Zhi-De Deng

Contact Information

zzzdeng@alum.mit.edu

+1 919 564 5282

www.zzzdeng.net

Last Updated January 6, 2025

Education

Ph.D., **Electrical Engineering**, Columbia University 2013
Dissertation: *Electromagnetic Field Modeling of Transcranial Electric & Magnetic Stimulation: Targeting, Individualization, and Safety of Convulsive & Subconvulsive Applications*

M.Phil., **Electrical Engineering**, Columbia University 2011
Graduate concentration in Neuroscience

M.Eng., **Electrical Engineering & Computer Science**, MIT 2007
Thesis: *Stochastic Chaos and Thermodynamic Phase Transitions: Theory and Bayesian Estimation Algorithms*

S.B., **Electrical Science & Engineering**, MIT 2007

S.B., **Physics**, MIT 2006
Minor in Economics

Postgraduate Training & Fellowship Appointments

Research Fellow, National Institute of Mental Health 2016 – 2019
Noninvasive Neuromodulation Unit
Experimental Therapeutics & Pathophysiology Branch
Richard J. Wyatt Memorial Fellowship for Translational Research

Postdoctoral Associate, Duke University School of Medicine 2013 – 2014
Division of Brain Stimulation & Neurophysiology
Department of Psychiatry & Behavioral Sciences

Professional & Academic Appointments

Staff Scientist, NIMH 2019 –
Noninvasive Neuromodulation Unit
Experimental Therapeutics & Pathophysiology Branch
Director, Computational Neurostimulation Research Program

Adjunct Assistant Professor, Duke University School of Medicine 2016 – 2024
Division of Behavioral Medicine & Neurosciences
Department of Psychiatry & Behavioral Sciences
Network Faculty, Duke Institute for Brain Sciences

Medical Instructor, Duke University School of Medicine 2014 – 2016
Division of Brain Stimulation & Neurophysiology
Department of Psychiatry & Behavioral Sciences
KL2 Scholar, Duke Translational Medicine Institute

Predoctoral Research Assistantships & Internships

Visiting Graduate Research Assistant, Duke Psychiatry 2010 – 2013
Division of Brain Stimulation & Neurophysiology

Graduate Research Assistant, Columbia University 2007 – 2010
Division of Brain Stimulation & Therapeutic Modulation
TL1 Scholar, Irving Institute for Clinical and Translational Research

Research Assistant, Harvard–MIT Division of Health Sciences & Technology 2005 – 2007

Executive Intern, Weill Cornell Medicine Anesthesiology — Summer 2004

Internship Coordinator, The New York Times Company Foundation — Summer 2003

Newsroom Technology Intern, The New York Times Company — Summer 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

Elected to Full Membership — 2024
Sigma Xi, The Scientific Research Honor Society

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)

Elevated to Senior Membership — 2023
Institute of Electrical and Electronics Engineers (IEEE)

Elected to Associate Membership — 2023
American College of Neuropsychopharmacology

First Place Winner in Science as Art Competition — 2022
NIMH Intramural Research Program Fellows' Scientific Training Day

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
NIMH/Stanford University/University of Pittsburgh

New Investigator Award — 2017
International Society for CNS Clinical Trials and Methodology

Certificate for Highly Cited Research — 2016
Brain Stimulation, 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 Travel Fellowship Award 2015
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

CTSA T32 Certificate Award 2009
Columbia University Irving Institute for Clinical and Translational Research

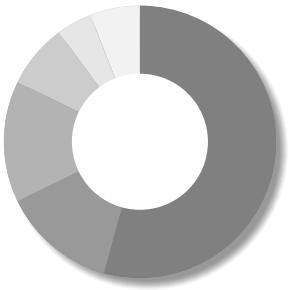
Student Paper Competition Finalist 2006
IEEE Engineering in Medicine and Biology Society

New York Times College Scholarship 2002 – 2006
The New York Times Company Foundation

Research Focus

- Brain stimulation: Device development, computational modeling, stimulus parameter and dose optimization, translational and clinical applications
- Computational electromagnetics
- Electrophysiological and neuroimaging biomarker development
- Neural plasticity
- Nonlinear dynamics of physiological systems

Research Output Summary



64 Refereed journal articles
16 Refereed engineering proceedings & technical letters
17 Refereed reviews, protocols, & consensus papers
9 Book chapters
5 Editorials, correspondences, & commentaries
4 Granted patents + **3** pending patent applications
\+ **170** Abstracts

Refereed Journal Articles

*** 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 ultrabrief 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.
PMID: 39515580; DOI: 10.1016/j.bpsc.2024.10.016
Journal cover

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*, vol. 3, imag_a_00412, Jan. 2025.
DOI: 10.1162/imag_a_00412
Third Place in Best Student Paper (awarded to N. I. Hasan), *Photonics and Electromagnetics Research Symposium*, 2024.

Z. Qi, G. M. Noetscher, A. Miles, K. Weise, T. R. Knösche, C. R. Cadman, A. R. Potashinsky, K. Liu, W. A. Wartman, G. Nunez 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*, online ahead of print, Dec. 2024.
PMID: 39710004; DOI: 10.1016/j.brs.2024.12.1192

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.
PMCID: PMC11405677; DOI: 10.1093/cercor/bhae371

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.
PMCID: PMC11319663; DOI: 10.1038/s41386-024-01871-w

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 multitargeting treatment," *The Journal of ECT*, online ahead of print, Aug. 2024.
PMID: 39185880; DOI: 10.1097/YCT.0000000000001069

* 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.
PMCID: PMC11345267; DOI: 10.3389/fpsyt.2024.1434434

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.
PMCID: PMC11307324; DOI: 10.1088/1741-2552/ad692f

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.
PMCID: PMC11073721; DOI: 10.1371/journal.pone.0302660

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.
PMCID: PMC11524532; DOI: 10.1017/S1092852923006387

* 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.
PMCID: PMC10839568; DOI: 10.1111/bdi.13370
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 rotating permanent magnet stimulation," *Bioengineering*, vol. 11, no. 3, 258, Mar. 2024.
PMCID: PMC10968657; DOI: 10.3390/bioengineering11030258
Part of Special Issue: *Electric, Magnetic, and Electromagnetic Fields in Biology and Medicine: From Mechanisms to Biomedical Applications*
Trainee Travel Award (awarded to P. L. Robins), *NIMH Fellows' Scientific Training Day*, 2023.

* **Z.-D. Deng**, B. Luber, 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.
PMCID: PMC10701670; DOI: 10.1001/jamapsychiatry.2023.4599

Commentary: vol. 81, no. 7, pp. 736–737, July 2024. Reply: pp. 737–738.
Media coverage: *Pyschiatric 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. Ryman, 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.
PMCID: PMC10876627; DOI: 10.1038/s41386-023-01780-4
Research highlight commentary: pp. 635–636.

W. A. Wartman, K. Weise, M. Rachh, L. Morales, **Z.-D. Deng**, A. 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. 5, 055030, Feb. 2024.
PMCID: PMC10902857; DOI: 10.1088/1361-6560/ad2638
Part of Special Issue: *Electromagnetic Modeling for Brain Stimulation*
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. Oltedal, 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. Jorgensen, A. Jorgensen, 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.
PMCID: PMC11116108; DOI: 10.1038/s41380-023-02318-2

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. 1, 18657, Oct. 2023.
PMCID: PMC10618282; DOI: 10.1038/s41598-023-45602-5

* **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," *Biomedicines*, vol. 11, no. 8, 2320, Aug. 2023.
PMCID: PMC10452519; DOI: 10.3390/biomedicines11082320
Part of Special Issue: *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.
PMCID: PMC10502963; DOI: 10.1016/j.jad.2023.05.042

M. Teferi, W. Makhoul, **Z.-D. Deng**, D. J. Oathes, Y. 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.
PMCID: PMC10382694; DOI: 10.1016/j.bpsgos.2022.04.001

J. Miller, T. Jones, J. Upston, **Z.-D. Deng**, S. M. McClintock, E. Erhardt, D. Farrar, 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.
PMCID: PMC10329999; DOI: 10.1016/j.bpsc.2023.03.001

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.
PMCID: PMC10232815; DOI: 10.3389/fpsyt.2023.1168672
Part of Research Topic: *Translational Approaches in Neurostimulation Research: Challenges and Opportunities for Neuropsychiatry*

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.
PMCID: PMC10278869; DOI: 10.1088/1741-2552/ac9a76

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. Mc Laughlin, and X. Zhang, "Alpha oscillatory activity is causally linked to working memory retention," *PLOS Biology*, vol. 21, no. 2, e3001999, Feb. 2023.
PMCID: PMC9983870; DOI: 10.1371/journal.pbio.3001999

