

ZHI-DE DENG

CONTACT  zzzdeng@alum.mit.edu

INFORMATION  +1 919 564 5282

 www.zzzdeng.net

LAST UPDATED December 18, 2024

RESEARCH SPECIALTIES Noninvasive brain stimulation: technology development, modeling, device safety, translational and clinical applications

Computational electromagnetics

Electrophysiological and neuroimaging biomarker development

Neural plasticity and translational neuromodeling

Nonlinear dynamics of physiological systems

EDUCATION **Columbia University** New York, NY

 Ph.D., Electrical Engineering 2013

Dissertation: *Electromagnetic Field Modeling of Transcranial Electric and Magnetic Stimulation: Targeting, Individualization, and Safety of Convulsive and Subconvulsive Applications*

M.Phil., Electrical Engineering 2011

Graduate concentration in Neuroscience

Massachusetts Institute of Technology Cambridge, MA

M.Eng., Electrical Engineering & Computer Science 2007

Thesis: *Stochastic Chaos and Thermodynamic Phase Transitions: Theory and Bayesian Estimation Algorithms*

S.B., Electrical Science & Engineering 2007

S.B., Physics 2006

Minor in Economics

PROFESSIONAL & ACADEMIC APPOINTMENTS **National Institute of Mental Health** Bethesda, MD
Intramural Research Program

Staff Scientist 2019–

Experimental Therapeutics & Pathophysiology Branch

Noninvasive Neuromodulation Unit

 Director, Computational Neurostimulation Research Program

Research Fellow 2016–2019

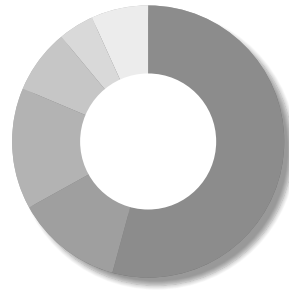
Experimental Therapeutics & Pathophysiology Branch

Noninvasive Neuromodulation Unit

 Richard J. Wyatt Memorial Fellowship for Translational Research

	Duke University School of Medicine	Durham, NC
	<i>Adjunct Assistant Professor</i>	2016–2024
	Department of Psychiatry & Behavioral Sciences Division of Behavioral Medicine & Neurosciences	
	<i>Faculty Network Member</i>	2015–2024
	Duke Institute for Brain Sciences	
	<i>Medical Instructor</i>	2014–2016
	Department of Psychiatry & Behavioral Sciences Division of Brain Stimulation & Neurophysiology	
	 Duke Translational Medicine Institute KL2 Fellow	
	<i>Postdoctoral Associate</i>	2013–2014
	Department of Psychiatry and Behavioral Sciences Division of Brain Stimulation & Neurophysiology Neurocognitive Research Lab	
	<i>Visiting Graduate Research Assistant</i>	2010–2013
	Department of Psychiatry & Behavioral Sciences Division of Brain Stimulation & Neurophysiology Brain Stimulation Engineering Lab	
	Columbia University College of Physicians & Surgeons New York State Psychiatric Institute	New York, NY
	<i>Graduate Research Assistant</i>	2007–2010
	Department of Psychiatry Division of Brain Stimulation & Therapeutic Modulation Technology Development Lab	
	 Columbia Irving Institute for Clinical and Translational Research T32 Fellow	
	Harvard–MIT Division of Health Sciences & Technology	Cambridge, MA
	<i>Research Assistant</i>	2005–2007
	Neurophysiology & Neuroengineering Lab	
NONPROFIT LEADERSHIP	Singula Institute	New York, NY
	<i>Co-founder, Scientific Advisor</i>	2017–
INTERNSHIPS	NewYork-Presbyterian/Weill Cornell Medical Center	New York, NY
	<i>Executive Intern, Anesthesiology</i>	2004
	The New York Times Company, Inc.	New York, NY
	<i>Internship Coordinator</i>	2003
	The New York Times Company Foundation/The Children’s Aid Society	
	<i>Newsroom Technology Intern</i>	2002

AWARDS & HONORS	NIMH Director's Award	2024
	For outstanding transdisciplinary scientific contributions to advance neuromodulation technologies for the study and treatment of psychiatric disorders, NIMH	
	High Five Award	2024
	For excellent preparation for and presentation at the Noninvasive Neuromodulation Unit's Board of Scientific Counselors review, NIMH	
	Scholar, Advanced Research Institute in Geriatric Mental Health	2023–2024
	Dartmouth College, supported by grant from NIH (R25MH068502)	
	NIMH Director's Award	2019
	For scientific innovation at the interface of computation and psychiatry, NIMH	
	Richard J. Wyatt Memorial Fellowship Award for Translational Research	2018
	NIMH Intramural Research Program	
	New Investigator Award	2018
	American Society of Clinical Psychopharmacology	
	Early Career Investigator Travel Fellowship Award	2018
	Society of Biological Psychiatry	
	Research Colloquium for Junior Investigators	2018
	American Psychiatric Association	
	Alies Muskin Career Development Leadership Program	2018
	Anxiety & Depression Association of America	
	NARSAD Young Investigator Award	2017
	Brain & Behavior Research Foundation	
	Career Development Institute for Psychiatry	2017
	Stanford University	
	New Investigator Award	2017
	International Society for CNS Clinical Trials and Methodology	
	Certificate for Highly Cited Research	2016
	<i>Brain Stimulation</i> , Elsevier	
	Young Investigator Memorial Travel Award	2015
	American College of Neuropsychopharmacology	
	Scholar, Summer Research Institute in Geriatric Mental Health	2015
	Weill Cornell Medical College, supported by grant from NIH (R25MH019946)	
	Chair's Choice Award	2014
	Society of Biological Psychiatry	
	Innovative Research Poster Award	2014
	National Network of Depression Centers	
	Best Abstract Award	2010
	International Society for ECT and Neurostimulation	
	Presidential Teaching Award Finalist	2010
	Columbia University	
	Student Paper Competition Finalist	2006
	IEEE Engineering in Medicine and Biology Society	
	New York Times College Scholarship	2002
	The New York Times Company Foundation	



- 64 Refereed journal articles
- 15 Refereed engineering proceedings & letters
- 17 Reviews, protocols, & consensus papers
- 9 Book chapters
- 5 Editorials, correspondences, & commentaries
- 8 Patents/patent applications
- + 170 Abstracts

* Denotes first, joint first, or senior author

S. M. McClintock, **Z.-D. Deng**, M. M. Husain, V. J. Thakkar, E. Bernhardt, R. D. Weiner, B. Luber, and S. H. Lisanby, "Comparing the neurocognitive effects of right-unilateral ultra-brief pulse electroconvulsive therapy and magnetic seizure therapy for the treatment of major depressive episode," *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, vol. 10, no. 2, Feb. 2025.

Journal cover

Z. Qi, G. M. Noetscher, A. Miles, K. Weise, T. R. Knösche, C. R. Cadman, A. R. Potashinsky, K. Liu, W. A. Wartman, G. C. Nuñez Ponasso, M. Bikson, H. Lu, **Z.-D. Deng**, A. R. Nummenmaa, and S. N. Makaroff, "Enabling electric field model of microscopically realistic brain," *Brain Stimulation*, in press.

N. I. Hasan, M. Dannhauer, D. Wang, **Z.-D. Deng**, and L. J. Gomez, "Real-time computation of brain E-field for enhanced transcranial magnetic stimulation neuronavigation and optimization," *Imaging Neuroscience*, online ahead of print, 2024.

First Place in Student Paper Award (awarded to N. I. Hasan), *International Applied Computational Electromagnetics Society Symposium*, 2024.

Third Place in Best Student Paper (awarded to N. I. Hasan), *Photonics and Electromagnetics Research Symposium*, 2024.

N. Khadka, **Z.-D. Deng**, S. H. Lisanby, M. Bikson, and J. A. Camprodon, "Computational models of high-definition electroconvulsive therapy (ECT) for focal or multi-targeting," *The Journal of ECT*, online ahead of print, 2024.







































B. Luber, L. Beynel, **Z.-D. Deng**, L. G. Appelbaum, T. Jones, A. Harrison, D. L. K. Murphy, E. Lo, R. A. McKinley, and S. H. Lisanby, "Site- and frequency-specific enhancement of visual search performance with online individual alpha frequency (IAF) repetitive transcranial magnetic stimulation (rTMS) to the inferior frontal junction," *Cerebral Cortex*, vol. 34, no. 9, bhae371, Sept. 2024.


M. Teferi, H. Gura, M. Patel, A. Casalvera, K. G. Lynch, W. Makhoul, **Z.-D. Deng**, D. J. Oathes, Y. I. Sheline, and N. L. Balderston, "Intermittent theta-burst stimulation to the right dorsolateral prefrontal cortex may increase potentiated startle in healthy individuals," *Neuropsychopharmacology*, vol. 49, no. 10, pp. 1619–1629, Sept. 2024.

* M. Dib, J. D. Lewine, C. C. Abbott, and **Z.-D. Deng**, "Electroconvulsive therapy modulates loudness dependence of auditory evoked potentials: A pilot MEG study," *Frontiers in Psychiatry*, vol. 15, 1434434, Aug. 2024.






























H. Nguyen, C. Q. Li, S. Hoffman, **Z.-D. Deng**, Y. Yang, and H. Lu, "Ultra-high frequency repetitive TMS at subthreshold intensity induces suprathreshold motor response via temporal summation," *Journal of Neural Engineering*, vol. 21, no. 4, 046044, Aug. 2024.

























L. Beynel, H. Gura, Z. Rezaee, E. C. Ekpo, **Z.-D. Deng**, J. O. Joseph, P. Taylor, B. Luber, and S. H. Lisanby, "Lessons learned from an fMRI-guided rTMS study on performance in a numerical Stroop task," *PLOS ONE*, vol. 19, no. 5, e0302660, May 2024.




























- S. K. Kar, A. Agrawal, A. Silva-dos-Santos, Y. Gupta, and **Z.-D. Deng**, “The efficacy of transcranial magnetic stimulation in the treatment of obsessive-compulsive disorder: An umbrella review of meta-analyses,” *CNS Spectrums*, vol. 29, no. 2, pp. 109–118, Apr. 2024.  
- * B. Kadriu, **Z.-D. Deng**, C. Kraus, J. N. Johnston, A. Figtman, I. D. Henter, S. Kasper, and C. A. Zarate, Jr., “The impact of body mass index on clinical features of bipolar disorder: A STEP-BD study,” *Bipolar Disorder*, vol. 26, no. 2, pp. 160–175, Mar. 2024.  
 Media coverage: *Psychiatric Times*, Feb. 2024. 
 - * P. L. Robins, S. N. Makaroff, M. Dib, S. H. Lisanby, and **Z.-D. Deng**, “Electric field characteristics of transcranial rotating permanent magnetic stimulation,” *Bioengineering*, vol. 11, no. 3, 258, Mar. 2024.  
 Part of the Special Issue on *Electric, magnetic, and electromagnetic fields in biology and medicine: From mechanisms to biomedical applications* 
 NIMH Intramural Research Program Trainee Travel Award (awarded to P. L. Robins), *NIMH IRP Fellows’ Scientific Training Day*, 2023.
 - * **Z.-D. Deng**, B. Lubner, S. M. McClintock, R. D. Weiner, M. M. Husain, and S. H. Lisanby, “Clinical outcomes of magnetic seizure therapy vs electroconvulsive therapy for major depressive episode: A randomized clinical trial,” *JAMA Psychiatry*, vol. 81, no. 3, pp. 240–249, Mar. 2024.  
 Commentary: vol. 81, no. 7, pp. 736–737. 
 Reply: vol. 81, no. 7, pp. 737–738, July 2024. 
 Media coverage: *Psychiatric News*, Feb. 2024.  · *MedPage Today*, Feb. 2024.  · *Brain & Behavior Research Foundation*, Jan. 2024.  · *NIMH Research Highlight*, Dec. 2023. 
 - * C. C. Abbott, J. Miller, D. Farrar, M. Argyelan, M. Lloyd, T. Squillaci, B. Kimbrell, S. Rymann, T. R. Jones, J. Upston, D. K. Quinn, A. V. Peterchev, E. Erhardt, A. Datta, S. M. McClintock, and **Z.-D. Deng**, “Amplitude-determined seizure-threshold, electric field modeling, and electroconvulsive therapy antidepressant and cognitive outcomes,” *Neuropsychopharmacology*, vol. 49, no. 4, pp. 640–648, Mar. 2024.  
 Research highlight commentary: vol. 49, no. 4, pp. 635–636, Mar. 2024. 
- W. A. Wartman, K. Weise, M. Rachh, L. Morales, **Z.-D. Deng**, A. R. Nummenmaa, and S. N. Makaroff, “An adaptive h-refinement method for the boundary element fast multipole method for quasi-static electromagnetic modeling,” *Physics in Medicine and Biology*, vol. 69, no. 4, 055030, Feb. 2024.   
 Third Place in International Student Competition (awarded to W. A. Wartman), *Brain & Human Body Modeling Conference*, 2023.
- M. Argyelan, **Z.-D. Deng**, O. T. Ousdal, L. Olteidal, B. Angulo, M. Baradits, A. J. Spitzberg, U. Kessler, A. Sartorius, A. Dols, K. L. Narr, R. Espinoza, J. A. van Waarde, I. Tendolkar, P. van Eijndhoven, G. A. van Wingen, A. Takamiya, T. Kishimoto, M. B. Jørgensen, A. Jørgensen, O. B. Paulson, A. Yrondi, P. Péran, C. Soriano-Mas, N. Cardoner, M. Cano, L. van Diermen, D. Schrijvers, J.-B. Belge, L. Emsell, F. Bouckaert, M. Vandenbulcke, M. Kiebs, R. Hurlemann, P. C. R. Mulders, R. Redlich, U. Dannlowski, E. Kavakbasi, M. D. Kritzer, K. K. Ellard, J. A. Camprodon, G. Petrides, A. K. Malhotra, and C. C. Abbott, “Electroconvulsive therapy-induced volumetric brain changes converge on a common causal circuit in depression,” *Molecular Psychiatry*, vol. 29, no. 2, pp. 229–237, Feb. 2024.   
- S. N. Makaroff, Z. Qi, M. Rachh, W. A. Wartman, K. Weise, G. M. Noetscher, M. Daneshzand, **Z.-D. Deng**, L. Greengard, and A. R. Nummenmaa, “A fast direct solver for surface-based whole-head modeling of transcranial magnetic stimulation,” *Scientific Reports*, vol. 13, no. 8, 18657, Oct. 2023.   
- * **Z.-D. Deng**, P. L. Robins, M. Dannhauer, L. M. Haugen, J. D. Port, and P. E. Croarkin, “Optimizing TMS coil placement approaches for targeting the dorsolateral prefrontal cortex in depressed adolescents: An electric field modeling study,” *Biomedicine*, vol. 11, no. 8, 2320, Aug. 2023.  



































