validated methods for self-administered assessments using mobile devices for large cross-sectional studies, longitudinal studies, and high frequency measurement approaches. My program has partnered with some of the largest studies in health and science to provide software tools for measuring RDoC domains of cognitive functioning, including the All of Us Research Program, the NIH Nurses Health Study, and the NIMH Aurora study. The TMB Digital Neuropsychology Toolkit my group developed and made available at the beginning of the Covid-19 pandemic is currently being used by over 1500 researchers and clinicians. In addition, the digital technology infrastructure and open-source cognitive assessment software my group has developed is currently being used at over 500 sites internationally through the dissemination arm of my program, the Many Brains Project. Over the past 15 years, my program has collected some of the largest samples in cognition research and provided critical technology infrastructure to support the progress of behavioral science globally.

Below are ongoing projects relevant to scalable digital cognitive assessment:

R01 MH121617

Germine (PI)

Mobile measures of threat sensitivity for cross-sectional and longitudinal assessment

R01 DK121240

Germine (PI)

Glycemic variability and fluctuations in cognitive status in adults with type 1 diabetes

U2C AG060408

Sliwinski (PI), Role: Site PI / Co-Investigator
Ambulatory methods for measuring cognitive change

Citations, with an emphasis on key methods work:

1. Singh, S., Strong, R., Xu, I., Fonseca, L.M., Hawks, Z., Grinspoon, E., Jung, L., Li, F., Weinstock, R.S., Sliwinski, M., Chaytor, N., & **Germine, L.T.** Reliability and validity of ecological momentary assessment of cognition in clinical and community samples. *Journal of Medical and Internet Research (JMIR)*. In Press.
2. Hawks Z.W., Strong, R., Jung, L., Beck, E.D., Passell, E.J., Grinspoon, E., Singh, S., Frumkin, M.R., Sliwinski, M., & **Germine, L.T.** Accurate prediction of momentary cognition from intensive longitudinal data. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. 2022 (epub ahead of print).
3. Singh S., Strong, R.W., Jung, L., Li, F., Grinspoon, E., Scheuer, L.S., Passell, E.J., Martini, P., Chaytor, N., Soble, J.R., **Germine, L.T.** The TestMyBrain Digital Neuropsychology Toolkit: Development and psychometric characteristics. *Journal of Clinical and Experimental Neuropsychology*. 2021; 43(8): 786-795.
4. **Germine, L.T.**, Strong, R., Singh, S., & Sliwinski, M.J. Toward dynamic phenotypes and the scalable measurement of human behavior. *Neuropsychopharmacology*. 2021;46: 209-216. PMID: 32629456

B. Positions, Scientific Appointments and Honors

Positions and Scientific Appointments

2022-Present Associate Professor, Department of Psychiatry, Harvard Medical School, Boston, MA
2018-2022 Assistant Professor, Department of Psychiatry, Harvard Medical School, Boston, MA
2017-2022 Research Associate, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA
2016-Present Technical Director, Institute for Technology in Psychiatry, McLean Hospital, Belmont, MA
2016-Present Director, Laboratory for Brain and Cognitive Health Technology, McLean Hospital, Belmont, MA
2016-Present Neuroscientist, Division of Depression & Anxiety Disorders, McLean Hospital, Belmont, MA
2016-2018 Instructor, Department of Psychiatry, Harvard Medical School, Boston, MA
2015-Present President, The Many Brains Project, Belmont, MA
2012-2016 Research Fellow, Department of Psychiatry, Massachusetts General Hospital, Boston, MA
2012-2016 Research Associate, Stanley Center for Psychiatric Research, Broad Institute, Cambridge, MA

Honors

2019 Society for Research in Psychopathology Early Career Award
2015 White House Invitee, Champions of Change in Precision Medicine
2015 Society for Research in Psychopathology Face of the Future Award
2014 Ruth L. Kirschstein National Research Service Award for Individual Postdoctoral Fellows, National Institutes of Health
2013 Stuart T. Hauser Research Training Fellowship in Biological and Social Psychiatry, Harvard Medical School, Boston, MA
2012 MGH Clinical Research Award - Psychiatry
2009-2011 George W. Goethals Award for Excellence in Teaching, Harvard University (four semesters)
2007 NSF Graduate Research Fellowship

1. Scalable approaches to digital cognitive assessment

My research program is focused around developing and validating mobile/web-based methods for conducting behavioral and cognitive assessment, in both traditional research approaches and through large-scale citizen science. I have shown that digital web-based, citizen science methods can produce reliable and generalizable results, even where these results rely on demanding, performance-based cognitive assessments done in naturalistic settings. I have also shown how large-scale data collection (through TestMyBrain.org) can be used to iteratively refine assessments, translating traditional measures to forms that are more accessible, more engaging, and with better psychometrics than their original, lab / clinic-based counterparts, and then applying these paradigms more broadly. Using data from the nearly 3 million participants who have participated in studies on TestMyBrain.org, I have published some of the largest

samples in cognition and perception research. My work in this area has shaped best practices in mobile/web-based study design, cognitive assessment, and approaches to remote participant engagement.