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, no. 1, 43, Feb. 2023.
PMCID: PMC9902462; DOI: 10.1038/s41398-023-02312-w

* S. N. Makaroff, H. Nguyen, Q. Meng, H. Lu, A. R. Nummenmaa, and **Z.-D. Deng**, "Modeling transcranial magnetic stimulation coils with magnetic cores," *Journal of Neural Engineering*, vol. 20, no. 1, 016028, Jan. 2023.
PMCID: PMC10481791; DOI: 10.1088/1741-2552/acae0d

S. Qi, V. D. Calhoun, D. Zhang, J. Miller, **Z.-D. Deng**, K. L. Narr, Y. Sheline, S. M. McClintock, R. Jiang, X. Yang, J. Upston, T. 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. 20, no. 1, 477, Dec. 2022.
PMCID: PMC9733153; DOI: 10.1186/s12916-022-02678-6

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.
PMCID: PMC9854270; DOI: 10.1016/j.neuroimage.2022.119705

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. D. 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, no. 1, 616, Oct. 2022.
PMCID: PMC9556519; DOI: 10.1038/s41597-022-01695-7

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.
PMCID: PMC10680084; DOI: 10.1097/YCT.0000000000000812

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.
PMCID: PMC10644970; DOI: 10.1088/1741-2552/ac697c

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.
PMCID: PMC8851689; DOI: 10.1016/j.neuroimage.2021.118863
Part of Special Issue: *Neuromodulation and Neuroimaging for Targeted Brain Networks Interrogation*
Media coverage: *NIMH Research Highlight*, Mar. 2022.

* **Z.-D. Deng**, M. Argyelan, J. Miller, D. K. 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.
PMCID: PMC9095458; DOI: 10.1038/s41380-021-01380-y
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, 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.
PMCID: PMC8674270; DOI: 10.1038/s41386-021-01110-6

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 major depressive disorder in older adults: Phase 2 of the PRIDE study," *American Journal of Geriatric Psychiatry*, vol. 30, no. 1, pp. 15–28, Jan. 2022.
PMCID: PMC8595359; DOI: 10.1016/j.jagp.2021.04.006

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.
PMCID: PMC7225078; DOI: 10.1038/s41380-019-0589-8

A. Takamiya, F. Bouckaert, M. Laroy, J. Blommaert, A. Radwan, A. Khatoun, **Z.-D. Deng**, M. Mc Laughlin, 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.
PMCID: PMC8474653; DOI: 10.1016/j.brs.2021.06.011

E. A. Fridgeirsson, **Z.-D. Deng**, D. Denys, J. A. van Waarde, and G. A. van Wingen, "Electric field strength induced by electroconvulsive therapy is associated with clinical outcome," *NeuroImage: Clinical*, vol. 30, 102581, Feb. 2021.
PMCID: PMC7895836; DOI: 10.1016/j.nicl.2021.102581

P. J. C. Suen, S. Doll, M. C. Batistuzzo, 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.
PMCID: PMC8100980; DOI: 10.1007/s00406-020-01127-w
Part of Collection: *Brain Stimulation in Psychiatry*

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.
PMCID: PMC7744398; DOI: 10.1016/j.jagp.2020.06.008

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.
PMCID: PMC8474665; DOI: 10.1016/j.brs.2020.03.009

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.
PMCID: PMC7150637; DOI: 10.1016/j.bpsc.2019.12.020

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, 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.
PMCID: PMC7050408; DOI: 10.1016/j.jagp.2019.10.003
Commentary: pp. 317–319.

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.
PMCID: PMC7021903; DOI: 10.1038/s41386-019-0583-5

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 from neurostimulation," *Advanced Science*, vol. 7, no. 4, 1902863, Feb. 2020.
PMCID: PMC7029648; DOI: 10.1002/advs.201902863
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.
PMCID: PMC7026136; DOI: 10.1038/s41398-020-0751-8

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 mag-

netic stimulation requires cellular magnetoreceptors and specific stimulation patterns," *Science Advances*, vol. 5, no. 10, eaav9847, Oct. 2019.
PMCID: PMC6821463; DOI: 10.1126/sciadv.aav9847

M. Argyelan, L. Oltedal, **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.
PMCID: PMC6874416; DOI: 10.7554/eLife.49115

* 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.
PMCID: PMC7654714; DOI: 10.1016/j.neubiorev.2019.08.018

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.
PMCID: PMC6719775; DOI: 10.1109/TNSRE.2019.2926543

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.
PMCID: PMC6593304; DOI: 10.3389/fneur.2019.00587
Part of Research Topic: *Innovative Technologies and Clinical Applications for Invasive and Non-Invasive Neuromodulation: From the Workbench to the Bedside*

M. J. Dubin, I. P. Ilieva, **Z.-D. Deng**, J. Thomas, A. Cochran, 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.
PMCID: PMC6486658; DOI: 10.1016/j.jad.2019.02.039

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.
PMCID: PMC6431788; DOI: 10.1016/j.jad.2018.06.048
Part of Special Issue: *Suicide*

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.
PMCID: PMC5929994; DOI: 10.1088/1741-2552/aaa505

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 electromagnetic fields," *Frontiers in Neural Circuits*, vol. 10, 85, Nov. 2016.
PMCID: PMC5093126; DOI: 10.3389/fncir.2016.00085
Part of Research Topic: *There's Method in Our Magnets: Understanding rTMS from Models, Mice and Men*

* **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.
PMCID: PMC4289667; DOI: 10.1109/TNSRE.2014.2339014

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.
PMCID: PMC4115015; DOI: 10.1038/nn.3751

* **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.
PMCID: PMC4020988; DOI: 10.1016/j.clinph.2013.11.038
Part of Special Issue: *Transcranial Brain Stimulation* Editorial: pp. 1077–1078.
Commentary: vol. 126, no. 7, pp. 1455–1456, July 2015. Reply: pp. 1456–1457.

* **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, "Controlling stimulation strength and focality in electroconvulsive therapy via current amplitude and electrode size and spacing: Comparison with magnetic seizure therapy," *The Journal of ECT*, vol. 29, no. 4, pp. 325–335, Dec. 2013.
PMCID: PMC3905244; DOI: 10.1097/YCT.0b013e3182a4b4a7
Best Abstract Award, *International Society for ECT & Neurostimulation Annual Meeting*, 2010.

B. Luber, J. Steffner, A. Tucker, C. Habeck, A. V. Peterchev, **Z.-D. Deng**, R. C. 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.
PMCID: PMC3649828; DOI: 10.5665/sleep.2712

* **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.
PMCID: PMC3568257; DOI: 10.1016/j.brs.2012.02.005
Journal cover and in Issue Highlights. Commentary: pp. 14–15.

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.
PMCID: PMC3495594; DOI: 10.1016/j.neuroimage.2011.10.029

* **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, "Electric field strength and focality in electroconvulsive therapy and magnetic seizure therapy: A finite element simulation study," *Journal of Neural Engineering*, vol. 8, no. 1, 016007, Jan. 2011.
PMCID: PMC3903509; DOI: 10.1088/1741-2560/8/1/016007

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.
PMCID: PMC2532677; DOI: 10.1109/TBME.2007.912658

Refereed Engineering Proceedings & Technical Letters

D. Tang, W. Wartman, A. Nummenmaa, M. Daneshzand, G. M. Noetscher, H. Lu, **Z.-D. Deng**, and S. N. Makaroff, "A BEM-FMM TMS coil designer using MATLAB platform," *Brain Stimulation*, online ahead of print, Jan. 2025.
PMID: 39755366; DOI: 10.1016/j.brs.2024.11.011

* **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.
PMCID: PMC11449792; DOI: 10.1038/s41380-024-02567-9

N. I. Hasan, M. Dannhauer, D. Wang, **Z.-D. Deng**, and L. J. Gomez, "Real-time computation of E-field for transcranial magnetic stimulation," *International Applied Computational Electromagnetics Society Symposium*, May 2024, pp. 1–2.
URL: https://ieeexplore.ieee.org/document/10580138
First Place in Student Paper Award (awarded to N. I. Hasan)

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.
DOI: 10.1007/978-3-030-65092-6_8

* **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.
PMID: 29060150; DOI: 10.1109/EMBC.2017.8037106

* **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.
PMID: 26736728; DOI: 10.1109/EMBC.2015.7318828

* **Z.-D. Deng**, A. V. Peterchev, A. D. Krystal, B. Luber, 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.
DOI: 10.1109/NER.2013.6696000