✧ Part of the Special Issue on *Emerging trends in brain stimulation* 




























🏆 First Place in International Student Competition (awarded to P.L. Robins), *Brain & Human Body Modeling Conference*, 2022.








- C. Kraus, A. Kautzky, V. Watzal, A. Gramser, B. Kadriu, **Z.-D. Deng**, L. Bartova, C. A. Zarate, Jr., R. Lanzenberger, D. Souery, S. Montgomery, J. Mendlewicz, J. Zohar, G. Fanelli, A. Serretti, and S. Kasper, “Body mass index and clinical outcomes in individuals with major depressive disorder: Finding from the GSRD European Multicenter Database,” *Journal of Affective Disorder*, vol. 335, pp. 349–357, Aug. 2023.  
- M. Teferi, W. Makhoul, **Z.-D. Deng**, D. J. Oathes, Y. I. Sheline, and N. L. Balderston, “Continuous theta burst stimulation to the right dorsolateral prefrontal cortex may increase potentiated startle in healthy individuals,” *Biological Psychiatry: Global Open Science*, vol. 3, no. 3, pp. 470–479, July 2023.  
- J. Miller, T. R. Jones, J. Upston, **Z.-D. Deng**, S. M. McClintock, E. Erhardt, D. Farrar, D. K. Quinn, and C. C. Abbott, “Electric field, ictal theta power, and clinical outcomes in electroconvulsive therapy,” *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, vol. 8, no. 7, pp. 760–767, July 2023.  
- A. Guillen, C. C. Abbott, **Z.-D. Deng**, Y. Huang, P. Pascoal-Faria, D. Q. Truong, and A. Datta, “Impact of modeled field of view in electroconvulsive therapy current flow simulations,” *Frontiers in Psychiatry*, vol. 14, 1168672, May 2023.  
- M. Alawi, P. F. Lee, **Z.-D. Deng**, Y. K. Goh, and P. E. Croarkin, “Modelling the differential effects of age on transcranial magnetic stimulation induced electric fields,” *Journal of Neural Engineering*, vol. 20, no. 2, 026016, Mar. 2023.  
- X. Chen, R. Ma, W. Zhang, G. Q. Zeng, Q. Wu, A. Yimiti, X. Xia, J. Cui, Q. Liu, X. Meng, J. Bu, Q. Chen, Y. Pan, N. X. Yu, S. Wang, **Z.-D. Deng**, A. T. Sack, M. McLaughlin, and X. Zhang, “Alpha oscillatory activity is causally linked to working memory retention,” *PLOS Biology*, vol. 21, no. 2, e3001999, Feb. 2023.  
- Z. Fu, C. C. Abbott, J. Miller, **Z.-D. Deng**, S. M. McClintock, M. S. E. Sendi, J. Sui, and V. D. Calhoun, “Cerebro-cerebellar functional neuroplasticity mediates the effect of electric field on electroconvulsive therapy outcomes,” *Translational Psychiatry*, vol. 13, 43, Feb. 2023.   
- S. N. Makaroff, H. Nguyen, Q. Meng, H. Lu, A. Nummenmaa, and **Z.-D. Deng**, “Modeling transcranial magnetic stimulation coils with magnetic cores,” *Journal of Neural Engineering*, vol. 20, no. 1, 016028, Jan. 2023.   
- S. Qi, V. D. Calhoun, D. Zhang, J. Miller, **Z.-D. Deng**, K. L. Narr, Y. I. Sheline, S. M. McClintock, R. Jiang, X. Yang, J. Upston, T. R. Jones, J. Sui, and C. C. Abbott, “Links between electroconvulsive therapy responsive and cognitive impairment multimodal brain networks in late-life major depressive disorder,” *BMC Medicine*, vol. 22, 477, Dec. 2022.   
◇ Correction: vol. 21, 113, Mar. 2023. 
- H. Li, **Z.-D. Deng**, D. Oathes, and Y. Fan, “Computation of transcranial magnetic stimulation electric fields using self-supervised deep learning,” *NeuroImage*, vol. 264, 119705, Dec. 2022.  
- A. Richie-Halford, M. Cieslak, L. Ai, S. Caffarra, S. Covitz, A. R. Franco, I. I. Karipidis, J. Kruper, M. Milham, B. Avelar-Pereira, E. Roy, V. J. Sydnor, J. Yeatman, The Fibr Community Science Consortium [including **Z.-D. Deng**], T. D. Satterthwaite, and A. Rokem, “An analysis-ready and quality controlled resource for pediatric brain white-matter research,” *Scientific Data*, vol. 9, 616, Oct. 2022.   
- J. Miller, T. Jones, J. Upston, **Z.-D. Deng**, S. M. McClintock, S. Ryman, D. Quinn, and C. C. Abbott, “Ictal theta power as an electroconvulsive therapy safety biomarker: A pilot study,” *The Journal of ECT*, vol. 38, no. 2, pp. 88–94, June 2022.  

- H. Bagherzadeh, Q. Meng, **Z.-D. Deng**, H. Lu, E. Hong, Y. Yang, and F.-S. Choa, “Angle-tuned coils: Attractive building blocks for TMS with improved depth–spread performance,” *Journal of Neural Engineering*, vol. 19, no. 2, 026059, May 2022.  
- B. Luber, S.W. Davis, **Z.-D. Deng**, D. Murphy, A. Martella, A.V. Peterchev, and S.H. Lisanby, “Using diffusion tensor imaging to effectively target TMS to deep brain structures,” *NeuroImage*, vol. 249, 118863, Apr. 2022.  
- * **Z.-D. Deng**, M. Argyelan, J. Miller, D. Quinn, M. Lloyd, T.R. Jones, J. Upston, E. Erhardt, S.M. McClintock, and C.C. Abbott, “Electroconvulsive therapy, electric field, neuroplasticity, and clinical outcomes,” *Molecular Psychiatry*, vol. 27, no. 3, pp. 1676–1682, Mar. 2022.  
 Commentary: vol. 27, no. 9, pp. 3571–3572, Sept. 2022. 
 Reply: vol. 29, no. 10, pp. 3289–3290, Oct. 2024. 
- N.L. Balderston, J.C. Beer, D. Seok, W. Makhoul, **Z.-D. Deng**, T. Girelli, M. Teferi, N. Smyk, M. Jaskir, D.J. Oathes, R.T. Shinohara, and Y.I. Sheline, “Proof of concept study to develop a novel connectivity-based electric-field modelling approach for individualized targeting of transcranial magnetic stimulation treatment,” *Neuropsychopharmacology*, vol. 47, no. 2, pp. 588–598, Jan. 2022.  
- S.H. Lisanby, S.M. McClintock, W.V. McCall, R.G. Knapp, C.M. Cullum, M. Mueller, **Z.-D. Deng**, A.A. Teklehaimanot, M.V. Rudorfer, E. Bernhardt, G. Alexopoulos, S.H. Bailine, M.C. Briggs, E.T. Geduldig, R.M. Greenberg, M.M. Husain, S. Kaliora, V. Latoussakis, L.S. Liebman, G. Petrides, J. Prudic, P.B. Rosenquist, S. Sampson, K.G. Tobias, R.D. Weiner, R.C. Young, C.H. Kellner, Prolonging Remission in Depressed Elderly (PRIDE) Work Group, “Longitudinal neurocognitive effects of combined electroconvulsive therapy (ECT) and pharmacotherapy in geriatric major depressive disorder: Phase 2 of the PRIDE study,” *American Journal of Geriatric Psychiatry*, vol. 30, no. 1, pp. 15–28, Jan. 2022.  
- B. Kadriu, C.A. Farmer, P. Yuan, L.T. Park, **Z.-D. Deng**, R. Moaddel, I.D. Henter, B. Shovestul, E.D. Ballard, C. Kraus, P.W. Gold, R. Machado-Vieira, and C.A. Zarate, Jr., “The kynurenine pathway and bipolar disorder: Intersection of the monoaminergic and glutamatergic systems and immune response,” *Molecular Psychiatry*, vol. 26, no. 8, pp. 4085–4095, Aug. 2021.  
- A. Takamiya, F. Bouckaert, M. Laroy, J. Blommaert, A. Radwan, A. Khatoun, **Z.-D. Deng**, M. McLaughlin, W. Van Paesschen, F.-L. De Winter, J. Van den Stock, S. Sunaert, P. Sienaert, M. Vandenbulcke, and L. Emsell, “Biophysical mechanisms of electroconvulsive therapy-induced volume expansion in the medial temporal lobe: A longitudinal *in vivo* human imaging study,” *Brain Stimulation*, vol. 14, no. 4, pp. 1038–1047, July–Aug. 2021.  
- E.A. Friðgeirsson, **Z.-D. Deng**, D. Denys, J.A. van Waarde, and G.A. van Wingen, “Electric field strength induced by electroconvulsive therapy may be associated with clinical outcome: A pilot study,” *NeuroImage: Clinical*, vol. 30, 102581, Feb. 2021.  
- P.J.C. Suen, S. Doll, M.C. Battistuzzo, G. Busatto, L.B. Razza, F. Padberg, E. Mezger, L. Bulubas, D. Keeser, **Z.-D. Deng**, and A.R. Brunoni, “Association between tDCS computational modeling and clinical outcomes in depression: Data from the ELECT-TDCS trial,” *European Archives of Psychiatry and Clinical Neuroscience*, vol. 271, no. 1, pp. 101–110, Feb. 2021.  
- C.C. Abbott, D. Quinn, J. Miller, E. Ye, S. Iqbal, M. Lloyd, T.R. Jones, J. Upston, **Z.-D. Deng**, E. Erhardt, and S.M. McClintock, “Electroconvulsive therapy pulse amplitude and clinical outcomes,” *American Journal of Geriatric Psychiatry*, vol. 29, no. 2, pp. 166–178, Jan. 2021.  

















