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| BIOGRAPHICAL SKETCH |
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NAME: Dav Clark, Ph.D.

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

POSITION TITLE: Research Scientist, CNIR, Kennedy Krieger Institue

EDUCATION/TRAINING

| INSTITUTION AND LOCATION | DEGREE  *(if applicable)* | COMPLETION DATE | FIELD OF STUDY |
| --- | --- | --- | --- |
| University of Maryland, College Park, MD | B.S.  B.A.  B.S. | 1999 | Mathematics  Linguistics  Computer Science |
| Massachusetts Institute of Technology, Cambridge, MA | M.S. | 2002 | Cognitive Neuroscience |
| University of California, Berkeley, CA | Ph.D. | 2013 | Psychology |

**Personal Statement:** My training has spanned both academic research and holistic movement- and mindfulness-based approaches to human wellbeing. My research has explored brain-based perspectives on learning, including motor skill learning, attitude change, and memory for novel and known linguistic stimuli, and “real world” movies. This work spanned multiple methods, with a focus on fMRI, TMS, and behavior. My masters research with Prof. Anthony Wagner at MIT, in addition to subsequent positions at Massachusetts General Hospital and in Prof. Lila Davachi’s lab at NYU provided me with a strong orientation to prefrontal and medial temporal learning and memory systems using fMRI, TMS, and MEG with a particular focus on multi-modal methods. My Ph.D. training included work with Prof. Rich Ivry at UC Berkeley on motor learning – rounding out my training to include cerebellar- and striatally-dependent learning in addition to neocortical motor control regions with a focus on fMRI methods. Also at UC Berkeley, I worked with Prof. Michael Ranney on “high-level” learning targeting conceptual and attitudinal change using classrooms and the cloud-based mechanical turk for subject recruitment. In parallel, I have engaged in mindfulness practices including yoga, martial arts and zen meditation, including a 4-year training in the Feldenkrais Method and subsequent work as a teacher. I have applied this diverse background to the quantitative investigation of mindfulness training to pediatric populations as a co-investigator on NIH R21 with Prof. Stewart Mostofsky at Kennedy Krieger Institute: “Movement-Based Training for Children with ADHD” (R21 MH104651). In this research, we are investigating tai chi training via the lens of developmental disorder, and we have already developed methods for quantifying neurologic, physiologic and behavioral changes in our ongoing trial in Baltimore.

Complementary to my domain expertise, I recently finished a 2-year appointment as a data scientist working with a variety of novel initiatives on the UC Berkeley campus to enable collaborative, data-intensive science. In particular, I have been a leader in initiating hybrid research–training projects with both graduate and undergraduate students, culminating in a year-long research seminar on “Hacking Measurement” that completed in Fall of 2015. Of note, I have initiated a collaboration with Dr. J.B. Poline to build a collaborative platform for brain-imaging meta-analysis in the context of Hacking Measurement. I have additionally been a contributor to the NiPy project to create open tools for reproducible neuroscience research, primarily in helping to initiate the NiPype project. My work teaching and building solutions with BIDS and the D-Lab has prepared me to engage in productive collaborations in the years to come.

In July, 2016 I returned to focusing on my core research interests with Dr. Mostofsky at the Kennedy Krieger Institute and Johns Hopkins University. My existing work on data management and reproducible analysis are proving invaluable in scaling up our efforts on understanding mindfulness based interventions in my work at the Center for Neurodevelopmental Imaging Research (CNIR) at KKI. Here, I am able to employ my skills to both extend the center’s robust findings on the role of movement in ADHD and other disorders and also apply these findings to understanding the mechanisms of movement-based interventions – including “stillness” and breath-focused approaches. The proposed research will be integrated into a larger program to explore the effects of mindfulness and movement-based interventions for improving neural and cognitive function in children with ADHD.