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.
PMID: 22255576; DOI: 10.1109/IEMBS.2011.6091396

* **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.
PMID: 22254725; DOI: 10.1109/IEMBS.2011.6090561

* **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. 6821–6824.
PMID: 21095849; DOI: 10.1109/IEMBS.2010.5625958

* **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. 2049–2052.
PMID: 21096149; DOI: 10.1109/IEMBS.2010.5626517

* 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.
PMID: 21096148; DOI: 10.1109/IEMBS.2010.5626553

* **Z.-D. Deng**, S. H. Lisanby, and A. V. Peterchev, "Effect of anatomical variability on neural stimulation strength and focality in electroconvulsive therapy (ECT) and magnetic seizure therapy (MST)," *Proceedings of the IEEE Engineering in Medicine and Biology Society*,

Sept. 2009, pp. 682–688.
PMID: 19964484; DOI: 10.1109/IEMBS.2009.5334091

* **Z.-D. Deng**, A. V. Peterchev, and S. H. Lisanby, "Coil design considerations for deep-brain transcranial magnetic stimulation (dTMS)," *Proceedings of the IEEE Engineering in Medicine and Biology Society*, Aug. 2008, pp. 5675–5679.
PMID: 19164005; DOI: 10.1109/IEMBS.2008.4650502

* **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.
PMID: 17946187; DOI: 10.1109/IEMBS.2006.260139

* 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.
PMID: 17946480; DOI: 10.1109/IEMBS.2006.260051
Student paper competition finalist (awarded to N. M. Arzeno), *Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 2006.

Refereed 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. Dedert, 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.
PMCID: PMC11379281; DOI: 10.1371/journal.pone.0291562

* 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.
PMCID: PMC10922371; DOI: 10.1016/j.biopsych.2023.11.022
Part of Special Issue: *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.
PMCID: PMC10881663; DOI: 10.3389/fpsyt.2024.1304528
Part of Research Topic: *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.
PMCID: PMC10700353; DOI: 10.1038/s41386-023-01677-2
Part of *2024 Neuropsychopharmacology Reviews: Rapid & 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.
PMCID: PMC10031774; DOI: 10.1016/j.clinph.2022.08.018
Part of Special Issue: *IFCN-endorsed Guidelines and Consensus Papers*

L. Borrione, P. C. Cirillo, L. V. M. Aparicio, B. A. Cavendish, L. Valiengo, D. O. Moura, J. P. de Souza, M. S. Luethi, I. Klein, B. Bariani, 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.
PMCID: PMC10627342; DOI: 10.1080/14737175.2022.2083959

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.
PMCID: PMC8617166; DOI: 10.1038/s41386-021-01094-3
Part of *2022 Neuropsychopharmacology Reviews: Prefrontal Cortex*

N. L. Balderston, C. Roberts, E. M. Beydler, **Z.-D. Deng**, T. Radman, B. Luber, S. H. Lisanby, M. Ernst, and C. Grillon, "A generalized workflow for conducting electric field–optimized, fMRI-guided, transcranial magnetic stimulation," *Nature Protocols*, vol. 15, no. 11, pp. 3595–3614, Nov. 2020.
PMCID: PMC8123368; DOI: 10.1038/s41596-020-0387-4

L. Borrione, 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.
PMCID: PMC7430385; DOI: 10.1590/1516-4446-2019-0741

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.
PMCID: PMC7681914; DOI: 10.4088/JCP.19ac13138

* **Z.-D. Deng**, B. Luber, N. L. Balderston, M. Velez Afanador, M. M. Noh, J. Thomas, W. C. Altekruse, 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.
PMCID: PMC8100981; DOI: 10.1146/annurev-pharmtox-010919-023253

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.
PMCID: PMC7442165; DOI: 10.1016/j.pmip.2019.04.003

* 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.
PMCID: PMC5997279; DOI: 10.1016/j.brs.2017.12.008

* 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.
PMCID: PMC5484089; DOI: 10.1080/09540261.2017.1305949
Part of Special Issue: *Brain Stimulation*

* **Z.-D. Deng**, S. M. McClintock, N. E. Oey, B. Luber, 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.
PMCID: PMC4342851; DOI: 10.1016/j.conb.2014.08.015
Part of Special Issue: *Neuropsychiatry*

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.
PMCID: PMC4143898; DOI: 10.1097/YCT.0000000000000137

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.
PMCID: PMC2933093; DOI: 10.1097/YCT.0b013e3181e48165

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.
DOI: 10.1093/oxfordhb/9780198832256.013.41

R. J. Ilmoniemi, **Z.-D. Deng**, L. 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.
DOI: 10.1093/oxfordhb/9780198832256.013.4

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 *Depression*, M. H. Trivedi, Ed., Oxford, UK: Oxford University Press, 2019, ch. 13, pp. 218–240.
DOI: 10.1093/med/9780190929565.003.0013

* S. Makarov, G. Bogdanov, G. Noetscher, W. Appleyard, R. Ludwig, J. Joutsa, and **Z.-D. Deng**, "Design and analysis of a whole-body noncontact electromagnetic subthreshold stimulation device with field modulation targeting nonspecific neuropathic pain," in *Brain and Human Body Modeling: Computational Human Modeling at EMBC 2018*, S. Makarov, M. Horner, and G. Noetscher, Eds., Switzerland: Springer Nature, 2019, ch. 5, pp. 85–123.
PMID: 31725237; DOI: 10.1007/978-3-030-21293-3_5

* **Z.-D. Deng**, C. Liston, F. M. Gunning, M. J. Dubin, E. A. Fridgeirsson, J. Lilien, G. van Wingen, and J. 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. Makarov, M. Horner, and G. Noetscher, Eds., Switzerland: Springer Nature, 2019, ch. 4, pp. 75–84.
PMID: 31725245; DOI: 10.1007/978-3-030-21293-3_4

B. Luber and **Z.-D. Deng**, "Application of non-invasive brain stimulation in psychophysiology," in *Handbook of Psychophysiology*, J. T. Cacioppo, L. G. Tassinary, and G. G. Berntson, Eds., 4th ed. Cambridge, UK: Cambridge University Press, 2016, ch. 7, pp. 116–150.
DOI: 10.1017/9781107415782.007

A. V. Peterchev, **Z.-D. Deng**, and S. M. Goetz, "Advances in transcranial magnetic stimulation technology," in *Brain Stimulation: Methodologies and Interventions*, I. M. Reti, Ed., Hoboken, NJ: Wiley-Blackwell, 2015, ch. 10, pp. 165–190.
DOI: 10.1002/9781118568323.ch10

S. H. Lisanby and **Z.-D. Deng**, "Magnetic seizure therapy for the treatment of depression," in *Brain Stimulation: Methodologies and Interventions*, I. M. Reti, Ed., Hoboken, NJ: Wiley-Blackwell, 2015, ch. 8, pp. 123–148.
DOI: 10.1002/9781118568323.ch8

Editorials, Correspondences, & Commentaries

S. K. Kar, A. Silva-dos-Santos, M. 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.
PMCID: PMC11464472; DOI: 10.3389/fpsyt.2024.1488846

* **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.
PMID: 38656323; DOI: 10.1001/jamapsychiatry.2024.0695

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.
PMID: 35680342; DOI: 10.1016/j.bpsc.2022.03.006

* **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.
PMID: 25468237; DOI: 10.1016/j.clinph.2014.10.144

* **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.
PMID: 25088734; DOI: 10.1016/j.clinph.2014.06.048

Other Contributions: Acknowledged Contributions, Nonrefereed Publications, & Creative Works

American Psychiatric Association Task Force on Electroconvulsive Therapy, *The Practice of Electroconvulsive Therapy: Recommendations for Treatment, Training, and Privileging*, 3rd ed. Washington, DC: American Psychiatric Association Publishing, 2024.
Contribution: Created illustrations of ECT configurations and computational models

* **Z.-D. Deng**, "Brain: An intricate web," artwork, *NIMH IRP Fellows' 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.
PMCID: PMC7448696; DOI: 10.1111/ejn.14624
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.
DOI: 10.1109/NER.2013.6696152
Contribution: Performed magnetic field simulation

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.
PMID: 24112906; DOI: 10.1016/B978-0-444-53497-2.00027-9
Contribution: Created Figure 27.3

* **Z.-D. Deng** and A. V. Peterchev, "Safety of transcranial magnetic stimulation and electroconvulsive therapy in patients with a deep brain stimulation implant," Technical report for St. Jude Medical/Advanced Neuromodulation System, Plano, TX, 2010.