- M. L. Cox, **Z.-D. Deng**, H. Palmer, A. Watts, L. Beynel, J. R. Young, S. H. Lisanby, J. Migaly, and L. G. Appelbaum, "Utilizing transcranial direct current stimulation to enhance laparoscopic technical skills training: A randomized controlled trial," *Brain Stimulation*, vol. 13, no. 3, pp. 863–872, May–June 2020.  
- S. Aronson Fischell, T. J. Ross, **Z.-D. Deng**, B. J. Salmeron, and E. A. Stein, "Transcranial direct current stimulation applied to the dorsolateral and ventromedial prefrontal cortices in smokers modifies cognitive circuits implicated in the nicotine withdrawal syndrome," *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, vol. 5, no. 4, pp. 448–460, Apr. 2020.  
- S. H. Lisanby, S. M. McClintock, G. Alexopoulos, S. H. Bailine, E. Bernhardt, M. C. Briggs, C. M. Cullum, **Z.-D. Deng**, M. Dooley, E. T. Geduldig, R. M. Greenberg, M. M. Husain, S. Kaliora, R. G. Knapp, V. Latoussakis, L. S. Liebman, W. V. McCall, M. Mueller, G. Petrides, J. Prudic, P. B. Rosenquist, M. V. Rudorfer, S. Sampson, A. A. Teklehaimanot, K. G. Tobias, R. D. Weiner, R. C. Young, C. H. Kellner, on behalf of the CORE/PRIDE Work Group, "Neurocognitive effects of combined electroconvulsive therapy (ECT) and venlafaxine in geriatric depression: Phase 1 of the PRIDE study," *American Journal of Geriatric Psychiatry*, vol. 28, no. 3, pp. 304–316, Mar. 2020.  
 Commentary: vol. 28, no. 3, pp. 317–319, Mar. 2020. 
- N. L. Balderston, E. M. Beydler, C. Roberts, **Z.-D. Deng**, T. Radman, T. Lago, B. Luber, S. H. Lisanby, M. Ernst, and C. Grillon, "Mechanistic link between right prefrontal cortical activity and anxious arousal revealed using transcranial magnetic stimulation in healthy subjects," *Neuropsychopharmacology*, vol. 45, no. 4, pp. 694–702, Mar. 2020.  
- L.-Z. Yang, W. Zhang, W. Wang, Z. Yang, H. Wang, **Z.-D. Deng**, C. Li, B. Qiu, D.-R. Zhang, R. Cohen Kadosh, H. Li, and X. Zhang, "Neural and psychological predictors of cognitive enhancement and impairment due to neurostimulation," *Advanced Science*, vol. 7, no. 4, 1902863, Feb. 2020.  
 Journal inside back cover 
- N. L. Balderston, E. M. Beydler, M. Goodwin, **Z.-D. Deng**, T. Radman, B. Luber, S. H. Lisanby, M. Ernst, and C. Grillon, "Low-frequency parietal repetitive transcranial magnetic stimulation reduces fear and anxiety," *Translational Psychiatry*, vol. 10, no. 1, 68, Feb. 2020.  
- T. Dufor, S. Grehl, A. D. Tang, M. Doulazmi, M. Traoré, N. Debray, C. Dubacq, **Z.-D. Deng**, J. Mariani, A. M. Lohof, and R. M. Sherrard, "Neural circuit repair by low-intensity magnetic stimulation requires cellular magnetoreceptors and specific stimulation patterns," *Science Advances*, vol. 5, no. 10, eaav9847, Oct. 2019.  
- M. Argyelan, L. Olstedal, **Z.-D. Deng**, B. Wade, M. Bikson, A. Joanlanne, S. Sanghani, H. Bartsch, M. Cano, A. M. Dale, U. Dannlowski, A. Dols, V. Enneking, R. Espinoza, U. Kessler, K. L. Narr, K. J. Oedagaard, M. L. Oudega, R. Redlich, M. L. Stek, A. Takamiya, L. Emsell, F. Bouckaert, P. Sienaert, J. Pugol, I. Tendolkar, P. van Eijndhoven, G. Petrides, A. K. Malhotra, and C. Abbott, "Electric field causes volumetric changes in the human brain," *eLife*, vol. 8, e49115, Oct. 2019.   
- * L. Beynel, L. G. Appelbaum, B. Luber, C. A. Crowell, S. A. Hilbig, W. Lim, D. Nguyen, N. A. Chrapliwy, S. W. Davis, R. Cabeza, S. H. Lisanby, and **Z.-D. Deng**, "Effects of online repetitive transcranial magnetic stimulation (rTMS) on cognitive processing: A meta-analysis and recommendations for future studies," *Neuroscience and Biobehavioral Reviews*, vol. 107, pp. 47–58, Dec. 2019.   
- S. M. Goetz, S. M. Madhi Alavi, **Z.-D. Deng**, and A. V. Peterchev, "Statistical model of motor evoked potentials," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 27, no. 8, pp. 1539–1545, Aug. 2019.   



- T. Popa, L. S. Morris, R. Hunt, **Z.-D. Deng**, S. Horovitz, K. Mente, H. Shitara, K. Baek, M. Hallett, and V. Voon, “Modulation of resting connectivity between the mesial frontal cortex and basal ganglia,” *Frontiers in Neurology*, vol. 10, 587, June 2019.  
- M. J. Dubin, I. P. Ilieva, **Z.-D. Deng**, J. Thomas, A. Albright, K. Kravets, B. D. Brody, P. J. Christos, J. H. Kocsis, C. Liston, and F. M. Gunning, “A double-blind pilot dosing study of low field magnetic stimulation (LFMS) for treatment-resistant depression (TRD),” *Journal of Affective Disorders*, vol. 249, pp. 286–293, Apr. 2019.  
- P. E. Croarkin, P. A. Nakonezny, **Z.-D. Deng**, M. Romanowicz, J. L. Vande Voort, D. Doruk Camsari, K. M. Schak, J. D. Port, and C. P. Lewis, “High frequency repetitive TMS for suicidal ideation in adolescents with depression,” *Journal of Affective Disorders*, vol. 239, pp. 282–290, Oct. 2018.  
- B. Wang, M. R. Shen, **Z.-D. Deng**, J. E. Smith, J. J. Tharayil, C. J. Gurrey, L. J. Gomez, and A. V. Peterchev, “Redesigning existing transcranial magnetic stimulation coils to reduce energy: Application to low field magnetic stimulation,” *Journal of Neural Engineering*, vol. 15, no. 3, 036022, Apr. 2018.  
- S. Grehl, D. Martina, C. Goyenvalle, **Z.-D. Deng**, J. Rodger, and R. M. Sherrard, “*In vitro* magnetic stimulation: A simple stimulation device to deliver defined low intensity electro-magnetic fields,” *Frontiers in Neural Circuits*, vol. 10, 85, Nov. 2016.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Effects of anatomical variability on electric field characteristics of electroconvulsive therapy and magnetic seizure therapy: a parametric modeling study,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 23, no. 1, pp. 22–31, Jan. 2015.  
- J. K. Mueller, E. M. Grigsby, V. Prevosto, F. W. Petraglia, III, H. Rao, **Z.-D. Deng**, A. V. Peterchev, M. A. Sommer, T. Egner, M. L. Platt, and W. M. Grill, “Simultaneous transcranial magnetic stimulation and single-neuron recording in alert non-human primates,” *Nature Neuroscience*, vol. 17, no. 8, pp. 1130–1136, Aug. 2014.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Coil design considerations for deep transcranial magnetic stimulation,” *Clinical Neurophysiology*, vol. 125, no. 6, pp. 1202–1212, June 2014.  
 Commentary 1: vol. 125, no. 6, pp. 1077–1078, June 2014. 
 Commentary 2: vol. 126, no. 7, pp. 1455–1456.   Reply: vol. 126, no. 7, pp. 1456–1457, July 2015. 
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Controlling stimulation strength and focality in electroconvulsive therapy via electrode size, spacing, and current amplitude,” *The Journal of ECT*, vol. 29, no. 4, pp. 325–335, Dec. 2013.  
 Best Abstract Award, *International Society for ECT and Neurostimulation Annual Meeting*, 2010.
- B. Luber, J. Steffner, A. Tucker, C. Habeck, A. V. Peterchev, **Z.-D. Deng**, R. Basner, Y. Stern, and S. H. Lisanby, “Extended remediation of sleep deprived-induced working memory deficits using fMRI-guided transcranial magnetic stimulation,” *Sleep*, vol. 36, no. 6, pp. 857–871, June 2013.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Electric field depth–focality tradeoff in transcranial magnetic stimulation: simulation comparison of 50 coil designs,” *Brain Stimulation*, vol. 6, no. 1, pp. 1–13, Jan. 2013.  
 Commentary: vol. 6, no. 1, pp. 14–15, Jan 2013. 
 Journal cover and in issue highlights
- W. H. Lee, **Z.-D. Deng**, T. S. Kim, A. F. Laine, S. H. Lisanby, and A. V. Peterchev, “Regional electric field induced by electroconvulsive therapy in a realistic head model: influence of white matter anisotropic conductivity,” *NeuroImage*, vol. 59, no. 3, pp. 2110–2123, Feb. 2012.  



- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Electric field strength and focality of electroconvulsive therapy and magnetic seizure therapy: A finite element simulation study,” *Journal of Neural Engineering*, vol. 8, no. 1, 016007, Jan. 2011.  
- N. M. Arzeno, **Z.-D. Deng**, and C.-S. Poon, “Analysis of first-derivative based QRS detection algorithms,” *IEEE Transactions on Biomedical Engineering*, vol. 55, no. 2, pp. 478–484, Feb. 2008.  
- D. Tang, W. A. Wartman, A. R. Nummenmaa, M. Daneshzand, G. Noetscher, H. Lu, **Z.-D. Deng**, and S. N. Makaroff, “TMS coil designer with fast multipole method using MATLAB or Python platform,” *Brain Stimulation*, in press, 2024.   
- * **Z.-D. Deng**, M. Argyelan, J. Miller, T. R. Jones, J. Upston, S. M. McClintock, and C. C. Abbott, “On assumptions and key issues in electric field modeling for ECT,” *Molecular Psychiatry*, vol. 29, no. 10, pp. 3289–3290, Oct. 2024.  
- M. Alawi, P. F. Lee, Y. K. Goh, **Z.-D. Deng**, and P. E. Croarkin, “Modelling of transcranial magnetic stimulation (TMS) induced fields in different age groups,” *Proceedings of International Conference for Innovation in Biomedical Engineering and Life Sciences*, Jan. 2021, vol. 81, pp. 68–75. 
- * **Z.-D. Deng** and S. H. Lisanby, “Electric field characteristics of low-field synchronized transcranial magnetic stimulation (sTMS),” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, July 2017, pp. 1445–1448.  
- * **Z.-D. Deng**, S. M. McClintock, and S. H. Lisanby, “Brain network properties in depressed patients receiving seizure therapy: A graph theoretical analysis of peri-treatment resting EEG,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2015, pp. 2203–2206.  
- * **Z.-D. Deng**, A. V. Peterchev, A. D. Krystal, B. Lubner, S. M. McClintock, M. M. Husain, and S. H. Lisanby, “Topography of seizures induced by electroconvulsive therapy and magnetic seizure therapy,” *Proceedings of the IEEE Engineering in Medicine and Biology Society Conference on Neural Engineering*, Nov. 2013, pp. 577–580. 
- W. H. Lee, **Z.-D. Deng**, A. F. Laine, S. H. Lisanby, and A. V. Peterchev, “Influence of white matter conductivity anisotropy on electric field strength induced by electroconvulsive therapy,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2011, pp. 5473–5476.  
- * **Z.-D. Deng** and A. V. Peterchev, “Transcranial magnetic stimulation coil with electronically switchable active and sham modes,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2011, pp. 1993–1996.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Transcranial magnetic stimulation in the presence of deep brain stimulation implants: Induced electrode currents,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2010, pp. 6812–6824.  
- * **Z.-D. Deng**, D. E. Hardesty, S. H. Lisanby, and A. V. Peterchev, “Electroconvulsive therapy in the presence of deep brain stimulation implants: Electric field effects,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2010, pp. 2049–2062.  
- * W. H. Lee, **Z.-D. Deng**, T. S. Kim, A. F. Laine, S. H. Lisanby, and A. V. Peterchev, “Regional electric field induced by electroconvulsive therapy: A finite element simulation study,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2010, pp. 2045–2048.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “Effect of head anatomical variability on neural polarization strength and focality in electroconvulsive therapy and magnetic seizure therapy,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Sept. 2009, pp. 682–688.  


- * **Z.-D. Deng**, A. V. Peterchev, and S. H. Lisanby, “Coil design considerations for deep brain transcranial magnetic stimulation,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2008, pp. 5675–5679.  
- * **Z.-D. Deng**, C.-S. Poon, N. M. Arzeno, and E. S. Katz, “Heart rate variability in pediatric obstructive sleep apnea,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2006, pp. 3565–3568.  
- * N. M. Arzeno, C.-S. Poon, and **Z.-D. Deng**, “Quantitative analysis of QRS detection algorithms based on the first derivative of the ECG,” *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2006, pp. 1788–1791.  
 Student paper competition finalist (awarded to N. M. Arzeno), *Annual International Conference of the IEEE EMBS*, 2006.