**B. Positions and Honors:**

# Positions

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| 2013-2016 | Data Scientist, Berkeley D-Lab, UC Berkeley, Berkeley, CA |
| 2014 | Lecturer, School of Information, UC Berkeley, Berkeley, CA |
| 2005 | Programmer / Analyst, NYU |
| 2002 | Programmer / Analyst, Massachusetts General Hospital |

# Honors

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| 1999 | Jacob Javits Fellowship (declined) |
| 1999-2002 | National Science Foundation Graduate Research Fellowship |
| 2009-2012 | Fellow, Research in Cognition and Mathematics Education program (2 years of full support) |
| 2014-2016 | Fellow, Moore–Sloan Berkeley Institute for Data Science (BIDS; 2 years of 50% support) |

# Other Experience and Professional Memberships

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| 2001- | Member, Society for Neuroscience |
| 2006- | Member & Licensed Practitioner, Feldenkrais Guild of North America |
| 2010- | Member, International Society for the Learning Sciences |
| 2010- | Reviewer for Cognition and Instruction, Journal of Cognitive Neuroscience, International Conference for the Learning Sciences, Annual Conference of the Cognitive Science Society, SIGCHI, Frontiers in Neuroinformatics, SciPy, International Journal of Yoga Therapy |

**C. Contributions to Science:**

**C-1. Elucidating brain mechanisms of learning and memory:** The goal of this work was to identify brain regions implicated in the encoding of novel information, and the subsequent memory paradigm was heavily employed. This work ranged from exploring the specificity of prefrontally mediated mechanisms for encoding to whole brain analyses in which I developed a novel subsequent memory intersubject correlation method. This work has served both to demonstrate how the nature of the material can affect the engagement of brain mechanisms (e.g., when the encoded stimulus is known or unknown) but also how networks identified using event related methods are also active in memory encoding under conditions of free movie viewing. Moving forward, I have sought to find innovative ways to apply an understanding of mechanisms of learning and memory to the development of interventions.

1. **Clark D**, Wagner AD. Assembling and encoding word representations: fMRI subsequent memory effects implicate a role for phonological control. Neuropsychologia. 2003;41(3):304–317. PMID: 12457756
2. Kahn I, Pascual-Leone A, Théoret H, Fregni F, **Clark D**, Wagner AD. Transient disruption of ventrolateral prefrontal cortex during verbal encoding affects subsequent memory performance. Journal of neurophysiology. 2005;94(1):688–698. PMID: 15758048
3. Hasson U, Furman O, **Clark D**, Dudai Y, Davachi L. Enhanced intersubject correlations during movie viewing correlate with successful episodic encoding. Neuron. 2008 Feb;57(3):452–462. PMCID: PMC2789242
4. **Clark D**, Ranney MA. Known knowns and unknown knowns: Multiple memory routes to improved numerical estimation. In: Gomez K, Lyons L, Randinsky J, editors. Learning in the Disciplines: Proceedings of the Ninth International Conference of the Learning Sciences (ICLS 2010). Chicago, IL: International Society of the Learning Sciences, Inc.; 2010. p. 460–467.

**C-2. Investigating movement-based learning with a focus on interventions:** While empirical work is still underway in “Movement-Based Training for Children with ADHD,” I have synthesized a broad literature to inform this ongoing work. In particular, I have investigated the interface between higher-level processes like cognitive control, and core motor control. I continue to apply the mechanisms elaborated in these reviews to the development of effective investigations of mindful movement training with Dr. Mostofsky.

1. **Clark D**, Ivry RB. Multiple systems for motor skill learning. WIREs Cogni Sci. 2010;1(4):461–467. PMCID: PMC4346332
2. **Clark D**, Schumann F, Mostofsky SH. Mindful movement and skilled attention. Frontiers in Human Neuroscience. 2015;9:297. PMCID: PMC4484342

**C-3. Develop technologies for open and reproducible science:** Both as a graduate student, and now in my role as data scientist at UC Berkeley, I have been engaged with the open science community. Both locally and at national conferences I have worked with the community to develop best practices for reproducibility and scientific training. Nipype provides a comprehensive interface to major neuroimaging packages, allowing the creation and sharing of reproducible analysis pipelines. The Berkeley Common Environment (BCE) is gaining broad adoption as a standard virtual environment for teaching and reproducibility.