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.
PMID: 16303337; DOI: 10.1016/j.resp.2005.09.008
Contribution: Performed noise titration computations

Articles in Review, Preprints, & Preregistrations

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

* S. Dey, E. Bharti, 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.
DOI: 10.1101/2024.09.28.615333

* L. Beynel, E. Wiener, N. Baker, E. Greenstein, S. Francis, A. Neacsiu, 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.
URL: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42024570287

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.
PMCID: PMC10979934; DOI: 10.1101/2024.03.08.584169

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.
DOI: 10.1101/2022.01.21.477303
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.
DOI: 10.1101/457630

Theses

* **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*, DOI: 10.7916/D8F47WCS

* **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*, HDL: 1721.1/41649

Selected Abstracts (Prior 3 years)

🖉 **Denotes oral presentation**

* E. Wiener, L. Beynel, N. Baker, E. Greenstein, A. D. Neacsiu, E. Jones, B. Gindoff, S. M. Francis, C. Neige, S. W. Davis, 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," *Annual Meeting of the Social and Affective Neuroscience Society*, 2025, submitted.

  L. Beynel, V. Roopchansingh, R. Reynolds, P. Taylor, **Z.-D. Deng**, L. Li, N. Baker, D. Brandy, K. Cameron, H. Gura, E. Ekpo, S. Menon, E. Wiener, Z. Rezaee, J. K. Rajendra, B. Luber, and S. H. Lisanby, "A journey towards an objective control of brain state: Concurrent rTMS during real time fMRI neurofeedback," *International Society for CNS Clinical Trials and Methodology Annual Scientific Meeting*, 2025, accepted.

* **Z.-D. Deng**, "Multichannel Individualized Stimulation Therapy (MIST): A targeted approach to optimize electroconvulsive therapy," *International Brain Stimulation Conference*, 2025, accepted.

🖉 S. Francis, Z. Rezaee, C. Reid, E. Bharti, M. Jaime, E. Greenstein, **Z.-D. Deng**, B. Luber, C. Zrenner, and S. H. Lisanby, "Enhancing TMS response through real-time EEG-triggered paired associative stimulation of mu rhythm," *International Brain Stimulation Conference*, 2025, accepted.

  D. Tang, W. Wartman, A. Nummenmaa, M. Daneshzand, G. Noetscher, H. Lu, **Z.-D. Deng**, and S. N. Makaroff, "A BEM-FMM TMS coil designer using MATLAB platform," *International Brain Stimulation Conference*, 2025, accepted; also presented at *NYC Neuromodulation Conference*, 2024.

  L. D. Oliver, D. M. Blumberger, C. Hawco, E. W. Dickie, J. Gallucci, J. Jeyachandra, S. Mansour, **Z.-D. Deng**, S. M. Hare, J. M. Gold, G. Foussias, M. Argyelan, Z. J. Daskalakis, R. W. Buchanan, A. K. Malhotra, and A. N. Voineskos, "Effects of individualized transcranial magnetic stimulation on social cognitive network functional connectivity in schizophrenia spectrum disorders: A target engagement study," *Neuropsychopharmacology*, vol. 49, supplement, p. 420, 2024.

* C. C. Abbott, T. L. Squillaci, B. A. Kimbrell, J. David, J. Upston, T. Jones, A. Datta, and **Z.-D. Deng**, "Predictive biomarkers to inform ECT parameter selection," *Neuropsychopharmacology*, vol. 49, supplement, p. 411, 2024.

* **Z.-D. Deng**, J. Kim, B. A. Pritchard, R. H. Schor, G. R. Dold, and S. H. Lisanby, "Multichannel Individualized Stimulation Therapy (MIST): Precision through computational modeling and multitargeted stimulation," *Neuropsychopharmacology*, vol. 49, supplement, p. 192, 2024.

  E. Jones, T. Torrico, L. Beynel, **Z.-D. Deng**, D. Nielson, E. Wiener, S. Menon, B. Luber, E. Ekpo, W. Regenold, and S. H. Lisanby, "Accelerated intermittent theta burst stimulation for depression," *American Psychiatric Nurses Association Annual Conference*, 2024.

* 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.

E. Greenstein, Z. Rezaee, **Z.-D. Deng**, L. Oberman, and S. H. Lisanby, "Exploring individual variability in TMS effects: The case for E-field modeling in research," *NIMH IRP Fellows' Scientific Training Day*, 2024.

Z. Qi, G. M. Noetscher, A. Miles, K. Weise, T. R. Knösche, C. R. Cadman, A. R. Potashinsky, K. Liu, W. A. Wartman, G. Nunez Ponasso, M. Bikson, H. Lu, **Z.-D. Deng**, A. R. Nummenmaa, and S. N. Makaroff, "Enabling electric field model of microscopically realistic brain," *NYC Neuromodulation Conference*, 2024.

E. Ekpo, L. Beynel, **Z.-D. Deng**, B. Luber, W. T. Regenold, E. Jones, and S. H. Lisanby, "Functional connectivity in depression: Task-based vs resting state fMRI," *Annual Biomedical Research Conference for Minoritized Scientists*, 2024.

N. I. Hasan, M. Dannhauer, D. Wang, **Z.-D. Deng**, and L. J. Gomez, "Real-time computation of E-field for transcranial magnetic stimulation," *National Radio Science Meeting*, 2025.
Third Place in Best Student Paper (awarded to N. I. Hasan), *Photonics and Electromagnetics Research Symposium*, 2024.

S. M. Francis, S. N. Menon, L. Beynel, P. L. Robins, **Z.-D. Deng**, A. Thurm, T. White, F. Pereira, L. M. Oberman, and S. H. Lisanby, "Identifying domain-specific nodes using network controllability to determine potential TMS targets for ASD," *Annual Meeting of the International Society for Autism Research*, 2024.

L. Beynel, B. Luber, H. Gura, Z. Rezaee, E. Ekpo, **Z.-D. Deng**, O. Joseph, P. Taylor, and S. H. Lisanby, "When the target is a moving target: Practical issues in using task fMRI for rTMS targeting," *Aperture Neuro*, vol. 4, no. Suppl 1, pp. 1457–1458, 2024

L. D. Oliver, D. M. Blumberger, C. Hawco, E. W. Dickie, J. Gallucci, J. Jeyachandra, **Z.-D. Deng**, J. M. Gold, G. Foussias, M. Argyelan, Z. J. Daskalakis, R. W. Buchanan, A. K. Malhotra, and A. N. Voineskos, "Effects of personalized transcranial magnetic stimulation on social cognitive network functional connectivity in schizophrenia spectrum disorders," *Biological Psychiatry*, vol. 95, no. 10, pp. S278–S279, 2024; also presented at *Annual Congress of the Schizophrenia International Research Society*, 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.

E. Ekpo, L. Beynel, **Z.-D. Deng**, B. Luber, W. T. Regenold, E. Jones, and S. H. Lisanby, "Goal priming: Using a task to assess functional connectivity in depression," *Biological Psychiatry*, vol. 95, no. 10, pp. S192–S193, 2024.

* C. C. Abbott, J. Miller, M. Argyelan, S. M. McClintock, and **Z.-D. Deng**, "Individualized amplitude and electroconvulsive therapy," *Biological Psychiatry*, vol. 95, no. 10, p. S31, 2024.

M. Argyelan, **Z.-D. Deng**, O. T. Ousdal, L. Oltedal, G. Petrides, A. Malhotra, and C. C. Abbott, "Electroconvulsive therapy-induced volumetric brain changes converge on a common causal circuit in depression," *Biological Psychiatry*, vol. 95, no. 10, pp. S29–S30, 2024.

P. L. Robins, S. H. Lisanby, and **Z.-D. Deng**, "Quantifying aliasing in paper electroencephalography (EEG) during electroconvulsive therapy (ECT)," *International Society for ECT and Neurostimulation Annual Meeting*, 2024.

M. Teferi, M. Patel, A. Casalvera, **Z.-D. Deng**, K. Lynch, D. Oathes, Y. Sheline, and N. Balderston, "Both cTBS and iTBS increase anxiety when delivered to the right dlPFC in healthy volunteers," *Neuropsychopharmacology*, vol. 46, supplement, p. 83, 2023.

M. Jaime, L. M. Oberman, S. M. Francis, J. Stout, **Z.-D. Deng**, P. L. Robins, J. W. van der Veen, and S. H. Lisanby, "An experimental methods based approach to understanding the mechanisms underlying MEG indices of auditory/language processing," *MEG North America Workshop*, 2023.