REVIEWS,
PROTOCOLS,
& CONSENSUS
PAPERS



- J. R. Young, C. S. Polick, A. M. Michael, M. Dannhauer, J. T. Galla, M. K. Evans, A. Troutman, A. C. Kirby, M. F. Dennis, C. W. Papanikolas, **Z.-D. Deng**, S. D. Moore, E. A. Deder, M. A. Addicott, L. G. Appelbaum, and J. C. Beckham, “Multimodal smoking cessation treatment combining repetitive transcranial magnetic stimulation, cognitive behavioral therapy, and nicotine replacement in veterans with posttraumatic stress disorder: A feasibility randomized controlled trial protocol,” *PLOS ONE*, vol. 19, no. 9, e0291562, Sept. 2024.  
- * M. Dannhauer, L. J. Gomez, P. L. Robins, D. Wang, N. I. Hasan, A. Thielscher, H. R. Siebner, Y. Fan, and **Z.-D. Deng**, “Electric field modeling in personalizing transcranial magnetic stimulation interventions,” *Biological Psychiatry*, vol. 95, no. 6, pp. 494–501, Mar. 2024.  
 Part of the Special Issue on *Transcranial magnetic stimulation* 
- L. M. Oberman, S. M. Francis, L. Beynel, M. Hynd, M. Jaime, P. L. Robins, **Z.-D. Deng**, J. Stout, J. W. van der Veen, and S. H. Lisanby, “Design and methodology for a proof of mechanism study of individualized neuronavigated continuous theta burst stimulation for auditory processing in adolescents with autism spectrum disorder,” *Frontiers in Psychiatry*, vol. 15, 1304528, Feb. 2024.  
 Part of the Research Topic on *Women in psychiatry 2023: Neurostimulation* 
- * **Z.-D. Deng**, P. L. Robins, W. Regenold, P. Rohde, M. Dannhauer, and S. H. Lisanby, “How electroconvulsive therapy works in the treatment of depression: Is it the seizure, the electricity, or both?” *Neuropsychopharmacology*, vol. 49, no. 1, pp. 150–162, Jan. 2024.  
 Part of the *2024 Neuropsychopharmacology Reviews: Rapid and novel treatments in psychiatry* 
- A. R. Brunoni, H. Ekhtiari, A. Antal, P. Auvichayapat, C. Baeken, I. M. Benseñor, M. Bikson, P. Boggio, B. Borroni, F. Brighina, J. Brunelin, S. Carvalho, W. Caumo, P. Ciechanski, L. Charvet, V. P. Clark, R. Cohen Kadosh, M. Cotelli, A. Datta, **Z.-D. Deng**, R. De Raedt, D. De Ridder, P. B. Fitzgerald, A. Floel, F. Frohlich, M. S. George, P. Ghobadi-Azbari, S. Goerigk, R. H. Hamilton, S. J. Jaberzadeh, K. Hoy, D. J. Kidgell, A. Khojasteh Zonoozi, A. Kirton, S. Laureys, M. Lavidor, K. Lee, J. Leite, S. H. Lisanby, C. Loo, D. M. Martin, C. Miniussi, M. Mondino, K. Monte-Silva, L. Morales-Quezada, M. A. Nitsche, A. H. Okano, C. S. Oliveira, B. Onarheim, K. Pacheco-Barrios, F. Padberg, E. M. Nakamura-Palacios, U. Palm, W. Paulus, C. Plewnia, A. Priori, T. K. Rajji, L. B. Razza, E. M. Rehn, G. Ruffini, K. Schellhorn, M. Zare-Bidoky, M. Simis, P. Skorupinski, P. Suen, A. Thibaut, L. C. L. Valiengo, M.-A. Vanderhasselt, S. Vanneste, G. Venkatasubramanian, I. R. Violante, A. Wexler, A. J. Woods, and F. Fregni, “Digitalized transcranial electrical stimulation: A consensus statement,” *Clinical Neurophysiology*, vol. 143, pp. 154–165, Nov. 2022.  
- L. Borriore, P. C. Cirillo, L. V. M. Aparicio, B. A. Cavendish, D. O. Moura, J. P. de Souza, I. Klein, J. Gallucci-Neto, P. Suen, F. Padberg, S. Goerigk, M.-A. Vanderhasselt, **Z.-D. Deng**, J. O’Shea, P. A. Lotufo, I. M. Bensenor, and A. R. Brunoni, “A study protocol for an ongoing multi-arm, randomized, double-blind, sham-controlled clinical trial with digital

features, using portable transcranial electrical stimulation and internet-based behavioral therapy for major depression disorders: The PSYLECT study,” *Expert Review of Neurotherapeutics*, vol. 22, no. 6, pp. 513–523, June 2022.  



W. T. Regenold, **Z.-D. Deng**, and S. H. Lisanby, “Noninvasive neuromodulation of the prefrontal cortex in mental health disorders,” *Neuropsychopharmacology*, vol. 47, no. 1, pp. 361–372, Jan. 2022.  



✦ Part of the 2022 *Neuropsychopharmacology Reviews: Prefrontal cortex* 



N. L. Balderston, C. Roberts, E. M. Beydler, **Z.-D. Deng**, T. Radman, B. Lubner, S. H. Lisanby, M. Ernst, and C. Grillon, “A generalized method for conducting electric-field optimized, fMRI-guided, transcranial magnetic stimulation,” *Nature Protocols*, vol. 15, no. 11, pp. 3595–3614, Nov. 2020.   

L. Borriore, H. Bellini, L. B. Razza, A. G. Avila, C. Baeken, A.-K. Brem, G. Busatto, A. F. Carvalho, A. Chekroud, Z. J. Daskalakis, **Z.-D. Deng**, J. Downar, W. Gattaz, C. Loo, P. A. Lotufo, M. D. G. M. Martin, S. M. McClintock, J. O’Shea, F. Padberg, I. C. Passos, G. A. Salum, M.-A. Vanderhasselt, R. Fraguas, I. Benseñor, L. Valiengo, and A. R. Brunoni, “Precision non-implantable neuromodulation therapies: A perspective for the depressed brain,” *Brazilian Journal of Psychiatry*, vol. 42, no. 4, pp. 403–419, July–Aug. 2020.  



B. Kadriu, **Z.-D. Deng**, C. Kraus, I. D. Henter, S. H. Lisanby, and C. A. Zarate, Jr., “Not so fast: Recent successes and failures in treating depression,” *Journal of Clinical Psychiatry*, vol. 81, no. 4, 19ac13138, May 2020.  



* **Z.-D. Deng**, B. Lubner, N. L. Balderston, M. Velez Afanador, M. M. Noh, J. Thomas, W. C. Altekruze, S. L. Exley, S. Awasthi, and S. H. Lisanby, “Device-based modulation of neurocircuits as a therapeutic for psychiatric disorders,” *Annual Review of Pharmacology and Toxicology*, vol. 60, pp. 591–614, Jan. 2020.  



E. Kallioniemi, S. M. McClintock, **Z.-D. Deng**, M. M. Husain, and S. H. Lisanby, “Magnetic seizure therapy: Towards personalized seizure therapy for major depression,” *Personalized Medicine in Psychiatry*, vol. 17–18, pp. 37–42, Nov.–Dec. 2019.  

M. Bikson, A. R. Brunoni, L. E. Charvet, V. P. Clark, L. G. Cohen, **Z.-D. Deng**, J. Dmochowski, D. J. Edwards, F. Frohlich, E. S. Kappenman, K. O. Lim, C. Loo, A. Mantovani, D. P. McMullen, L. C. Parra, M. Pearson, J. D. Richardson, J. M. Rumsey, P. Sehatpour, D. Sommers, G. Unal, E. M. Wassermann, A. J. Woods, and S. H. Lisanby, “Rigor and reproducibility in research with transcranial electrical stimulation: An NIMH-sponsored workshop,” *Brain Stimulation*, vol. 11, no. 3, pp. 465–480, May–June 2018.  


S. M. Goetz and **Z.-D. Deng**, “The development and modeling of devices and paradigms for transcranial magnetic stimulation,” *International Review of Psychiatry*, vol. 29, no. 2, pp. 115–145, Apr. 2017.  











* **Z.-D. Deng**, S. M. McClintock, N. E. Oey, B. Lubner, and S. H. Lisanby, “Neuromodulation for mood and memory: From the engineering bench to the patient bedside,” *Current Opinion in Neurobiology*, vol. 30, pp. 38–43, Feb. 2015.  

S. M. McClintock, J. Choi, **Z.-D. Deng**, L. G. Appelbaum, A. D. Krystal, and S. H. Lisanby, “Multifactorial determinants of the neurocognitive effects of electroconvulsive therapy,” *The Journal of ECT*, vol. 30, no. 2, pp. 165–176, June 2014.  











A. V. Peterchev, M. A. Rosa, **Z.-D. Deng**, J. Prudic, and S. H. Lisanby, “Electroconvulsive therapy stimulus parameters: Rethinking dosage,” *The Journal of ECT*, vol. 26, no. 3, pp. 159–174, Sept. 2010.  

BOOK
CHAPTERS

* **Z.-D. Deng** and S. H. Lisanby, “Next-generation seizure therapy,” in *The Oxford Handbook of Transcranial Stimulation*, E. M. Wassermann, A. V. Peterchev, U. Ziemann, H. R. Siebner, V. Walsh, and S. H. Lisanby, Eds., 2nd ed. Oxford, UK: Oxford University Press, 2024, ch. 45, pp. 1188–1210. 



- R. J. Ilmoniemi, **Z.-D. Deng**, L. J. Gomez, L. M. Koponen, J. O. Nieminen, A. V. Peterchev, and C. M. Epstein, “Transcranial magnetic stimulation coils,” in *The Oxford Handbook of Transcranial Stimulation*, E. M. Wassermann, A. V. Peterchev, U. Ziemann, H. R. Siebner, V. Walsh, and S. H. Lisanby, Eds., 2nd ed. Oxford, UK: Oxford University Press, 2024, ch. 4, pp. 102–123. 
- J. Thomas, **Z.-D. Deng**, S. Awasthi, and S. H. Lisanby, “Magnetic seizure therapy,” in *Neuropsychology of Depression*, S. M. McClintock and J. Choi, Eds. New York: Guilford Press, 2022, ch. 21, pp. 383–406.
- B. Kadriu, S. Subramanian, **Z.-D. Deng**, I. D. Henter, L. T. Park, and C. A. Zarate, Jr., “Rapid-acting antidepressants,” in *Primer on Depression*, M. H. Trivedi, Ed. Oxford, UK: Oxford University Press, 2019, ch. 13, pp. 218–240.  
- * S. N. Makarov, G. Bogdanov, G. M. Noetscher, W. Appleyard, R. Ludwig, J. T. Joutsa, and **Z.-D. Deng**, “Design and analysis of a whole body non-contact electromagnetic sub-threshold stimulation device with field modulation targeting nonspecific neuropathic pain,” in *Brain and Human Body Modeling: Computational Human Modeling at EMBC 2018*, S. N. Makarov, M. Horner, and G. M. Noetscher, Eds. Switzerland: Springer Nature, 2019, ch. 5, pp. 85–123.  
- * **Z.-D. Deng**, C. Liston, F. M. Gunning, M. J. Dubin, E. A. Friðgeirsson, J. Lilien, G. A. van Wingen, and J. A. van Waarde, “Electric field modeling for transcranial magnetic stimulation and electroconvulsive therapy,” in *Brain and Human Body Modeling: Computational Human Modeling at EMBC 2018*, S. N. Makarov, M. Horner, and G. M. Noetscher, Eds. Switzerland: Springer Nature, 2019, ch. 4, pp. 75–84.  
- B. Luber and **Z.-D. Deng**, “Application of non-invasive brain stimulation in psychophysiology,” in *Handbook of Psychophysiology*, J. T. Cacioppo, L. G. Tassinary, G. Berntson, Eds., 4th ed. Cambridge, UK: Cambridge University Press, 2016, ch. 7, pp. 116–150. 
- A. V. Peterchev, **Z.-D. Deng**, and S. M. Goetz, “Advances in transcranial magnetic stimulation technology,” in *Brain Stimulation: Methodologies and Interventions*, I. Reti, Ed. Hoboken, NJ: Wiley-Blackwell, 2015, ch. 10, pp. 165–190. 
- S. H. Lisanby and **Z.-D. Deng**, “Magnetic seizure therapy for the treatment of depression,” in *Brain Stimulation: Methodologies and Interventions*, I. Reti, Ed. Hoboken, NJ: Wiley-Blackwell, 2015, ch. 8, pp. 123–148. 