1. Gorgolewski K, Burns CD, Madison C, **Clark D**, Halchenko YO, Waskom ML, Ghosh SS. Nipype: a flexible, lightweight and extensible neuroimaging data processing framework in python. Front Neuroinform. 2011;5:13. PMID: 21897815
2. **Clark D**, Culich A, Hamlin B, Lovett R. BCE: Berkeley’s Common Scientific Compute Environment for Research and Education. Proceedings of the 13th Python in Science Conference. Austin, TX; 2014. p. 5–13. Available from: <http://conference.scipy.org/proceedings/scipy2014/clark.html>
3. **Clark D**. Hacking Measurement. <http://hackingmeasurement.berkeley.edu>

**C-4. Developing interventions for motivation and attitude change:** Education is more than just content-delivery. For example, an ongoing debate in the climate communication community surrounds the efficacy of science education in shifting public attitudes about climate change. While certainly not sufficient, our work has demonstrated that both descriptions of the mechanism of the greenhouse effect, as well as engaging in numerical estimation with feedback can shift attitudes in a way that endure over time. I have likewise applied a cognitive frame to educational interventions to consider the role of surprise and motivation in different contexts.

1. **Clark D**, Okamoto Y, Chiba S. What Drives Motivation? An Intensive, Tablet-Based, Experience Sampling Approach. EDULEARN17 Proceedings. Barcelona: IATED; 2017.
2. Ranney MA, **Clark D**. Climate Change Conceptual Change: Scientific Information Can Transform Attitudes. Top Cogn Sci. 2016 Jan 1;8(1):49–75.
3. **Clark D**, Ranney MA, Felipe J. Knowledge Helps: Mechanistic Information and Numeric Evidence as Cognitive Levers to Overcome Stasis and Build Public Consensus on Climate Change. In: Knauff M, Pauen M, Sebanz N, Wachsmuth I, editors. Cooperative Minds: Social Interaction and Group Dynamics Proceedings of the 35th Annual Meeting of the Cognitive Science Society. Austin, TX: Cognitive Science Society; 2013. p. 2070–2075.
4. Ranney MA, **Clark D**, Reinholz DL, Cohen S. Improving Americans’ Modest Global Warming Knowledge in the Light of RTMD (Reinforced Theistic Manifest Destiny) Theory. In: van Aalst K, Thompson K, Jacobson MM, Reimann P, editors. The Future of Learning: Proceedings of the Tenth International Conference of the Learning Sciences. International Society of the Learning Sciences, Inc.; 2012. p. 2–481 to 2–482.
5. Ranney MA, **Clark D**, Reinholz DL, Cohen S. Changing Global Warming Beliefs with Scientific Information: Knowledge, Attitudes, and RTMD (Reinforced Theistic Manifest Destiny Theory). In: Miyake N, Peebles D, Cooper RP, editors. Proceedings of the 34th Annual Meeting of the Cognitive Science Society. Austin, TX: Cognitive Science Society; 2012. p. 2228–2233.

**Complete List of Published Work:**

<https://www.researchgate.net/profile/Dav_Clark/contributions>

**D. Research Support:**

[5 R21 MH104651-02](https://public.era.nih.gov/grantfolder/piAppDetails/genericStatus.do?encryptedParam=SooXrw5VBnw.j_fP9zYLvaRSDFngwjpyDgghC73isRSOoy156XpKJR4.) (Co-Investigator, PI: Mostofsky) 08/05/14 – 07/31/16

NIH / NIMH

Role: Co-Investigator

Movement-Based Training for Children with ADHD: A Feasibility Study

The goal of this project is to examine the feasibility of a movement-based training approach for children with ADHD (using Tai Chi), targeting improvements in behavioral and physiologic measures of motor control, and with this, improvements in control of impulsive, hyperactive, and distractible behavior. The proposed study offers strong potential for developing novel therapies for ADHD with little risk of adverse reaction.