M. Jaime, E. Ekpo, L. M. Oberman, S. M. Francis, L. Beynel, M. Hynd, P. L. Robins, **Z.-D. Deng**, J. Stout, J. W. van der Veen, A. Thurm, 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," *NIMH IRP Fellows' Scientific Training Day*, 2023.

E. Ekpo, H. Gura, Z. Rezaee, **Z.-D. Deng**, B. Luber, S. H. Lisanby, and L. Beynel, "Effects of practice and fMRI-Guided rTMS on a numerical Stroop task," *NIMH IRP Fellows' Scientific Training Day*, 2023.

* 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.

* P. L. Robins, S. N. Makaroff, and **Z.-D. Deng**, "Electric field characteristics of rotating permanent magnet stimulation," *Biomedical Engineering Society Annual Meeting*, 2023; also presented at *NIMH IRP Fellows' Scientific Training Day*, 2023.
NIMH IRP Trainee Travel Award

E. Jones, **Z.-D. Deng**, Z. Rezaee, P. Rohde, P. L. Robins, W. T. Regenold, and S. H. Lisanby, "Transcranial electric stimulation therapy for treatment resistant depression," *American Psychiatric Nurses Association Annual Conference*, 2023.

S. N. Menon, S. M. Francis, L. Beynel, P. L. Robins, **Z.-D. Deng**, A. Thurm, T. White, F. Pereira, P. Taylor, L. M. Oberman, and S. H. Lisanby, "Localizing brain networks in autism: A protocol to identify potential rTMS targets," *NIH Julius Axelrod Symposium*, 2024; also presented at *NIMH IRP Fellows' Scientific Training Day*, 2023.

W. A. Wartman, K. Weise, M. Rach, L. Morales, **Z.-D. Deng**, A. Nummenmaa, and S. N. Makaroff, "An adaptive h-refinement method for the boundary element fast multipole method for quasi-static electromagnetic modeling," *Brain & Human Body Modeling Conference*, 2023.
Third Place in International Student Competition (awarded to W. A. Wartman)

S. N. Makaroff, W. A. Wartman, **Z.-D. Deng**, and A. Nummenmaa, "Charge-based brain modeling engine at mesoscale and multiscale," *WPI Research, Discovery, and Innovation Annual Symposium*, 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.

P. L. Robins, P. Rohde, **Z.-D. Deng**, W. T. Regenold, and S. H. Lisanby, "Feasibility method for magnetoencephalography data collection and analysis for patients receiving electroconvulsive therapy," *NIH Postbac Poster Day*, 2023.

P. Rohde, P. L. Robins, Z. Rezaee, **Z.-D. Deng**, E. Jones, W. T. Regenold, and S. H. Lisanby, "A feasibility study of transcranial electric stimulation (TEST) for treatment resistant depression investigating the necessity of seizure in electroconvulsive therapy," *NIH Postbac Poster Day*, 2023.

A. Guillen, C. C. Abbott, **Z.-D. Deng**, D. Truong, and A. Datta, "Impact of modeled field of volume in ECT current flow simulations," *International Brain Stimulation Conference*, 2023.

B. Luber, S. Davis, **Z.-D. Deng**, D. Murphy, A. V. Peterchev, and S. H. Lisanby, "Targeting deep brain structures with TMS using diffusion tensor imaging," *Brain Stimulation*, vol. 16, no. 1, p. 180, 2023.

W. Wartman, A. Miles, G. Hartwigsen, T. Knösche, **Z.-D. Deng**, and K. Weise, "How important are extracerebral brain compartments for TES, TMS, and ECT modeling predictions?" *Brain Stimulation*, vol. 16, no. 1, p. 138, 2023.

*🖉 M. Dannhauer and **Z.-D. Deng**, "Optimizing the placements of multielectrode tES montages from EEG dipole modeling," *Brain Stimulation*, vol. 16, no. 1, pp. 136–137, 2023.

🖉 J. Ferreira, L. Morales, R. Lemdiasov, H. Lu, **Z.-D. Deng**, and S. N. Makaroff, "TMS coil and TMS coil array designer with fast multipole method," *Brain Stimulation*, vol. 16, no. 1, p. 136, 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.

* H. Gura, E. Feuer, C. Abboud Chalhoub, S. Awasthi, M. Noh, B. Luber, and S. H. Lisanby, and **Z.-D. Deng**, "Effect of intertrain interval on theta burst induced changes in motor cortical excitability," Program No. 752.18. *Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience*, 2022.

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.

*🖉 P. L. Robins and **Z.-D. Deng**, "Comparison of coil localization approaches and induced electric fields in depressed adolescents receiving repetitive transcranial magnetic stimulation," *NIMH IRP Fellows' Scientific Training Day*, 2022.

*🖉 P. L. Robins, M. Dannhauer, L. M. Haugen, J. D. Port, P. E. Croarkin, and **Z.-D. Deng**, "Comparison of coil localization approaches and induced electric fields in depressed adolescents receiving repetitive transcranial magnetic stimulation," *Brain & Human Body Modeling Conference*, 2022.

🏅 First Place in International Student Competition (awarded to P. L. Robins)

M. Argyelan, C. C. Abbott, **Z.-D. Deng**, B. Wade, GEMRIC Consortium, G. Petrides, and A. Malhotra, "Personalizing electroconvulsive therapy with electrical field modeling," *Biological Psychiatry*, vol. 91, no. 9, p. S210, 2022.

*🖉 C. C. Abbott, S. M. McClintock, M. Argyelan, and **Z.-D. Deng**, "Individualizing electroconvulsive therapy (ECT) amplitude to improve clinical outcomes," *Biological Psychiatry*, vol. 91, no. 9, pp. S54–S55, 2022.

*🖉 **Z.-D. Deng**, S. M. McClintock, M. Husain, and S. H. Lisanby, "Depressive symptom dimensions and response trajectories in electroconvulsive therapy and magnetic seizure therapy," *Biological Psychiatry*, vol. 91, no. 9, p. S21, 2022.

E. C. Feuer, **Z.-D. Deng**, A. V. Peterchev, C. Sikes-Keilp, M. A. Rosa, and S. H. Lisanby, "Effects of stimulus frequency and individualized current amplitude on EEG and EMG characteristics in electroconvulsive therapy and magnetic seizure therapy," *International Society for ECT and Neurostimulation Annual Meeting*, 2022; also presented at *NIH Julius Axelrod Symposium*, 2022.

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, filed 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," WO 2024/215761 A1, filed Apr. 10, 2024.

C. C. Abbott, **Z.-D. Deng**, J. Upston, T. Jones, and A. Datta, "Systems and methods for electroconvulsive therapy," WO 2024/148196 A1, July 11, 2024.

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, assigned to NEVA Electromagnetics, LLC.

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 non-increasing parasympathetic modulation," U.S. Patent 9,737,258, Aug. 22, 2017, assigned to MIT.

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, filed Aug. 22, 2011. Not converted to non-provisional.

A. V. Peterchev, S. H. Lisanby, and **Z.-D. Deng**, "Methods, apparatus, and systems for magnetic stimulation," U.S. Patent 9,295,853, Mar. 29, 2016, assigned to The Trustees of Columbia University in the City of New York.

A. V. Peterchev, S. H. Lisanby, and **Z.-D. Deng**, "Methods, apparatus, and systems for magnetic stimulation," U.S. Patent 8,801,589, Aug. 12, 2014, assigned to The Trustees of Columbia University in the City of New York.

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 depression
NIMH Protocol 17-M-0147 2017–
Role: Associate investigator; PI: S. H. Lisanby

Development of non-invasive brain stimulation techniques
NIMH Protocol 18-M-0015 2017–
Role: Associate investigator; PI: S. H. Lisanby

Development of functional and structural magnetic resonance imaging techniques for the study of mood and anxiety disorders
NIMH Protocol 07-M-0021 2017–
Role: Associate investigator; PI: A. C. Nugent

Identifying neurobiological mechanisms that underlie acute nicotine withdrawal and drive early relapse in smokers
NIDA Protocol 12-DA-N474 2017 –
Role: Associate investigator; PI: A. Janes

Neuropharmacologic imaging and biomarker assessments of response to acute and repeated-dosed ketamine infusions in major depressive disorder
NIMH Protocol 17-M-0060 2016 –
Role: Associate investigator; PI: C. A. Zarate, Jr.

Evaluation of patients with mood and anxiety disorders and healthy volunteers
NIMH Protocol 01-M-0254 2016 –
Role: Associate investigator; PI: C. A. Zarate, Jr.