EDITORIALS,
CORRESPONDENCES, &
COMMENTARIES


- S. K. Kar, A. Silva-dos-Santos, L. A. Lebedev, and **Z.-D. Deng**, “Editorial: How does brain stimulation work? Neuroversion and other putative mechanisms of action,” *Frontiers in Psychiatry*, vol. 15, 1488846, Sept. 2024.  
- * **Z.-D. Deng**, R. D. Wiener, and S. H. Lisanby, “Magnetic seizure therapy vs electroconvulsive therapy for major depressive episode—Reply,” *JAMA Psychiatry*, vol. 81, no. 7, pp. 737–738, July 2024.  
- A. R. Brunoni, **Z.-D. Deng**, and F. Padberg, “Enhancing repetitive transcranial magnetic stimulation effects for depression treatment: *Navigare necesse est*—and smart clinical trial designs,” *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, vol. 7, no. 6, pp. 527–529, June 2022.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “On the characterization of coils for deep transcranial magnetic stimulation,” *Clinical Neurophysiology*, vol. 126, no. 7, pp. 1456–1457, July 2015.  
- * **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, “On the stimulation depth of transcranial magnetic stimulation coils,” *Clinical Neurophysiology*, vol. 126, no. 4, pp. 843–844, Apr. 2015.  


OTHER (NON-
AUTHORED)
CONTRIBUTIONS &
ARTWORKS



American Psychiatric Association, *The Practice of Electroconvulsive Therapy*, Third Edition: Recommendations for Treatment, Training, and Privileging (A Task Force Report of the American Psychiatric Association), Washington, DC: APA Publishing, 2025.
Contribution: Created figures illustrating ECT configurations and computational models



- * **Z.-D. Deng**, “Brain: An intricate web,” *NIMH Scientific Training Day*, Sept. 2022. 
 Voted First Place in Science as Art Competition

T. R. Lago, K. S. Blair, G. Alvarez, A. Thongdarong, J. R. Blair, M. Ernst, and C. Grillon, “Threat-of-shock decreases emotional interference on affective Stroop performance in healthy controls and anxiety patients,” *European Journal of Neuroscience*, vol. 55, no. 9–10, pp. 2519–2528, May 2022.  
Contribution: Created graphical abstract

- * **Z.-D. Deng**, “Blind researchers and the pathologic brain,” *National Academy of Neuropsychology Bulletin*, vol. 33, no. 1, cover artwork, 2020. 

R. C. Klein, S. M. Goetz, W. B. Liedtke, S. D. Moore, and A. V. Peterchev, “Static magnetic field modulates excitatory activity in layer II/III pyramidal neurons of the rat motor cortex,” *Proceedings of the IEEE Engineering in Medicine and Biology Society Conference on Neural Engineering*, Nov. 2013, pp. 1190–1193. 
Contribution: Performed magnetic field simulation in Figure 1C



W. Paulus, A. V. Peterchev, and M. Ridding, “Transcranial electric and magnetic stimulation: Technique and paradigms,” in *Handbook of Clinical Neurology*, 3rd Series, A. M. Lozano and M. Hallett, Eds., Amsterdam, The Netherlands: Elsevier, 2013, ch. 27, vol. 116, pp. 329–342.  
Contribution: Created Figure 27.3


M. Wysocki, M.-N. Fiamma, C. Straus, C.-S. Poon, and T. Similowski, “Chaotic dynamics of resting ventilatory flow in humans assessed through noise titration,” *Respiratory Physiology & Neurobiology*, vol. 153, no. 1, pp. 54–65, Aug. 2006.  
Contribution: Performed noise titration computations



ARTICLES IN
REVIEW,
PREPRINTS, &
PREREGISTRATION

S. Reeves, **Z.-D. Deng**, and J. R. Young, “A history of transcranial magnetic stimulation,” contracted book chapter.


- * S. Dey and **Z.-D. Deng**, “Controllability analysis of macaque structural connectome from an edge centric perspective.”


A. V. Peterchev, **Z.-D. Deng**, C. Sikes-Keilp, E. C. Feuer, M. A. Rosa, and S. H. Lisanby, “Optimal frequency for seizure induction with electroconvulsive therapy and magnetic seizure therapy,” *bioRxiv*, Sept. 2024.  

- * L. Beynel, E. Wiener, N. Baker, E. Greenstein, S. Francis, A. Neacsu, C. Neige, S. Davis, E. Jones, B. Gindoff, B. Luber, S. H. Lisanby, and **Z.-D. Deng**, “Efficacy of non-invasive brain stimulation (NIBS) combined with evidence-based psychotherapy for psychiatric and neurodevelopmental disorders: A meta-analysis,” *PROSPERO*, CRD42024570287, Aug. 2024. 

L. D. Oliver, J. Jeyachandra, E. W. Dickie, C. Hawco, S. Mansour, S. M. Hare, R. W. Buchanan, A. K. Malhotra, D. M. Blumberger, **Z.-D. Deng**, and A. N. Voineskos, “Bayesian Optimization of Neurostimulation (BOONStim),” *bioRxiv*, Mar. 2024.  



C. Thomas, **Z.-D. Deng**, Y. Huang, C. C. Abbott, G. Venkatasubramanian, and A. Datta, “Exploring the potential impact of race on cortical current flow due to ECT: A computational analysis.”

C. Lu, **Z.-D. Deng**, and F.-S. Choa, “Augmenting transcranial magnetic stimulation coil with magnetic material: An optimization approach,” *bioRxiv*, Jan. 2022. 



 Third Place in International Student Competition (awarded to C. Lu), *Brain & Human Body Modeling Conference*, 2021.


- * **Z.-D. Deng**, N. M. Arzeno, E. S. Katz, H. Chang, C. L. Marcus, and C.-S. Poon, “Non-high frequency heart rate chaos: A noninvasive marker of REM sleep and obstructive sleep apnea syndrome in children,” *bioRxiv*, Oct. 2018. 

DISSERTATION
& THESIS

- * **Z.-D. Deng**, “Electromagnetic Field Modeling of Transcranial Electric and Magnetic Stimulation: Targeting, Individualization, and Safety of Convulsive and Subconvulsive Applications,” Ph.D. dissertation, Columbia University, Department of Electrical Engineering, New York, NY, 2013. Sponsor: K. L. Shepard. Available: Columbia University Academic Commons. 
- * **Z.-D. Deng**, “Stochastic Chaos and Thermodynamic Phase Transitions: Theory and Bayesian Estimation Algorithms,” M.Eng. thesis, Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science, Cambridge, MA, 2007. Sponsor: C.-S. Poon. Available: DSpace@MIT. 

SELECTED
ABSTRACTS
(10/170)

- * E. Bharti, S. Dey, V. Voon, S. M. Goetz, C. A. Zarate, Jr., S. H. Lisanby, and **Z.-D. Deng**, “Personalized brain modeling of psychiatric treatments,” *NIMH IRP Fellows’ Scientific Training Day*, 2024.
- * S. Dey and **Z.-D. Deng**, “A robust state estimation strategy for brain stimulation,” *NIMH IRP Fellows’ Scientific Training Day*, 2024.
- * P. L. Robins, J. R. Gilbert, and **Z.-D. Deng**, “Characterizing hippocampal activation with magnetoencephalography using the mnemonic similarity task in healthy participants,” *Biological Psychiatry*, vol. 95, no. 10, p. S205, 2024; also in *Aperture Neuro*, vol. 4, no. Suppl 1, p. 1713, 2024; and *NIH Postbac Poster Day*, 2024.
- * M. Dannhauer, S. H. Lisanby, and **Z.-D. Deng**, “The next generation of Dosing Optimization for Transcranial Magnetic Stimulation (DO-TMS),” *NIMH IRP Fellows’ Scientific Training Day*, 2023.
- * J. Kim, B. A. Pritchard, R. H. Schor, G. R. Dold, S. H. Lisanby, and **Z.-D. Deng**, “Multichannel Individualized Stimulation Therapy (MIST) system for treatment of depression,” *Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 2023.
- E. Jones, **Z.-D. Deng**, Z. Rezaee, F. Mukhtar, E. Feuer, P. Rohde, P. L. Robins, W. T. Regenold, and S. H. Lisanby, “Innovative electroconvulsive therapy: Individualized Low Amplitude Seizure Therapy,” *American Psychiatric Nurses Association Annual Conference*, 2022.
-  Poster Award (awarded to the Noninvasive Neuromodulation Unit), *NIMH 75th Anniversary Event*, 2023.
- * **Z.-D. Deng**, M. Hynd, Z. Rezaee, A. R. Brunoni, and S. H. Lisanby, “Sham response in transcranial magnetic stimulation depression trials is increasing over time,” *Neuropsychopharmacology*, vol. 47, supplement, p. 199, 2022.
- * **Z.-D. Deng**, S. M. McClintock, M. M. Husain, and S. H. Lisanby, “Antidepressant response of electroconvulsive therapy and magnetic seizure therapy: Response trajectories by symptom clusters,” *Neuropsychopharmacology*, vol. 46, supplement, p. 226, 2021.
- M. Velez Afanador, **Z.-D. Deng**, and S. H. Lisanby, “Resting-state EEG source analysis in depressed patients treated with electroconvulsive therapy and magnetic seizure therapy,” *Biological Psychiatry*, vol. 83, no. 9, p. S405, 2018.
-  Outstanding Poster Award (awarded to M. Velez Afanador), *NIH Postbac Poster Day*, 2018.

- * **Z.-D. Deng**, S. M. McClintock, and S. H. Lisanby, “EEG-based graph theoretical measures as biomarkers of clinical outcome in electroconvulsive and magnetic seizure therapy,” *The National Network of Depression Centers Annual Conference*, 2014.
 Innovative Research Poster Award

INTELLECTUAL PROPERTY

- Z.-D. Deng**, J. Kim, G. R. Dold, B. A. Pritchard, R. H. Schor, and S. H. Lisanby, “Systems and methods for adjustable current individualized stimulation therapy,” U.S. Provisional Patent application 63/656,515, June 5, 2024.
- Z.-D. Deng**, B. A. Pritchard, J. Kim, G. R. Dold, R. H. Schor, and S. H. Lisanby, “Systems and methods for multichannel individualized stimulation therapy,” PCT/US24/23876, Apr. 10, 2024; U.S. Provisional Patent application 63/495,244, Apr. 10, 2023.
- C. C. Abbott, **Z.-D. Deng**, J. Upston, T. Jones, and A. Datta, “Systems and methods for E-field informed electroconvulsive therapy,” PCT WO/2024/148196, July 11, 2024; U.S. Provisional Patent application 63/437,017, Jan. 4, 2023.
- C. C. Abbott, A. Datta, J. Upston, T. Jones, and **Z.-D. Deng**, “Systems and methods for amplitude-determined seizure titrations and electric field modeling in electroconvulsive therapy,” U.S. Provisional Patent application 63/516,371, July 28, 2023.
- S. N. Makarov, G. M. Noetscher, V. S. Makarov, and **Z.-D. Deng**, “Whole body non-contact electrical stimulation device with variable parameters,” U.S. Patent 10,551,449, Feb. 4, 2020.
- C.-S. Poon and **Z.-D. Deng**, “Systems and methods for detecting a physiological abnormality in a patient by using cardiac or other chaos in combination with a non-increasing parasympathetic modulation,” U.S. Patent 9,737,258, Aug. 22, 2017; PCT WO/2014/120353, July 8, 2014.
- A. V. Peterchev and **Z.-D. Deng**, “Transcranial magnetic stimulation coil with electronically switchable active and sham modes,” U.S. Provisional Patent application 61/525,922, Aug. 22, 2011.
- A. V. Peterchev, S. H. Lisanby, and **Z.-D. Deng**, “Methods, apparatus, and systems for magnetic stimulation,” U.S. Patent 9,295,853 B2, Mar. 29, 2016; U.S. Patent 8,801,589, Aug. 12, 2014; PCT WO/2010/017249; U.S. Patent 2011/0184223 A1; U.S. Patent 2009/052768, Aug. 4, 2009.