- a. **Germine, L.T.**, Strong, R., Singh, S., & Sliwinski, M.J. Toward dynamic phenotypes and the scalable measurement of human behavior. *Neuropsychopharmacology*. 2021;46: 209-216. PMID: 32629456.
- b. **Germine, L.**, Reinecke, K., Chaytor, N.S. Digital neuropsychology: Challenges at the intersection of science and software. *The Clinical Neuropsychologist*. 2019. 33(2). 271-286. PMID: 30614374
- c. Singh S., Strong, R.W., Jung, L., Li, F., Grinspoon, E., Scheuer, L.S., Passell, E.J., Martini, P., Chaytor, N., Soble, J.R., **Germine, L.T.** The TestMyBrain Digital Neuropsychology Toolkit: Development and psychometric characteristics. *Journal of Clinical and Experimental Neuropsychology*. 2021; 43(8): 786-795.
- d. **Germine, L.**, Nakayama, K., Duchaine, B., Chabris, C., Chatterjee, G., & Wilmer, J. Is the web as good as the lab? Comparable performance from web and lab in cognitive/perceptual experiments. *Psychonomic Bulletin & Review*. 2012;19(5): 847-857. PMID: 22829343.

2. Citizen science and participant-centered research

A recurring theme in my research program is how to integrate participants into the research process through the open, transparent, and ethical return of research data and individualized research results. This includes an emphasis on user-centered design, accessibility, as well as frameworks for integrating participant feedback through a citizen science research model. TestMyBrain.org (and recruitment of over 3 million participants through that site) arose from the insight that people like to learn about themselves. Building tools to deliver individualized results from cognitive tests, self-report measures, and other research tools has enabled my program to reach a number and diversity of participants that would not have been possible using a traditional approach to research recruitment. Based on my unique expertise in participant-centered research design, I have served in an advisory capacity to many groups including the AARP, 23andme, Sage Bionetworks, the White House OSTP, and the All of Us Research program. Citations below are notable papers that were able to achieve massive sample sizes through citizen science recruitment as well as a review that outlines the approach.

- a. Duchaine, B., **Germine L.**, & Nakayama, K. Family Resemblance: Ten Family Members with Prosopagnosia and Within-Class Object Agnosia. *Cognitive Neuropsychology*. 2007;24: 419-430. PMID: 18416499.
- b. **Germine, L.**, Cashdollar, N., Duzel, E., & Duchaine, B. A new selective developmental deficit: Impaired object recognition with normal face recognition. *Cortex*. 2011;47: 598-607. PMID: 20547387.
- c. **Germine, L.**, Duchaine, B., & Nakayama, K. Where cognitive development and aging meet: Face learning ability peaks after age 30. *Cognition*. 2011;118(2): 201-210. PMID: 21130422
- d. **Germine, L.**, Russell, R., Bronstad, P.M., Blokland, G.A.M., Smoller, J.W., Kwok, H., ... & Wilmer, J.B. Individual aesthetic preferences for faces are shaped mostly by environments, not genes. *Current Biology*. 2015;25(20): 2684-2689. PMID: 26441352

3. Cognition across the lifespan

A final aim of my work is understanding how cognition changes across the lifespan, and how these changes differ across cognitive functions. One of my most important findings has been remarkable heterogeneity in the way cognitive domains differ across the lifespan, both across cohorts and different fluid and crystallized neurocognitive abilities. My work challenging the traditional fluid vs. cognitive intelligence distinction for lifespan cognitive ability (Hartshorne and Germine, 2015) was one of the most widely read papers in *Psychological Science* in 2015 and named a Forbes Top Ten Brain Science Discovery of 2015. I have also found dissociations across the lifespan for different aspects of memory, processing speed, executive functions, visual perception, and social abilities. This includes a recent paper looking at the trajectory of intraindividual variability of sustained attention performance across the lifespan, showing that within-person variability dissociates from reaction time speed and accuracy from ages 10 to 70 when measured using an attention-based paradigm.

- a. **Germine, L.**, Duchaine, B., & Nakayama, K. Where cognitive development and aging meet: Face learning ability peaks after age 30. *Cognition*. 2011;118(2): 201-210. PMID: 21130422.
- b. Halberda, J., Ly, R., Wilmer, J., Naiman, D., & **Germine, L.** Number sense across the lifespan as revealed by a massive internet-based sample. *Proceedings of the National Academy of Sciences*. 2012;109(28): 11116-11120. PMID: 22733748.
- c. Hartshorne, J., & **Germine, L.** When does cognitive functioning peak? The asynchronous rise and fall of different cognitive abilities across the lifespan. *Psychological Science*. 2015;26(4): 433-443. PMID: 25770099.
- d. Fortenbaugh, F.C., DeGutis, J., **Germine, L.**, Wilmer, J.B., Grosso, M., Russo, K., & Esterman, M. Sustained attention across the life span in a sample of 10,000: Dissociating ability and strategy. *Psychological Science*. 2015;26(9): 1497-1510. PMID: 26253551.