Modulation of the parieto–frontal communication
NINDS Protocol 18-N-0054 2018 – 2019
Role: Associate investigator; PI: M. Hallett

Effect of TMS to frontoparietal attention network on anxiety potentiated startle
NIMH Protocol 17-M-0042 2017 – 2019
Role: Associate investigator; PI: C. Grillon

Ongoing Research Support

ADEPT: Adaptive trial for the treatment of depression associated with concussion using repetitive transcranial magnetic stimulation protocols
Congressionally Directed Medical Research Programs Award TP220072 2024 –
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.

Charge-based brain modeling engine with boundary element fast multipole method
NIH/NIMH R01 MH130490 2023.07 – 2028.05
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 electromagnetic modeling.

Novel electric-field modeling approach to quantify changes in resting state functional connectivity following theta burst stimulation
NIH/NIMH U01 MH130447 2022.09 – 2027.06
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.

Development of a novel, scalable, neurobiologically-guided transcranial magnetic stimulation protocol for the treatment of cannabis use disorder
Centre for Addiction and Mental Health, Toronto, ON, Canada 2023.02 –
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: Sheline, Narr, Espinoza, McClintock, 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 – 2026.01
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.

Pending Research Support

Improving ECT clinical outcomes through seizure- and model-guided stimulation parameters
NIH UG3/UH3 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 UG3/UH3 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

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.

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.

Translational research evaluating neurocognitive memory processes
NIH/NIMH K23 MH087739 2013.07 – 2014.06
Role: Postdoctoral fellow; PI: S. M. McClintock
This study informs the cognitive component processes underlying memory impairment after electroconvulsive therapy.

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.

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 2008.07 – 2009.06
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 – 2008.06
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 – 2007.05
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 2023
Advancing neurostimulation treatment optimization and technology innovation

Westmead Hospital, Sydney, Australia 2020
Advances in neuromodulation: Electroconvulsive therapy

Clinical TMS Society 2018
Transcranial magnetic stimulation: Physics, devices, and modeling

University of New Mexico, Department of Psychiatry & Behavioral Sciences 2017
Toward individualized electroconvulsive therapy for treatment of depression

Central Regional Hospital, Butner, NC 2015
Individualized seizure therapy

Duke University School of Medicine, Department of Psychiatry & Behavioral Sciences 2015
Toward next generation seizure therapy

Invited Seminars

NIMH Intramural Research Program Investigators' Seminar Series Upcoming 2025.03
Reading faces: Using facial expression analysis to track emotional states in depression

IEEE Magnetics and EMBS Chapters Upcoming 2025.03
Virginia Commonwealth University Mechanical & Nuclear Engineering Department Seminar
Recent advances in transcranial magnetic stimulation: Devices, modeling, and applications

University of Texas Southwestern, Department of Psychiatry Upcoming 2025.02
From models to medicine: Advancing precision neuromodulation through engineering

UCSF Department of Psychiatry & Behavioral Sciences 2025
Engineering precision in neuromodulation: Computational models and clinical applications

University of Pittsburgh, Geriatric Psychiatry Neuroimaging Laboratory 2024
The full spectrum: Electromagnetic brain stimulation from minimal to maximal intensity

University of Texas Southwestern, Center for Depression Research and Clinical Care 2023
Advancements in computational neurostimulation for depression treatment optimization and technology development

University of Pittsburgh, Department of Psychiatry 2023
Computational neurostimulation: Treatment optimization and technology development

National Center of Neuromodulation for Rehabilitation, MUSC 2022
Model-driven design for brain stimulation therapies

NIMH Intramural Research Program Investigators' Seminar Series 2022
Seizure therapies: The next generation

Brown University/Butler Hospital, Department of Psychiatry & Human Behavior 2021
Computational model driven design for brain stimulation

University of Pennsylvania, Center for Neuromodulation in Depression and Stress 2021
Electromagnetic brain stimulation from low to high intensity

VA Boston Healthcare System, Boston University School of Medicine 2020
Harvard Medical School Neuropsychiatry Translational Research Fellowship Seminar
Precision neurostimulation: History, physics, computational modeling, and engineering

Medical University of Vienna, Neuroimaging Lab 2020
Precision seizure therapy

Mount Sinai Icahn School of Medicine, Depression and Anxiety Center 2019
Rational design of individualized noninvasive brain stimulation

NIMH Intramural Research Program Investigators' Seminar Series 2018
Computational neurostimulation: Engineering better brain stimulation therapies

UCLA Brain Mapping Center 2018
Computational neurostimulation: Engineering better brain stimulation therapies

UCLA Semel Institute for Neuroscience and Human Behavior 2018
Neuromodulation Division
Modeling and design for magnetic stimulation

USC Mark and Mary Stevens Neuroimaging and Informatics Institute 2018
Computational neurostimulation

NIDA, Neuroimaging Research Branch 2016
Advances in transcranial magnetic stimulation technology

Mayo Clinic College of Medicine, Department of Molecular Pharmacology 2016
Neurobiology of Alcoholism and Drug Addiction Lab
Transcranial magnetic stimulation technology development

Mayo Clinic College of Medicine, Department of Neurologic Surgery 2016
Neural Engineering Lab
Optimizing transcranial magnetic stimulation

NIMH, Experimental Therapeutics & Pathophysiology Branch 2016
Engineering better electromagnetic brain stimulation therapies

Duke University School of Medicine, Department of Psychiatry & Behavioral Sciences 2015
Chair's round: *Fundamentals of transcranial electric and magnetic stimulation dosing*

Weill Cornell Medical College, Department of Biomedical Engineering 2015
Transcranial magnetic stimulation: Pulse source, coil design, & concurrent neuroimaging

Duke University, Department of Biomedical Engineering 2014
Modeling and coil design considerations for transcranial magnetic stimulation

Conference Talks, Workshops, & Panels

International Society for ECT and Neurostimulation Annual Meeting Upcoming 2025.05
Multichannel Individualized Stimulation Therapy

American Neuropsychiatric Association Annual Meeting Upcoming 2025.03
Advancing personalized seizure therapy: Magnetic seizure therapy and Multichannel Individualized Stimulation Therapy
Part of panel: *Interventional neuropsychiatry: From mechanisms to clinical decision-making*

International Brain Stimulation Conference Upcoming 2025.02
Multichannel Individualized Stimulation Therapy (MIST): A targeted approach to optimize

electroconvulsive therapy
Part of symposium: *ECT reimagined: Precision, prediction, and personalized care*

IEEE Brain Discovery & Neurotechnology Workshop, University of Illinois Chicago 2024
A model-driven approach to personalized neuromodulation treatment

International Symposium on Novel Neuromodulation Techniques 2024
Model-driven brain stimulation treatments

NIMH Workshop on The Placebo Effect: Key Questions for Translational Research 2024
Challenges and strategies in implementing effective sham stimulation for noninvasive brain stimulation trials

International Society for Magnetic Resonance in Medicine Annual Meeting 2024
TMS devices and modeling
Part of workshop: *From basics to applications: MRI of neuromodulation using TMS and FUS*

Brain and Human Body Modeling Conference 2023
Effects of low intensity magnetic stimulation

International Conference of the IEEE Engineering in Medicine and Biology Society 2023
Modeling of TMS and ECT in the treatment of depression
Part of panel: *Computational analysis of non-invasive neuromodulation: Brain and spine*

ADAA Anxiety and Depression Conference 2023
Modeling and dose optimization for TMS and ECT
Part of panel: *Parsing through syndromic heterogeneity in youths with mental illness to identify neurocircuit mechanisms and develop novel treatments*

International Network of tES–fMRI Webinar Series 2022
Electric field modeling and optimization approaches for individualized targeting

International Society for Magnetic Resonance in Medicine 2022
Modeling of TMS
Part of workshop: *MRI of neuromodulation: Target engagement, neural mechanism, & biomarker development*

Bergen Workshop of the Global ECT–MRI Collaboration 2022
ECT device development

Brain and Human Body Modeling Conference 2022
ECT, electric field, neuroplasticity, and clinical outcomes
Part of panel: *Modeling of transcranial electrical stimulation and deep brain stimulation*

European Conference of Brain Stimulation in Psychiatry 2022
Symptom dimensions and response trajectories in ECT and MST
Part of panel: *Beyond clinical syndromes: Understanding mechanisms of neuromodulation from a dimensional perspective*

Society of Biological Psychiatry Annual Meeting 2022
Depressive symptom dimensions in seizure therapy
Part of panel: *Dimensional approaches to device neuromodulation*

Global ECT–MRI Collaboration Young Researchers Collective 2022
ECT, electric field, neuroplasticity, and clinical outcomes