NIH PROTOCOLS

- A feasibility study of Transcranial Electric Stimulation Therapy (TEST) for treatment resistant depression*
 NIMH Protocol 21-M-0031 2021–
 Role: Associate investigator; PI: S. H. Lisanby
- Role of GABAergic transmission in auditory processing in Autism Spectrum Disorder*
 NIMH Protocol 20-M-0159 2020–
 Role: Associate investigator; PI: S. H. Lisanby
- Safety and feasibility of individualized low amplitude seizure therapy*
 NIMH Protocol 19-M-0073 2019–
 Role: Associate investigator; PI: S. H. Lisanby
- Mechanism of action underlying ketamine’s antidepressant effects: An investigation of the AMPA throughput theory in patients with treatment-resistant major depression*
 NIMH Protocol 19-M-0107 2019–
 Role: Associate investigator; PI: C. A. Zarate, Jr.
- Concurrent fMRI-guided rTMS and cognitive therapy for the treatment of major depressive episodes*
 NIMH Protocol 17-M-0147 2017–
 Role: Associate investigator; PI: S. H. Lisanby

	<i>Development of non-invasive brain stimulation techniques</i>	2017–
	NIMH Protocol 18-M-0015	
	Role: Associate investigator; PI: S. H. Lisanby	
	<i>Development of functional and structural magnetic resonance imaging techniques for the study of mood and anxiety disorders</i>	2017–
	NIMH Protocol 07-M-0021	
	Role: Associate investigator; PI: A. C. Nugent	
	<i>Identifying neurobiological mechanisms that underlie acute nicotine withdrawal and drive early relapse in smokers</i>	2017–
	NIDA Protocol 12-DA-N474	
	Role: Associate investigator; PI: A. Janes	
	<i>Neuropharmacologic imaging and biomarker assessments of response to acute and repeated-dosed ketamine infusions in major depressive disorder</i>	2016–
ONGOING RESEARCH SUPPORT	NIMH Protocol 17-M-0060	
	Role: Associate investigator; PI: C. A. Zarate, Jr.	
	<i>Evaluation of patients with mood and anxiety disorders and healthy volunteers</i>	2016–
	NIMH Protocol 01-M-0254	
	Role: Associate investigator; PI: C. A. Zarate, Jr.	
	<i>Modulation of the parieto-frontal communication</i>	2018–2019
	NINDS Protocol 18-N-0054	
	Role: Associate investigator; PI: M. Hallett	
	<i>Effect of TMS to frontoparietal attention network on anxiety potentiated startle</i>	2017–2019
	NIMH Protocol 17-M-0042	
	Role: Associate investigator; PI: C. Grillon	
	<i>ADEPT: Adaptive trial for the treatment of depression associated with concussion using repetitive transcranial magnetic stimulation protocols</i>	2024–
	Congressionally Directed Medical Research Programs Award TP220072	
	Role: Intramural NIH collaborator; PI: D. L. Brody	
	This study aims to compare different types of TMS that may alleviate depressive symptoms in US military service members with a history of concussion.	
	<i>Charge-based brain modeling engine with boundary element fast multipole method</i>	2023.07–2028.05
	NIH/NIMH R01 MH130490	
	Role: Intramural NIH collaborator; PI: S. N. Makaroff	
	This project seeks to create a new brain modeling engine that employs boundary element and fast multipole methods to achieve superior spatial resolution and accuracy in electro-magnetic modeling.	
	<i>Novel electric-field modeling approach to quantify changes in resting state functional connectivity following theta burst stimulation</i>	2022.09–2027.06
	NIH/NIMH U01 MH130447	
	Role: Intramural NIH collaborator; PI: N. L. Balderston	
	This study aims to develop a model using whole-brain estimates of the TMS-induced electric field to predict changes in resting state functional connectivity following neuromodulatory TMS, and validate this model in a large cohort of healthy volunteers receiving multiple doses of either intermittent or continuous theta burst stimulation.	
	<i>Development of a novel, scalable, neurobiologically-guided transcranial magnetic stimulation protocol for the treatment of cannabis use disorder</i>	2023.02–
	Centre for Addiction and Mental Health, Toronto, ON, Canada	
	Role: Consultant; PI: V. M. Tang	
	This proof-of-concept clinical trial will evaluate the feasibility and tolerability of a 4-week	

course of rTMS to the prefrontal cortex and insula as a treatment for cannabis use disorder.

Deciphering mechanisms of ECT outcomes and adverse effects (DECODE)

NIH/NIMH R01 MH128686/MH128690/MH128691/MH128692 2022.08–2027.05

Role: Intramural NIH collaborator; mPIs: Y. I. Sheline, K. L. Narr, R. Espinoza, S. M. McClintock, C. C. Abbott

This multi-site prospective study aims to study the mechanism of ECT-induced antidepressant benefits and cognitive adverse effects to determine optimal ECT dose.

ECT amplitude titration for improved clinical outcomes in late-life depression

NIH/NIMH R61/R33 MH125126 2021.02–2023.01

Role: Intramural NIH collaborator; PI: C. C. Abbott

This study uses titrated amplitude ECT, individualized based on seizure threshold, to improve clinical response while minimizing cognitive impairment in geriatric depression.

Neuromodulation of social cognitive circuitry in people with schizophrenia spectrum disorders

NIH/NIMH R61/R33 MH120188 2020.05–2023.04

Role: Intramural NIH collaborator; mPIs: A. N. Voineskos, D. M. Blumberger

This study uses advanced brain imaging, and compare different brain stimulation techniques, to determine whether targeting the dorsomedial prefrontal cortex can engage social cognitive brain circuitry in people with schizophrenia spectrum disorders.

PENDING
RESEARCH
SUPPORT

Improving ECT clinical outcomes through seizure- and model-guided stimulation parameters

NIH UH3/UG3 2024.10

Role: mPI; collaborating PIs: C. C. Abbott, A. Datta

Development of high-density theta burst TMS technology and initial testing in humans

NIH UH3/UG3 2024.09

Role: Intramural NIH collaborator; PI: H. Lu

Improving the optimization of TMS coil placement with precise calculation of electric fields and robust computation of personalized functional networks

NIH/NIMH R01 2024.10

Role: Intramural NIH collaborator; PI: Y. Fan

Targeting the causal depression network with electroconvulsive therapy

NIH/NIMH R33/R61 2024.02

Role: Intramural NIH collaborator; PI: M. Argyelan

Development of a next generation ECT system: PREcision Optimally Targeted ECT

NIH/NIMH UG3/UH3 2024.06

Role: Intramural NIH collaborator; PI: C. C. Abbott

COMPLETED
RESEARCH
SUPPORT

ECT pulse amplitude and medial temporal lobe engagement

NIH/NINDS U01 MH111826 2016.09–2020.07

Role: Co-I; PI: C. C. Abbott

This study explores the impact of targeted hippocampal engagement with varying levels of electroconvulsive therapy current amplitude in elderly patients with clinical, neuropsychological and neuroimaging assessments.

Individualized low amplitude seizure therapy (iLAST)

Brain & Behavior Research Foundation Young Investigator Award 26161 2018.06–2020.06

Role: PI

This study aims to develop a novel form of seizure therapy for depression that avoids the neurocognitive side effects of electroconvulsive therapy by using computational modeling to direct multi-electrode configurations that provide targeted and individualized dosing.

Fast-Fail Trials: Mood and Anxiety Spectrum Disorders (FAST-MAS)

NIMH 271201200006I-3-27100003-1 2016.06–2017.12

Role: Data analyst; PI: A. D. Krystal

The goal of this project is to establish the kappa opiate receptor occupancy and mu opiate

receptor effects after two weeks of daily dosing with the investigational agent LY2456302, which has been demonstrated to be a selective kappa opiate receptor antagonist.

Transcranial direct current stimulation as a treatment for acute fear

NIH/NIMH R21 MH106772

2015.04–2017.01

Role: Co-I; PI: A. D. Krystal

This study investigates the utility of transcranial direct current stimulation to engage a target neural circuit, which could serve as the basis for developing better therapies for those suffering from acute fear related difficulties.

Individualized optimally-targeted seizure therapy

NIH/NCATS KL2 TR001115

2014.07–2016.06

Role: PI; Training Grant PI: R. M. Califf

This award from the Duke Translational Medicine Institute prepares the fellow for a successful career as a multidisciplinary independent researcher. The goal of the project is to develop a novel individualized neurotargeted seizure therapy.

Safety and feasibility of low amplitude electroconvulsive therapy

Duke University School of Medicine, Pilot fund

2015.03–2016.06

Role: PI

This study evaluates whether neurocognitive side effects of electroconvulsive therapy can be improved by reducing the current pulse amplitude.

Prolonging Remission In Depressed Elderly (PRIDE)

NIH/NIMH U01 MH084241

2009.04–2016.03

Role: Data analyst; PI: S. H. Lisanby

This study evaluates the efficacy and neurocognitive effects of combined electroconvulsive and pharmacotherapy in prolonging remission in elderly patients with major depression.

Low field magnetic stimulation coil design

Tal Medical

2015.04–2016.06

Role: Co-I; PI: A. V. Peterchev

This project develops a novel coil system for low field magnetic stimulation.

Concurrent cognitive behavioral therapy and transcranial magnetic stimulation in obsessive-compulsive disorder

American Psychiatric Association Research Scholarship

2015.11–2016.06

Role: Acting PI; Grantee: Y. Hu

The purpose of this pilot study is to evaluate the feasibility of repetitive transcranial magnetic stimulation of the supplementary motor area concurrently with elements of exposure and response prevention in patients with obsessive-compulsive disorder.

Evoked potentials as markers of ketamine-induced cortical plasticity in patients with major depressive disorder

Janssen Research & Development, LLC

2014.01–2015.12

Role: Co-I; PI: A. D. Krystal

This open-label trial evaluates the utility of somatosensory, motor, and transcranial magnetic stimulation-based evoked potentials as markers of cortical plasticity in response to a single intravenous infusion of ketamine in patients with depression.

Magnetic seizure therapy for the treatment of depression

Stanley Medical Research Institute

2005.07–2011.07

Role: Postdoctoral fellow; PI: S. H. Lisanby

This two-center, randomized, double-blind controlled trial compares the antidepressant efficacy and side effects of magnetic seizure therapy and electroconvulsive therapy.

Translational research evaluating neurocognitive memory processes

NIH/NIMH K23 MH087739

2010.07–2015.01

Role: Postdoctoral fellow; PI: S. M. McClintock

This study informs the cognitive component processes underlying memory impairment

after electroconvulsive therapy.

Rational dosing for electric and magnetic seizure therapy

NIH/NIMH R01 MH091083

2010.07–2015.12

Role: Graduate research assistant, contributed to grant writing; PI: S. H. Lisanby

This study aims to optimize stimulus parameters of electric and magnetic seizure therapy through computational modeling and preclinical studies of seizure induction.

Field shaping and coil design for transcranial magnetic stimulation

NIH/NCRR TL1 RR024158

2010.09–2011.06

Role: PI; Training Grant PI: H. N. Ginsberg

This award from the Columbia University Irving Institute for Clinical and Translational Research supports clinical research training for predoctoral students in the basic sciences. The goal of the project is to develop novel coil design for transcranial magnetic stimulation.

Development of a novel TMS device with controllable pulse shape

NIH/NIBIB R21 EB006855

2007.08–2009.07

Role: Graduate research assistant; PI: A. V. Peterchev

This project develops an efficient transcranial magnetic stimulation device that produces nearly rectangular pulses with adjustable amplitude, width, and directionality.

Nonlinear analysis of heart rate variability

NIH/NHLBI R01 HL079503

2005.11–2009.06

Role: Graduate research assistant; PI: C.-S. Poon

This project develops advanced nonlinear estimation and adaptive control algorithms for the modeling and analysis of the cardiovascular system.