4. Psychometrics and individual differences

One of the biggest barriers to progress in science is reliance on poor or poorly understood measurement tools. As digital technology brings new methods and new opportunities for innovative measurement, one key area of my work has been emphasizing the importance of basic psychometric considerations. In addition to coining the term “digital neuropsychology” to refer to the assessment of neuropsychological function using personal digital devices, my group was the first to demonstrate differences in scores by device type in the everyday world and among real world participants. In experimental psychopathology, investigations of basic psychometrics aspects of test scores (e.g. internal reliability) have revealed widespread. In 2018-2019, the NIMH commissioned a report from my group (HHSN271201700776PP, PI Germine) to evaluate psychometrics of RDoC-relevant cognitive tests. This report identified huge variations in the psychometric properties of widely used tests, with some having little to no reliability despite their popularity. The impact of my work has been a wider appreciation of the need to consider reliability and device variability in digital cognitive assessment of information processing mechanisms in psychopathology.

- a. Passell, E., Dillon, D.G., Baker, J.T., Vogel, S.C., Scheuer, L.S., Mirin, N.L., ... & **Germine, L.** Digital cognitive assessment: Results from the TestMyBrain NIMH Research Domain Criteria (RDoC) Field Test Battery Report. *PsyArXiv [Report published as preprint under HHSN271201700776P]* July 6, 2020 [cited 2023 May 29]
- b. **Germine, L.**, Reinecke, K., Chaytor, N.S. Digital neuropsychology: Challenges at the intersection of science and software. *The Clinical Neuropsychologist*. 2019. 33(2). 271-286. PMID: 30614374
- c. Passell, E., Strong, R.W., Rutter, L.A., Kim, H., Scheuer, L., Martini, P., Grinspoon, L., & **Germine, L.** Cognitive test scores vary with choice of personal digital device. *Behavior Research Methods*. 2021. PMID: 33954913.
- d. Xu, I., Passell, E., Strong, R.W., Grinspoon, E., Wu, Ch., Jung, L., Wilmer, J.B., & **Germine, L.T.** No evidence for consistent reliability across 36 variations of the emotional dot probe task in 9,000 participants. *PsyRxiv [Preprint]* April 1, 2023 [cited 2023 May 29]

5. Dynamic cognitive phenotypes and cognitive ecological momentary assessment methods

Digital technology and the widespread availability of portable digital devices enables the broad measurement of cognitive function in ecological contexts, making a science of everyday cognition feasible towards characterizing variations in normal function, detecting deviations from normal function, and identifying patterns in coupling between cognitive function and other aspects of the environment, physiology, or everyday life that indicate points of potential intervention. Over the last 2-3 years my group has been making strides in this area, showing that cognitive ecological momentary assessment produces high quality data in both community and clinical populations, that variations in momentary cognition are highly predictable from other ecological momentary assessment data, and that such cognitive variations can predict important mental and brain health outcomes. Further, my program now disseminates tools for cognitive ecological momentary assessment to the broader community through the Many Brains Project. I have served as principal investigator (R01 DK 121240, R01 MH121617) of this work as well as supported infrastructure for cognitive EMA as part of collaborative projects (U2C AG060408).

- a. Hawks, Z., Beck, E. D., Jung, L., Fonseca, L. M., Sliwinski, M., Weinstock, R. S., ... & **Germine, L.** (2023). Dynamic associations between glucose and ecological momentary cognition in Type 1 Diabetes. *PsyRxiv [Preprint]* March 13, 2023 [cited 2023 May 29]

- b. Singh, S., Strong, R., Xu, I., Fonseca, L.M., Hawks, Z., Grinspoon, E., ... & **Germine, L.T.** Reliability and validity of ecological momentary assessment of cognition in clinical and community samples. *Journal of Medical and Internet Research (JMIR)*. In Press.
- c. Hawks Z.W., Strong, R., Jung, L., Beck, E.D., Passell, E.J., Grinspoon, E., ... & **Germine, L.T.** Accurate prediction of momentary cognition from intensive longitudinal data. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. 2022 (epub ahead of print).
- d. **Germine, L. T.**, Joormann, J., Passell, E., Rutter, L. A., Scheuer, L., Martini, P., ... & Kessler, R. C. Neurocognition after motor vehicle collision and adverse post-traumatic neuropsychiatric sequelae within 8 weeks: Initial findings from the AURORA study. *Journal of affective disorders*, 2022; 298, 57-67.

A bibliography of my >100 peer-reviewed publications is available at the following URL: [My NCBI](#)