American Academy of Child and Adolescent Psychiatry Annual Meeting 2021
Introduction to computational psychiatry
Part of panel: *Recent work with contemporary computational methods and artificial intelligence to advance the practice of child and adolescent psychiatry*

European College of Neuropsychopharmacology Congress 2021
Precision neurostimulation: Electroconvulsive therapy
Part of panel: *Neurobiology of rapid mood changes*

Society for Brain Mapping & Therapeutics Annual Congress 2021
Advances in electroconvulsive therapy for treatment of depression

International College of Neuropsychopharmacology Virtual World Congress 2021
Next generation seizure therapy and neuromodulation

European Conference of Brain Stimulation in Psychiatry 2020
Electric field modeling to inform ECT dosing and device development
Part of panel: *What can we learn from ECT: Insights from the GEMRIC consortium*

University of Minnesota Non-Invasive Brain Stimulation Workshop 2020
Use of individual electric field models in clinical research

NYC Neuromodulation Online 2020
Discussant, *Noninvasive vagus nerve stimulation applied to stress management, opioid withdrawal, and neurocognitive disorders*

American College of Neuropsychopharmacology Annual Meeting 2019
Rational design of precision seizure therapy
Part of panel: *Precision neurostimulation for treatment of psychiatric disorders*

International Symposium on Advancing Stimulation Precision Medicine of Brain Disorders, Copenhagen University Hospital Hvidovre, Danish Research Centre for Magnetic Resonance
Rational design of precision seizure therapy 2019

International College of Neuropsychopharmacology Meeting 2019
Individualized seizure therapy: Reinventing ECT
Part of workshop: *Neurobiological and clinical characterization, and treatment development for treatment resistant depression*

International Brain Stimulation Conference 2019
Individualized electroconvulsive therapy for treatment of depression
Part of panel: *Individualized brain stimulation: Addressing heterogeneity across modalities*

Bergen Workshop of the Global ECT–MRI Collaboration 2018
Electric field modeling for electroconvulsive therapy

Joint NYC Neuromodulation Conference & NANS Summer Series 2018
Optimizing high-density stimulation arrays for brain targeting

Neuropsychiatric Drug Development Summit 2018
Targeted intermittent device delivered interventions will ultimately prove superior to maintenance treatment with drugs for brain disorders

International Conference of the IEEE Engineering in Medicine and Biology Society 2018
Electric field induced by TMS: Applications in depression and anxiety
Part of panel: *Computational human models for brain stimulation*

American Psychiatric Association Annual Conference 2018
Individualized neurotargeted seizure therapy: Reinventing ECT
Part of Presidential symposium: *ECT in the era of new brain stimulation treatments*

ADAA Anxiety and Depression Conference 2018
Individualized neurotargeted seizure therapy: Reinventing ECT
Part of panel: *Personalized medicine for treatment resistant depressed patients: Novel strategies to optimize treatment with antidepressant medications, ketamine, and ECT*

NIMH Non-Invasive Brain Stimulation Electric Field Modeling Workshop 2017
Use of individual electric field models in clinical research

NYC Neuromodulation Conference 2017
Low field magnetic stimulation

NIMH Workshop on Transcranial Electrical Stimulation: Mechanisms, Technology, and Therapeutic Applications 2016

Effect of anatomical variability on electric field characteristics of tES

International Society for ECT and Neurostimulation Annual Meeting 2015
Workshop: *Spatial targeting with transcranial magnetic stimulation*

International Conference of the IEEE Engineering in Medicine and Biology Society 2010
TMS in the presence of deep brain stimulation implants: Induced electrode currents
ECT in the presence of deep brain stimulation implants: Electric field effects

Annual National Predoctoral Clinical Research Training Program Meeting 2009
Coil design for deep-brain transcranial magnetic stimulation

TRANSFORM Research Day, Irving Institute for Clinical and Translational Research 2009
Electromagnetic field shaping and coil design for transcranial brain stimulation

International Conference of the IEEE Engineering in Medicine and Biology Society 2008
Coil design considerations for deep brain transcranial magnetic stimulation

Annual Meeting of the Society for Neuroscience 2006
Heart rate variability is more chaotic in REM than NREM sleep in children

International Conference of the IEEE Engineering in Medicine and Biology Society 2006
Heart rate variability in pediatric obstructive sleep apnea

Teaching & Mentoring Appointments

Educational Counselor, MIT 2022 –

Research Mentor, University of Maryland, College Park 2018 – 2019
Fischell Department of Bioengineering
Capstone project: *Detection of brain-to-brain synchrony for improved psychotherapy*

Lecturer, NIH
National Institute of Mental Health
Basic Training Course on Transcranial Magnetic Stimulation 2020
fMRI Course Summer 2017
National Institute of Neurological Disorders and Stroke
Clinical Neuroscience Program Lecture Series 2017, 2019

Faculty, Duke University
Department of Psychology & Neuroscience
Research Independent Study 2016
Matching Undergraduates to Science and Engineering Research Program 2015 – 2016
Biosciences Collaborative for Research Engagement 2015 – 2016
Department Psychiatry & Behavioral Sciences
Visiting Fellowship in Electroconvulsive Therapy (CME accredited) 2015
Visiting Fellowship in Transcranial Magnetic Stimulation (CME accredited) 2014 – 2016

Teaching Assistant, Columbia University
Department of Electrical Engineering
Analog Systems in VLSI (graudate level) Spring 2010
The Digital Information Age Fall 2009

Recitation Instructor, Columbia University Mailman School of Public Health
Department of Biostatistics
Biostatistics (graduate level) Fall 2009

Teaching Assistant, MIT
Concourse Program
Multivariable Calculus Fall 2003 – 2006
Differential Equations Spring 2004 – 2007

Sponsored Theses

G. Asturias, Psychology & Neuroscience, Duke University 2015 – 2017
Undergraduate honors thesis: "Effect of repetitive transcranial magnetic stimulation on the structural and functional connectome in patients with major depressive disorder." Available: *DukeSpace*, HDL: 10161/14299
Graduated with Distinction
Career progression: Medical student, Stanford University School of Medicine

Thesis Examination Committee Membership

W. A. Wartman, Electrical & Computer Engineering, Worcester Polytechnic Institute 2024
Ph.D. dissertation: "Adaptive mesh refinement for quasistatic electromagnetic modeling of brain stimulation and recording methods." Sponsor: S. N. Makaroff.

D. Q. Troung, Biomedical Engineering, CUNY City College 2019
Ph.D. dissertation: "Translational modeling of non-invasive electrical stimulation." Sponsor: M. Bikson. Available: *CUNY Academic Works*, URL: https://academicworks.cuny.edu/cc_etds_theses/774

Career Development Award Advisory

S. K. Conroy, M.D., Ph.D., Indiana University School of Medicine 2024 –
Project: "Targeting the medial prefrontal cortex with theta burst stimulation to reduce negative self-referential processing in major depression"

S. M. Hare, Ph.D., University of Maryland School of Medicine
NIH/NIMH K01 MH133116 2024 – 2029
Project: "Cognitive and neural correlates of TMS motor intracortical inhibition in schizophrenia"

S. H. Siddiqi, M.D., Brigham & Women's Hospital
NIH/NIMH K23 MH121657 2020 – 2025
Project: "Personalized circuit-based neuromdulation targets for depression"
Klerman Prize for Exceptional Clinical Research, *Brain & Behavior Research Foundation*

N. L. Balderston, Ph.D., University of Pennsylvania Perelman School of Medicine
NIH/NIMH K01 MH121777 2019 – 2023
Project: "Examining the mechanisms of anxiety regulation using a novel, sham-controlled, fMRI-guided rTMS protocol and a translational laboratory model of anxiety"
Klerman Prize for Exceptional Clinical Research, *Brain & Behavior Research Foundation*

Research Fellows & Postdocs

S. Dey, Ph.D., NIMH Visiting Postdoctoral Fellow 2024 –

M. Dannhauer, Ph.D., NIMH Research Fellow 2022 – 2024
Career progression: Assistant Professor, Computer Science, East Carolina University

Graduate Students

E. Bharti, Ph.D. candidate, NIH–Cambridge Scholars Program 2024 –

M. Kshirsagar, M.S., Biomedical Engineering, Duke University 2012
Career progression: Consultant, Deloitte Consulting

Postbacs

P. L. Robins, B.A., NIMH Intramural Research Training Award (IRTA) Fellow 2021 – 2024
NIMH Intramural Research Program Trainee Travel Award 2023
First Place in Student Competition, *Brain & Human Body Modeling Conference* 2022
Career progression: TMS technician, Columbia Associates

M. R. Hynd, B.S., NIMH IRTA Fellow 2020 – 2022
Career progression: Ph.D. student, University of North Carolina at Chapel Hill