GRAND
ROUNDS

Advanced Research Institute Grand Rounds in Mental Health and Aging Research
Advancing neurostimulation treatment optimization and technology innovation

2023

Westmead Hospital, Sydney, Australia

Advances in neuromodulation: Electroconvulsive therapy

2020

Clinical TMS Society

Transcranial magnetic stimulation: Physics, devices, and modeling

2018

University of New Mexico, Department of Psychiatry & Behavioral Sciences

Toward individualized electroconvulsive therapy for treatment of depression

2017

Central Regional Hospital, Butner, NC

Individualized seizure therapy

2015

Duke University School of Medicine, Department of Psychiatry & Behavioral Sciences

Toward next generation seizure therapy

2015

INVITED
SEMINARS

NIMH Intramural Research Program Investigators' Seminar Series

Upcoming 2025

Reading faces: Application of facial expression analysis for tracking emotional states in depression

UCSF Department of Psychiatry & Behavioral Sciences

Upcoming 2025

Engineering precision in neuromodulation: Computational models and clinical applications

University of Pittsburgh, Geriatric Psychiatry Neuroimaging Laboratory

The full spectrum: Electromagnetic brain stimulation from minimal to maximal intensity

2024

University of Texas Southwestern, Center for Depression Research and Clinical Care

Advancements in computational neurostimulation for depression treatment optimization and technology development

2023

University of Pittsburgh, Department of Psychiatry


Computational neurostimulation: Approach to treatment optimization and technology development

2023


CONFERENCE TALKS, WORKSHOPS, & PANELS	Medical University of South Carolina National Center of Neuromodulation for Rehabilitation <i>Model-driven design for brain stimulation therapies</i>	2022
	NIMH Intramural Research Program Investigators' Seminar Series <i>Seizure therapies: The next generation</i>	2022
	Butler Hospital, Brown University <i>Computational model driven design for brain stimulation</i>	2021
	University of Pennsylvania, Center for Neuromodulation in Depression and Stress <i>Electromagnetic brain stimulation from low to high intensity</i>	2021
	VA Boston Healthcare System, Boston University School of Medicine Harvard Medical School Neuropsychiatry Translational Research Fellowship Seminar <i>Precision neurostimulation: History, physics, computational modeling, and engineering</i>	2020
	Medical University of Vienna, Neuroimaging Lab <i>Precision seizure therapy</i>	2020
	Mount Sinai Icahn School of Medicine, Depression and Anxiety Center <i>Rational design of individualized noninvasive brain stimulation</i>	2019
	NIMH Intramural Research Program Investigators' Seminar Series <i>Computational neurostimulation: Engineering better brain stimulation therapies</i>	2018
	UCLA Brain Mapping Center <i>Computational neurostimulation: Engineering better brain stimulation therapies</i>	2018
	UCLA Semel Institute for Neuroscience and Human Behavior Neuromodulation Division <i>Modeling and design for magnetic stimulation</i>	2018
	USC Mark and Mary Stevens Neuroimaging and Informatics Institute <i>Computational neurostimulation</i>	2018
	NIDA, Neuroimaging Research Branch <i>Advances in transcranial magnetic stimulation technology</i>	2016
	Mayo Clinic College of Medicine, Department of Molecular Pharmacology Neurobiology of Alcoholism and Drug Addiction Lab <i>Transcranial magnetic stimulation technology development</i>	2016
	Mayo Clinic College of Medicine, Department of Neurologic Surgery Neural Engineering Lab <i>Optimizing transcranial magnetic stimulation</i>	2016
	NIMH, Experimental Therapeutics & Pathophysiology Branch <i>Engineering better electromagnetic brain stimulation therapies</i>	2016
	Duke University School of Medicine, Department of Psychiatry & Behavioral Sciences Chair's round: <i>Fundamentals of transcranial electric and magnetic stimulation dosing</i>	2015
	Weill Cornell Medical College, Department of Biomedical Engineering <i>Transcranial magnetic stimulation: Pulse source, coil design, & concurrent neuroimaging</i>	2015
	Duke University, Department of Biomedical Engineering <i>Modeling and coil design considerations for transcranial magnetic stimulation</i>	2014
	International Society for ECT and Neurostimulation Annual Meeting <i>Multichannel Individualized Stimulation Therapy</i>	Upcoming 2025
	American Neuropsychiatric Association Annual Meeting Panel: <i>Interventional neuropsychiatry: From mechanisms to clinical decision-making</i>	Upcoming 2025



International Brain Stimulation Conference	Upcoming 2025
On-demand symposium: <i>ECT reimaged: Precision, prediction, and personalized care</i>	
IEEE Brain Discovery & Neurotechnology Workshop, University of Illinois Chicago	2024
<i>A model-driven approach to personalized neuromodulation treatment</i>	
International Symposium on Novel Neuromodulation Techniques	2024
<i>Model-driven brain stimulation treatments</i>	
NIMH Workshop on The Placebo Effect: Key Questions for Translational Research	2024
<i>Challenges and strategies in implementing effective sham stimulation for noninvasive brain stimulation trials</i> 	
International Society for Magnetic Resonance in Medicine Annual Meeting	2024
Workshop: <i>From basics to applications: MRI of neuromodulation using TMS and FUS</i>	
Contributed talk: <i>TMS devices and modeling</i>	
Brain and Human Body Modeling Conference	2023
The Martinos Center for Biomedical Imaging, Massachusetts General Hospital	
Chair: <i>New modeling methods and targets: Spinal cord stimulation and novel stimulation</i>	
Chair: <i>Development and assessment of modeling methods</i>	
Contributed talk: <i>Effects of low intensity magnetic stimulation</i>	
Judge: Student competition	
International Conference of the IEEE Engineering in Medicine and Biology Society	2023
Panel: <i>Computational analysis of non-invasive neuromodulation: Brain and spine</i>	
Contributed talk: <i>Modeling of TMS and ECT in the treatment of depression</i>	
ADAA Anxiety and Depression Conference	2023
Panel: <i>Parsing through syndromic heterogeneity in youths with mental illness to identify neurocircuit mechanisms and develop novel treatments</i>	
Contributed talk: <i>Modeling and dose optimization for TMS and ECT</i>	
International Brain Stimulation Conference	2023
Symposium chair: <i>Insights and challenges in preclinical models of TMS: Multimodal investigations across animal species</i>	
Fast-track oral symposium chair: <i>Advanced computational modeling and optimization methods for noninvasive brain stimulation</i>	
International Network of tES-fMRI (INTF) Webinar Series	2022
<i>Electric field modeling and optimization approaches for individualized targeting</i>	
International Society for Magnetic Resonance in Medicine	2022
Workshop: <i>MRI of neuromodulation: Target engagement, neural mechanism, and bio-marker development</i>	
Contributed talk: <i>Modeling of TMS</i> 	
Bergen Workshop of the Global ECT-MRI Collaboration	2022
<i>ECT device development</i> 	
International Congress of Clinical Neurophysiology	2022
Chair: <i>Towards optimized TMS targeting approaches</i>	
Brain and Human Body Modeling Conference	2022
The Martinos Center for Biomedical Imaging, Massachusetts General Hospital	
Chair: <i>Modeling of transcranial electrical stimulation and deep brain stimulation</i>	
Contributed talk: <i>ECT, electric field, neuroplasticity, and clinical outcomes</i>	
European Conference of Brain Stimulation in Psychiatry	2022
Panel: <i>Beyond clinical syndromes: Understanding mechanisms of neuromodulation from a dimensional perspective</i>	
Contributed talk: <i>Symptom dimensions and response trajectories in ECT and MST</i>	

Society of Biological Psychiatry Annual Meeting	2022
Panel: <i>Dimensional approaches to device neuromodulation</i>	
Contributed talk: <i>Depressive symptom dimensions in seizure therapy</i>	
Global ECT–MRI Collaboration Young Researchers Collective	2022
<i>ECT, electric field, neuroplasticity, and clinical outcomes</i>	
American Academy of Child and Adolescent Psychiatry Annual Meeting	2021
Panel: <i>Recent work with contemporary computational methods and artificial intelligence to advance the practice of child and adolescent psychiatry</i>	
Contributed talk: <i>Introduction to computational psychiatry</i>	
European College of Neuropsychopharmacology Congress	2021
Panel: <i>Neurobiology of rapid mood changes</i>	
Contributed talk: <i>Precision neurostimulation: Electroconvulsive therapy</i>	
Society for Brain Mapping & Therapeutics Annual Congress	2021
<i>Advances in electroconvulsive therapy for treatment of depression</i>	
American Society of Clinical Psychopharmacology Annual Meeting	2021
Early Career Workshop: <i>How to give a virtual talk</i>	
International College of Neuropsychopharmacology Virtual World Congress	2021
<i>Next generation seizure therapy and neuromodulation</i>	
European Conference of Brain Stimulation in Psychiatry	2020
Panel: <i>What can we learn from ECT: Insights from the GEMRIC consortium</i>	
Contributed talk: <i>Electric field modeling to inform ECT dosing and device development</i>	
University of Minnesota Non-Invasive Brain Stimulation Workshop	2020
<i>Use of individual electric field models in clinical research</i> 	
American Society of Clinical Psychopharmacology Annual Meeting	2020
Panel: <i>New developments in neurostimulation</i> #coronacancelled	
NYC Neuromodulation Online	2020
Discussant: <i>Noninvasive vagus nerve stimulation applied to stress management, opioid withdrawal, and neurocognitive disorders</i>	
American College of Neuropsychopharmacology Annual Meeting	2019
Panel: <i>Precision neurostimulation for treatment of psychiatric disorders</i>	
Contributed talk: <i>Rational design of precision seizure therapy</i>	
International Symposium on Advancing Stimulation Precision Medicine of Brain Disorders, Copenhagen University Hospital Hvidovre, Danish Research Centre for Magnetic Resonance	2019
<i>Rational design of precision seizure therapy</i>	
International College of Neuropsychopharmacology Meeting	2019
Workshop: <i>Neurobiological and clinical characterization, and treatment development for treatment resistant depression</i>	
Contributed talk: <i>Individualized seizure therapy: Reinventing ECT</i>	
American Society of Clinical Psychopharmacology Annual Meeting	2019
Co-chair: <i>Treatment-resistant mood disorders across the lifespan: Novel therapeutics</i>	
International Brain Stimulation Conference	2019
Panel: <i>Individualized brain stimulation: Addressing heterogeneity across modalities</i>	
Contributed talk: <i>Individualized electroconvulsive therapy for treatment of depression</i>	
2 nd Bergen Workshop of the Global ECT–MRI Collaboration	2018
<i>Electric field modeling for electroconvulsive therapy</i>	
Joint NYC Neuromodulation Conference & NANS Summer Series	2018
<i>Optimizing high-density stimulation arrays for brain targeting</i>	

Neuropsychiatric Drug Development Summit	2018
<i>Targeted intermittent device delivered interventions will ultimately prove superior to maintenance treatment with drugs for brain disorders</i>	
International Conference of the IEEE Engineering in Medicine and Biology Society	2018
Chair: <i>Computational human models for brain stimulation</i>	
Contributed talk: <i>Electric field induced by TMS: Applications in depression and anxiety</i>	
APA Annual Conference Presidential Symposium	2018
Presidential symposium: <i>ECT in the era of new brain stimulation treatments</i>	
Contributed talk: <i>Individualized neurotargeted seizure therapy: Reinventing ECT</i>	
ADAA Anxiety and Depression Conference	2018
Panel: <i>Personalized medicine for treatment resistant depressed patients: Novel strategies to optimize treatment with antidepressant medications, ketamine, and ECT</i>	
Contributed talk: <i>Individualized neurotargeted seizure therapy: Reinventing ECT</i>	
NIMH Non-Invasive Brain Stimulation Electric Field Modeling Workshop	2017
<i>Use of individual electric field models in clinical research</i> 	
NYC Neuromodulation Conference	2017
<i>Low field magnetic stimulation</i>	
NIMH Workshop on Transcranial Electrical Stimulation: Mechanisms, Technology, and Therapeutic Applications	2016
<i>Effect of anatomical variability on electric field characteristics of tES</i>	
International Society for ECT and Neurostimulation Annual Meeting	2015
Workshop: <i>Spatial targeting with transcranial magnetic stimulation</i>	

TEACHING &
MENTORING
APPOINTMENTS

National Institutes of Health	Bethesda, MD
<i>Lecturer, NINDS</i>	
Clinical Neuroscience Program Lecture Series	2017, 2019
<i>Lecturer, NIMH</i>	
NIH Basic Training Course on Transcranial Magnetic Stimulation 	2020
fMRI Course	2017
University of Maryland, College Park	College Park, MD
<i>Research Mentor, Fischell Department of Bioengineering</i>	
Capstone project: <i>Detection of brain-to-brain synchrony for improved psychotherapy</i>	
Duke University	Durham, NC
<i>Instructor, Department of Psychology & Neuroscience</i>	
Research Independent Study	2016
<i>Faculty, Department of Psychiatry & Behavioral Sciences</i>	
Visiting Fellowship in Transcranial Magnetic Stimulation & Electroconvulsive Therapy Fellowship (Continuing Medical Education accredited)	2014–2016
<i>Research Mentor</i>	
Matching Undergraduates to Science and Engineering Research Program	2015–2016
<i>Faculty, Biosciences Collaborative for Research Engagement</i>	
	2015–2016

