Karl D. Lerud

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Education

2013 – 2019 + **Ph.D., University of Connecticut** in Psychological Sciences.
Thesis title: *Electrophysiological, neural, and perceptual aspects of pitch.*

2011 – 2013 + **Florida Atlantic University** in Complex Systems and Brain Sciences.

2009 – 2011 + **M.A., University of Wisconsin-Milwaukee** in Liberal Studies.
Thesis title: *An approach to systems-theoretic music cognition.*

2002 – 2006 + **B.F.A., University of Wisconsin-Milwaukee** in Music Composition and Technology.

Employment History

2019 – present + **Postdoctoral Fellow.** Neurology, Baystate Health and University of Massachusetts Medical School.

2013 – 2019 + **Research Assistant.** Music Dynamics Laboratory, University of Connecticut.

+ **Teaching Assistant.** Department of Psychological Sciences, University of Connecticut.

2015 – 2018 + **Scientific Programmer.** Oscilloscape, LLC.

2011 – 2013 + **Teaching Assistant.** Florida Atlantic University, Center for Complex Systems and Brain Sciences.

Research Publications

Journal Articles

1. **Lerud, K. D.**, Vines, B. W., Shinde, A. B. & Schlaug, G. (2021). Modulating short-term auditory memory with focal transcranial direct current stimulation applied to the supramarginal gyrus. *NeuroReport*, *32*(8), 702–710. https://doi.org/10.1097/wnr.0000000000001647

2. Shinde, A. B., **Lerud, K. D.**, Munsch, F., Alsop, D. C. & Schlaug, G. (2021). Effects of tDCS dose and electrode montage on regional cerebral blood flow and motor behavior. *NeuroImage*, *237*(April). https://doi.org/10.1016/j.neuroimage.2021.118144

3. **Lerud, K. D.**, Shinde, A. B., Thielscher, A. & Schlaug, G. (2020). Targeted multielectrode tDCS increases functional connectivity within the arcuate fasciculus network: An exploratory study and analysis. *submitted*.

4. **Lerud, K. D.** (2019b). Residue pitch perception of shifted frequency complexes. *submitted*.

5. **Lerud, K. D.**, Kim, J. C., Almonte, F. V., Carney, L. H. & Large, E. W. (2019). A canonical oscillator model of cochlear dynamics. *Hearing Research*, *380*, 100–107. https://doi.org/10.1016/j.heares.2019.06.001

6. **Lerud, K. D.** & Large, E. W. (2019a). Nonlinear frequency components in auditory responses to complex sounds: Physiology, measurement, and generation. *in prep*.

7. **Lerud, K. D.**, Skoe, E., Hancock, R. & Large, E. W. (2019). A high-density EEG and structural MRI source analysis of the frequency following response. *in prep*.

8. **Lerud, K. D.**, Almonte, F. V., Kim, J. C. & Large, E. W. (2014). Mode-locking neurodynamics predict human auditory brainstem responses to musical intervals. *Hearing Research*, *308*, 41–9. https://doi.org/10.1016/j.heares.2013.09.010

Conference Proceedings

1. **Lerud, K. D.** (2019a). A high-density EEG and structural MRI source analysis of the frequency following response to pitch shifted stimuli. In A. Calcus & T. Schoof (Eds.), *Frequency following response workshop* (p. 15).
2. **Lerud, K. D.** & Large, E. W. (2019b). Source analysis of the frequency following response to pitch-shifted stimuli with high-density EEG. In P. Martens & F. Upham (Eds.), *Proceedings of the society for music perception and cognition* (p. 57).
3. **Lerud, K. D.**, Kim, J. C. & Large, E. W. (2014a). A neurodynamic account of residue pitch. In M. K. Song (Ed.), *Proceedings of the international conference on music perception and cognition* (p. 185).
4. **Lerud, K. D.**, Kim, J. C. & Large, E. W. (2014b). Pitch shift of the residue and its brainstem electrophysiological correlates are explained by nonlinear oscillation. *Proceedings of the acoustical society of america* (p. 2166). Acoustical Society of America. https://doi.org/10.1121/1.4877038
5. **Lerud, K. D.**, Kim, J. C. & Large, E. W. (2013a). Auditory brainstem EEG, residue pitch, and nonlinear dynamical systems. In M. Schutz & F. A. Russo (Eds.), *Proceedings of the society for music perception and cognition* (2B–3.3).
6. **Lerud, K. D.**, Kim, J. C. & Large, E. W. (2013b). Nonlinear oscillation accounts for the perception of residue pitch and its brainstem EEG correlate. *2013 neuroscience meeting planner* (356.06/UU7). Society for Neuroscience.
7. **Lerud, K. D.**, Kim, J. C. & Large, E. W. (2012). A nonlinear dynamical systems approach to pitch perception. *2012 neuroscience meeting planner* (462.12/W15). Society for Neuroscience.

Teaching and training

General Psychology I Lab	+ Scientific literacy, research methods, statistics, neuroscience
Principles of Research Lab	+ Experimental design, research methods, IRB submission, data collection, regression and advanced statistical analyses, research presentation
Sensory Neuroscience Lab	+ Intro to programming in MATLAB, auditory neuroscience, fundamental signal processing
EEG execution and data analysis	+ Electrode, EEG net, and amplifier preparation and usage, EEG data storage and manipulation, EEG data processing and analysis
MRI image and data analysis	+ Complete pipeline from raw MRI image volumes to analyzed data: DICOM to NIfTI conversion, preprocessing, standard space transformation, and segmentation, manual ROI creation and application, and subsequent statistical evaluations

Skills and activities

Academic	+ Research methods, teaching, consultation, MATLAB training and analysis, LaTeX typesetting and publishing, Git version control.
Programming Languages	+ MATLAB, Python, R, LaTeX, LilyPond, Git, Bash.

Skills and activities (continued)

Software
- SPM, FSL, FreeSurfer, MRIcro/n/GL, SimNIBS, EEGLAB, FieldTrip, Brainstorm

Coding Projects
- **GrFNN Toolbox for numerical integration of networks of nonlinear oscillators,** `https://github.com/MusicDynamicsLab/GrFNNToolbox`
- **GrFNN Cochlea Toolbox for simulation of a canonical nonlinear cochlear model,** `https://github.com/MusicDynamicsLab/GrFNNCochlea`

Academic journal reviewer
- *Neuropsychologia*, *Brain Research*

Awards

2016
- **Connecticut Institute for the Brain and Cognitive Sciences (IBaCS) Seed Grant**, $ 22,000 for dissertation research.

2014
- **SEMPRE Travel Award for International Conference on Music Perception and Cognition**, $ 662 for travel to ICMPC in Seoul, South Korea.