S. Awasthi, B.S., NIMH IRTA Fellow 2018 – 2020
Career progression: Medical student, Stanford University School of Medicine

M. M. Noh, S.B., NIMH IRTA Fellow 2018 – 2019
Career progression: Medical student, University of Cincinnati College of Medicine

J. Thomas, M.S., NIMH IRTA Fellow 2017 – 2019
Career progression: Program officer, National Academies of Sciences, Engineering, & Medicine

M. Velez Afanador, B.S., NIMH IRTA Fellow 2016 – 2019
Outstanding Poster Award, *NIH Postbac Poster Day* 2018
Career progression: Medical student, Howard University College of Medicine

Undergrads

D. T. Weaver, Biology, Duke University 2016
Career progression: M.D./Ph.D. student, Case Western Reserve University

E. F. Salgado, Psychology & Neuroscience, Duke University 2016
Graduated with Distinction
Career progression: Ph.D. student, Indiana University–Purdue University Indianapolis

Z. Feng, Biomedical Engineering and Biology, Duke University 2015 – 2016
Career progression: Medical student, University of Colorado School of Medicine

M. L. Glidewell, Biomedical Engineering, Duke University 2015 – 2016
Career progression: Senior strategy consultant, IBM

W. Lim, Biomedical Engineering, Duke University 2015 – 2016
Career progression: Medical student, Texas A&M College of Medicine

F. M. Mercer, Gender, Sexuality and Feminist Studies, Duke University 2015 – 2016
Career progression: Analyst, Morgan Stanley

E. Shinder, Biology, Duke University 2015 – 2016
Graduated with Distinction
Career progression: Medical student, Stony Brook School of Medicine

E. P. Vienneau, Biomedical Engineering, Duke University 2015 – 2016
Howard G. Clark Award for Excellence in Research
Career progression: Ph.D. student, Vanderbilt University

S. H. Lee, Biomedical Engineering, Duke University 2015
Career progression: Manager, Strategy & Operations, Tempus Labs

R. Shah, Psychology & Neuroscience, Duke University 2015
Career progression: Medical student, Yale School of Medicine

J. R. Lilien, Electrical & Computer Engineering, Duke University 2014 – 2016
Walter J. Seeley Scholastic Award
Career progression: Machine learning engineer, Amazon

Interns

M. Dib, Biomedical Engineering, University of Maryland, College Park 2018 – 2019
Supervised as a summer intern at the NIH, provided ongoing mentorship during academic terms, including advising Capstone design project
Career progression: Medical student, Weill Cornell Medicine

A. L. Halberstadt, Biology and Psychology, Carnegie Mellon University Summer 2017
Career progression: Ph.D. student, Penn State University

C. M. Prevost, Biomedical Engineering, Clemson University Summer 2015
Career progression: Medical student, University South Carolina School of Medicine Greenville

J. V. McCall, Biomedical Engineering, North Carolina State University Summer 2013
Career progression: Ph.D. student, North Carolina State University

Professional Societies Membership

IEEE, Engineering in Medicine and Biology Society 2004 –
Senior Member (2023 –), Member (2013 – 2023), Student Member (2004 – 2013)

American College of Neuropsychopharmacology, Associate Member 2023 –

Biomedical Engineering Society, Member 2021 –

American Society of Clinical Psychopharmacology, Member 2019 –

Past memberships:

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

Committees, Advisory Roles, & Nonprofit Leadership

Advisory Board, Center for Multiscale Bioelectromagnetic Studies of the Brain Department of Electrical & Computer Engineering, Worcester Polytechnic Institute	2025 –
Early Career Committee, American Society of Clinical Psychopharmacology	2023 – 2027
Technology Committee, American Society of Clinical Psychopharmacology	2023 – 2025
Technology Task Force, American Society of Clinical Psychopharmacology	2020 – 2023
Co-founder & Scientific Advisor, Singula Institute	2017 –

Grant Review

Reviewer, NIH BluePrint MedTech Program	2022 –
Reviewer, NIH Center for Scientific Review Biophysics of Neural Systems Study Section	2021.10
Reviewer, Duke Institute for Brain Sciences, Research Incubator Awards	2018, 2021

Editorial Roles

Deputy Editor, *Transcranial Magnetic Stimulation*	2024 –
Associate Editor, *Frontiers in Psychiatry* Sections: Neurostimulation, Neuroimaging Co-Editor on Research Topic: *How Does Brain Stimulation Work? Neuroversion and Other Putative Mechanisms of Action* ⊂	2022 – 2024
Review Editor, *Frontiers in Psychology* Sections: Addictive Behaviors, Consciousness Research	2022 –
Review Editor, *Frontiers in Psychiatry* Sections: Neurostimulation, Neuroimaging	2016 – 2022
Guest Associate Editor, *Frontiers in Pharmacology: Neuropharmacology* Co-Editor on Research Topic: *Neurobiology of Rapid Mood Changes* ⊂	2020
Guest Editor, *Physics in Medicine and Biology* Special Issue: *Electromagnetic Modeling for Brain Stimulation* ⊂	2024
Ad hoc journal reviewer *AIP Advances* *American Journal of Psychiatry* *Asian Journal of Psychiatry* *Australasian Physical and Engineering Sciences in Medicine* *Biological Psychiatry* *BioMedical Engineering OnLine* *Brain Sciences* *Brain Stimulation* *Cerebral Cortex* *Chaos, Solitons & Fractals* *Clinical EEG and Neuroscience* *Clinical Neurophysiology* *CNS Spectrums* *Computational and Mathematical Methods in Medicine* *Computer Methods and Programs in Biomedicine*	2010 –

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 and abstracts 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

Conference & Workshop Organization

Brain and Human Body Modeling Conference 2023
Organizing committee, and judge in student competition
Chair of panel: *New modeling methods: Spinal cord stimulation and novel stimulation*
Chair of panel: *Development and assessment of modeling methods*

American Society of Clinical Psychopharmacology Annual Meeting 2023
Program review subcommittee

International Brain Stimulation Conference 2023
Chair of symposium: *Insights and challenges in preclinical models of TMS: Multimodal investigations across animal species*
Chair of symposium: *Advanced computational modeling and optimization methods for non-invasive brain stimulation*

International Congress of Clinical Neurophysiology 2022
Chair of panel: *Towards optimized TMS targeting approaches*

Brain and Human Body Modeling Conference 2022
Organizing committee
Chair of panel: *Modeling of transcranial electrical stimulation and deep brain stimulation*

American Society of Clinical Psychopharmacology Annual Meeting 2019
Chair of panel: *Treatment-resistant mood disorders across the lifespan: Novel therapeutics*

International Conference of the IEEE Engineering in Medicine and Biology Society 2018
Chair of panel: *Computational human models for brain stimulation*

NYC Neuromodulation Conference 2018
Director of preconference workshop: *Computational modeling in neuromodulation: Tools for engineers, clinicians, and researchers*

Community Involvement, Outreach, & Science Advocacy

Producer, *Psychopharm Today* podcast 2024–
Hosted by the American Society of Clinical Psychopharmacology

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: *Fundamentals of transcranial brain stimulation*

ASCP Early Career Workshop 2021
Presentation: *Engaging presentation strategies for any audience*

Jewish Social Service Agency 2020
Presentation: *Basics of brain stimulation devices: What are they and how do they work*

University of Pennsylvania, Wharton Undergraduate Health Care Club 2019
Presentation: *Research in mental health treatment*

Judge, MIT Hacking Medicine: DC Grand Hack 2019

NIH High School Scientific Training and Enrichment Program 2019
Presentation: *Bioelectricity and brain stimulation*

NIH Take Your Child to Work Day 2019
Presentation: *How to fool your brain*

UCLA, CruX Neurotech Organization 2019
Presentation: *Neuromodulation in psychiatry*

University of Pennsylvania, Wharton Undergraduate Health Care Club 2018
Presentation: *Technology and the future of mental health treatment*

NIH Noninvasive Brain Stimulation Special Interest Group 2017–

Judge/Lead Judge, NIH Postbac Poster Day 2017–2019

Innovation Leader, Psychiatry Innovation Lab, American Psychiatric Association 2016

Duke Psychiatry, Mood Disorders Support and Education Group
Presentation: *Brain stimulation treatments for severe mood disorders* 2016
Presentation: *New frontiers in treatments for mood disorders* 2015

Duke Translational Medicine Institute, Undergraduate Research Society 2016
Presentation: *Engineering meets psychiatry*

Professional Development & Continuing Education

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 Recertified 2023.07