	Columbia University	New York, NY
	<i>Teaching Assistant</i> , Department of Electrical Engineering	
	Analog Systems in VLSI (graduate level)	Spring 2010
	The Digital Information Age	Fall 2009
	<i>Recitation Instructor</i> , Department of Biostatistics, Mailman School of Public Health	
	Biostatistics (graduate level)	Fall 2009
	Massachusetts Institute of Technology	Cambridge, MA
	<i>Educational Counselor</i>	2022–
	<i>Teaching Assistant</i> , Concourse Program	
	Multivariable Calculus	Fall 2003–2006
	Differential Equations	Spring 2004–2007
	<i>Grader</i> , Department of Electrical Engineering & Computer Science	
	Signals and Systems	Fall 2004
SUPERVISED THESES	G. Asturias, “Effect of repetitive transcranial magnetic stimulation on the structural and functional connectome in patients with major depressive disorder,” Undergraduate Honors Thesis, Duke University, Department of Psychology and Neuroscience, Durham, NC, 2017. Available: DukeSpace. 	
THESIS EXAMINATION COMMITTEE MEMBERSHIP	W. A. Wartman, “Adaptive mesh refinement for quasistatic electromagnetic modeling of brain stimulation and recording methods,” Ph.D. dissertation, Worcester Polytechnic Institute, Department of Electrical and Computer Engineering, Worcester, MA, 2024. Sponsor: S. N. Makaroff.	
	D. Q. Troung, “Translational modeling of non-invasive electrical stimulation,” Ph.D. dissertation, City College of the City University of New York, Department of Biomedical Engineering, New York, NY, 2019. Sponsor: M. Bikson. Available: CUNY Academic Works. 	
CAREER DEVELOPMENT AWARD ADVISORY	S. K. Conroy, M.D., Ph.D., Indiana University School of Medicine	2024–
	<i>Targeting the medial prefrontal cortex with TMS to reduce negative self-referential processing in major depression</i>	
	S. M. Hare, Ph.D., University of Maryland School of Medicine	
	NIH/NIMH K01 MH133116	2024–2029
	<i>Cognitive and neural correlates of TMS motor intracortical inhibition in schizophrenia</i>	
	S. H. Siddiqi, M.D., Brigham & Women’s Hospital	
	NIH/NIMH K23 MH121657	2020–2025
	<i>Personalized circuit-based neuromodulation targets for depression</i>	
	N. L. Balderston, Ph.D., NIH/University of Pennsylvania Perelman School of Medicine	
	NIH/NIMH K01 MH121777	2019–2023
	<i>Examining the mechanisms of anxiety regulation using a novel, sham-controlled, fMRI-guided rTMS protocol and a translational laboratory model of anxiety</i>	
RESEARCH FELLOWS & POSTDOCS	S. Dey, Ph.D., NIH	2024–
	M. Dannhauer, Ph.D., NIH	2022–2024
	Post-training position: Assistant Professor, Department of Computer Science, East Carolina University	
GRADUATE STUDENTS	E. Bharti, Ph.D. candidate, University of Cambridge (NIH–OxCam Program)	2024–
	M. Kshirsagar, M.S., Biomedical Engineering, Duke University	2012
	Post-training position: Consultant, Deloitte Consulting	

NIH POSTBAC TRAINEES	P. L. Robins, B.A., Physics, Lawrence University	2021–2024
	🏆 NIMH Intramural Research Program Trainee Travel Award	2023
	🏆 First Place in Student Competition, <i>Brain & Human Body Modeling Conference</i>	2022
	Post-training position: TMS technician, Columbia Associates	
	S. M. Awasthi, B.S., Biomedical Engineering, Johns Hopkins University	2018–2020
	Post-training position: Medical student, Stanford University School of Medicine	
	M. Noh, S.B., Bioengineering, MIT	2018–2019
	Post-training position: Medical student, University of Cincinnati College of Medicine	
	J. Thomas, M.S., Physiology and Biophysics, Georgetown University	2017–2019
	Post-training position: Program Officer, National Academies of Sciences, Engineering, and Medicine	
	M. Velez Afanador, B.S., Microbiology, University of Puerto Rico	2016–2019
	🏆 Outstanding Poster Award, <i>NIH Postbac Poster Day</i>	2018
	Post-training position: Medical student, Howard University College of Medicine	
UNDERGRAD STUDENTS	G. Asturias, Psychology & Neuroscience, Duke University	2015–2017
	🏆 Graduated with Distinction	
	Z. Feng, Biomedical Engineering and Biology, Duke University	2015–2016
	M. Glidewell, Biomedical Engineering, Duke University	2015–2016
	S. Lee, Biomedical Engineering, Duke University	2015–2016
	W. Lim, Biomedical Engineering, Duke University	2015–2016
	F. M. Mercer, Women’s Studies, Duke University	2015–2016
	E. Salgado, Psychology & Neuroscience, Duke University	2015–2016
	🏆 Graduated with Distinction	
	R. Shah, Psychology & Neuroscience, Duke University	2015–2016
	E. Shinder, Biology, Duke University	2015–2016
	🏆 Graduated with Distinction	
	E. P. Vienneau, Biomedical Engineering, Duke University	2015–2016
	🏆 Howard G. Clark Award for Excellence in Research	
	D. T. Weaver, Biology, Duke University	2015–2016
	J. R. Lilien, Electrical & Computer Engineering, Duke University	2014–2016
	🏆 Walter J. Seeley Scholastic Award	
INTERNS	M. Dib, Biomedical Engineering, University of Maryland, College Park	2018
	E. Chung, Psychology, University of Maryland, College Park	2017
	A. L. Halberstadt, Biology and Psychology, Carnegie Mellon University	2017
	G. Asturias, Psychology & Neuroscience, Duke University	2016
	C. M. Prevost, Biomedical Engineering, Clemson University	2015
	J. V. McCall, Biomedical Engineering, North Carolina State University	2013
PROFESSIONAL & SCHOLASTIC SOCIETIES MEMBERSHIP	IEEE , Engineering in Medicine and Biology Society	
	Senior Member	2023–
	Member	2013–2023
	Student Member	2004–2013

EDITORIAL ROLES	American Society of Clinical Psychopharmacology	
	Member	2019–
	Early Career Committee	2023–2027
	Technology Committee	2023–2025
	Producer, <i>Psychopharm Today</i> podcast 	2024–
	Technology Task Force	2020–2023
	Biomedical Engineering Society	
	Member	2021–
	American College of Neuropsychopharmacology	
	Associate Member	2023–
	Sigma Xi, The Scientific Research Honor Society	
	Full Member	2024–
	Anxiety and Depression Association of America	
	Member	2017–2018
	International Society for CNS Clinical Trials and Methodology	
	Member	2017–2019
	Organization for Human Brain Mapping	
	Member	2014–2019
	Society for Industrial and Applied Mathematics	
	Student Member	2008–2012
	Society for Neuroscience	
	Student Member	2005–2012
	American Physical Society	
	Student Member	2004–2009
EDITORIAL ROLES	Deputy Editor, <i>Transcranial Magnetic Stimulation</i>	2024–
	Associate Editor, <i>Frontiers in Psychiatry</i>	2022–
	Sections: Neurostimulation, Neuroimaging	
	Co-Editor on Research Topic: How does brain stimulation work? Neuroversion and other putative mechanisms of action 	2024
	Review Editor, <i>Frontiers in Psychology</i>	2022–
	Sections: Addictive Behaviors, Consciousness Research	
	Review Editor, <i>Frontiers in Psychiatry</i>	2016–2022
	Sections: Neurostimulation, Neuroimaging	
	Guest Associate Editor, <i>Frontiers in Pharmacology: Neuropsychopharmacology</i>	2020
	Co-Editor on Research Topic: Neurobiology of rapid mood changes 	
	Guest Editor, <i>Physics in Medicine and Biology</i>	2024
	Special Issue: Electromagnetic modeling for brain stimulation 	
	<i>Ad hoc</i> journal reviewer	2010–
	<i>AIP Advances</i>	
	<i>American Journal of Psychiatry</i>	
	<i>Asian Journal of Psychiatry</i>	
	emphAustralasian Physical and Engineering Sciences in Medicine	
	<i>Biological Psychiatry</i>	
	<i>BioMedical Engineering OnLine</i>	
	<i>Brain Sciences</i>	
	<i>Brain Stimulation</i>	

Cerebral Cortex
Clinical EEG and Neuroscience
Clinical Neurophysiology
CNS Spectrums
Computational and Mathematical Methods in Medicine
Computer Methods and Programs in Biomedicine
Cortex
European Psychiatry
Frontiers in Cell and Developmental Biology
Frontiers in Medicine: Intensive Care Medicine and Anesthesiology
Frontiers in Neurology: Applied Neuroimaging
Frontiers in Neuroscience: Brain Imaging Methods
IEEE Antennas and Propagation Magazine
IEEE Journal of Electromagnetics, RF, and Microwaves in Medicine and Biology
IEEE Transactions on Biomedical Engineering
IEEE Transactions on Neural Systems & Rehabilitation Engineering
IEEE Transactions on Magnetics
Imaging Neuroscience
Journal of ECT
Journal of Neural Engineering
Journal of Neuroscience Methods
Journal of Psychiatric Research
JoVE
Medical & Biological Engineering & Computing
Medical Hypotheses
Nature Mental Health
NeuroImage; NeuroImage Clinical
Neuromodulation: Technology at the Neural Interface
Neuroscience Letters
PLOS ONE
Scientific Reports
Translational Psychiatry

	Reviewer, Conference Proceedings & Abstract	2008–
	International Conference of the IEEE Engineering in Medicine and Biology Society	
	IEEE/EMBS International Conference on Neural Engineering	
	IEEE/EMBS International Conference on Biomedical and Health Informatics	
	Biomedical Engineering Society Annual Meeting	
GRANT REVIEW PANELS	Reviewer, NIH BluePrint MedTech Program	2022–2024
	<i>Ad hoc</i> reviewer, NIH Early Career Reviewer Program	2021
	Biophysics of Neural Systems Study Section	
	Reviewer, Duke Institute for Brain Sciences, Research Incubator Awards	2018, 2021
CONFERENCE ORGANIZING COMMITTEE	Organizing committee, Brain and Human Body Modeling Conference	2022–2023
	Program review subcommittee	2023
	American Society of Clinical Psychopharmacology Annual Meeting	
	Preconference workshop director, NYC Neuromodulation Conference	2018
	Workshop: <i>Computational modeling in neuromodulation: Tools for engineers, clinicians, and researchers</i>	

COMMUNITY INVOLVEMENT, OUTREACH, & SPECIAL INTEREST GROUPS	NIH Research Workforce Diversity and Equity Outreach Special Interest Group	2023–
	Judge, NIMH Training Day Three-Minute Talks competition	2022
	Mental Health Association of Maryland	2020
	Presentation: <i>Fundamentals of transcranial brain stimulation</i>	
	Jewish Social Service Agency	2020
	Presentation: <i>Basics of brain stimulation devices: What are they and how do they work</i>	
	Exhibitor, USA Science & Engineering Festival #coronacancelled	2020
	University of Pennsylvania, Wharton Undergraduate Health Care Club	2019
	Presentation: <i>Research in mental health treatment</i>	
	Judge, MIT Hacking Medicine: DC Grand Hack	2019
	NIH High School Scientific Training and Enrichment Program	2019
	Presentation: <i>Bioelectricity and brain stimulation</i>	
	NIH Take Your Child to Work Day	2019
	Presentation: <i>How to fool your brain</i>	
	UCLA, CruX Neurotech Organization	2019
	Presentation: <i>Neuromodulation in psychiatry</i>	
	University of Pennsylvania, Wharton Undergraduate Health Care Club	2018
	Presentation: <i>Technology and the future of mental health treatment</i>	
	NIH Noninvasive Brain Stimulation Special Interest Group	2017–
	Judge/Lead Judge, NIH Postbac Poster Day	2017–2019
PROFESSIONAL DEVELOPMENT & CONTINUING EDUCATION	Innovation Leader, Psychiatry Innovation Lab, American Psychiatric Association	2016
	Duke Psychiatry, Mood Disorders Support and Education Group	
	Presentation: <i>Brain stimulation treatments for severe mood disorders</i>	2016
	Presentation: <i>New frontiers in treatments for mood disorders</i>	2015
	Duke Translational Medicine Institute, Undergraduate Research Society	2016
	Presentation: <i>Engineering meets psychiatry</i>	
	Mid-Level Leadership Program, NIH	2023
	Diversity and Inclusion Certificate Program, NIH	2021–2022
	Non-invasive Transcranial Brain Stimulation Course, Danish Research Centre for Magnetic Resonance, Copenhagen University Hospital Hvidovre	2019
	Health Disparities Research Curriculum, Duke Translational Medicine Institute	2015–2016
	Tackling the Challenges of Big Data, MIT Professional Education Program	2015
	Clinical Research Training Program, Duke University	2014–2015
	Transcranial magnetic stimulation administration certified, Columbia University Irving Medical Center/New York State Psychiatric Institute	2009
	Basic Life Support, American Heart Association	renewed 2023