Christian Brodbeck

Assistant Research Professor

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Research positions

2020-present **Assistant Research Professor**, *Department of Psychological Sciences, University of Connecticut.*

2016-2020 **Post-Doctoral Associate, neural basis of speech perception**, *Institute for Systems Research, University of Maryland, College Park*, Computational Sensorimotor Systems Lab, advisor: Jonathan Z. Simon.
Research on the neural processing of natural, continuous speech using MEG. Collaborations to study language processing with MEG and EEG; changes in speech processing with age; and to develop a novel source localization algorithm. Developed and maintained open source data analysis software and held workshops for other MEG researchers. Mentored undergraduate and graduate student research projects.

Education

2011–16 **Ph.D., Psychology, Cognition & Perception**, *New York University, New York*, advisor: Liina Pylkkänen.
Dissertation: "Comprehending language in context: The neural basis of reference resolution". Research on the neural basis of referential language processing involving multiple MEG studies and one EEG study.

2003–10 **Licentiate, Psychology (equivalent to Master of Science)**, *University of Zurich*, concentration: Neuropsychology; 1. minor: English Linguistics; 2. minor: Neuroinformatics, thesis advisor: Martin Meyer.
Thesis: "Information Structure and the Closure Positive Shift: Event-Related Potentials to *Wh*-Question Answer Pairs". Designed and executed an EEG study on the processing of interphrase boundaries in spoken German.

Experience

2014 **Teaching assistant, Cognition**, *Brian McElree, New York University*, Fall Semester.
Taught two weekly recitation sessions, held office hours and graded exams.

2010-1 **Research assistant**, *Ulrike Toepel, University Hospital and University of Lausanne.*
Helped analyzing an EEG experiment on sentence comprehension in aphasic patients and healthy controls.

2010 **Research assistant**, *Claus Lamm, Laboratory for Social and Neural Systems Research, University of Zurich.*
Analyzed psychophysiological data (skin conductance and heart rate) from an experiment on the perception of pain in others and altruistic behavior.

2009 **Research assistant**, *Giorgia Silani, Laboratory for Social and Neural Systems Research, University of Zurich.*
Composed a literature review on gender differences in antisocial behavior, empathy, and alexithymia.

2006–11 **Clinical assistant**, *Sleep Laboratory Fluntern*, Zurich, part-time.
The Sleep Laboratory Fluntern is a medical facility assisting in the diagnosis and treatment of sleep disorders. I conducted anamnestic interviews with patients and set up and monitored polysomnographic data collection.

Preprints

2020 Brodbeck, C., Jiao, A., Hong, L. E., & Simon, J. Z. (2020). Dynamic processing of background speech at the cocktail party: Evidence for early active cortical stream segregation. *bioRxiv*. doi:10.1101/866749

Peer-reviewed articles

Brodbeck, C., & Simon, J. Z. (2020). Continuous speech processing. *Current Opinion in Physiology*, *18*, 25–31. doi:10.1016/j.cophys.2020.07.014

Das, P., Brodbeck, C., Simon, J. Z., & Babadi, B. (2020). Neuro-current response functions: A unified approach to MEG source analysis under the continuous stimuli paradigm. *NeuroImage*, *in press*. doi:10.1016/j.neuroimage.2020.116528

Kulasingham, J. P., Brodbeck, C., Presacco, A., Kuchinsky, S. E., Anderson, S., & Simon, J. Z. (2020). High gamma cortical processing of continuous speech in younger and older listeners. *NeuroImage*, *222*, 117291. doi:10.1016/j.neuroimage.2020.117291

2018 Brodbeck, C., Hong, L. E., & Simon, J. Z. (2018). Rapid transformation from auditory to linguistic representations of continuous speech. *Current Biology*, *28*(24), 3976–3983.e5. doi:10.1016/j.cub.2018.10.042

Brodbeck, C., Presacco, A., Anderson, S., & Simon, J. Z. (2018). Over-representation of speech in older adults originates from early response in higher order auditory cortex. *Acta Acustica united with Acustica*, *104*(5), 774–777. doi:10.3813/AAA.919221

Brodbeck, C., Presacco, A., & Simon, J. Z. (2018). Neural source dynamics of brain responses to continuous stimuli: Speech processing from acoustics to comprehension. *NeuroImage*, *172*, 162–174. doi:10.1016/j.neuroimage.2018.01.042

Matchin, W., Brodbeck, C., Hammerly, C., & Lau, E. (2018). The temporal dynamics of structure and content in sentence comprehension: Evidence from fMRI-constrained MEG. *Human Brain Mapping*, *40*(2), 663–678. doi:10.1002/hbm.24403

2017 Brodbeck, C., & Pylkkänen, L. (2017). Language in context: Characterizing the comprehension of referential expressions with MEG. *NeuroImage*, *147*, 447–60. doi:10.1016/j.neuroimage.2016.12.006

2016 Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2016). Language in context: MEG evidence for modality general and specific responses to reference resolution. *eNeuro*, *3*(6), ENEURO.0145–16.2016. doi:10.1523/ENEURO.0145-16.2016

2015 Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2015). EEG can track the time course of successful reference resolution in small visual worlds. *Frontiers in Psychology*, *6*(1787). doi:10.3389/fpsyg.2015.01787

2014 Gramfort, A., Luessi, M., Larson, E., Engemann, D., Strohmeier, D., Brodbeck, C., Parkkonen, L., & Hämäläinen, M. (2014). MNE software for processing MEG and EEG data. *Neuroimage*, *86*, 446–60. doi:10.1016/j.neuroimage.2013.10.027

2013 Gramfort, A., Luessi, M., Larson, E., Engemann, D. A., Strohmeier, D., Brodbeck, C., Goj, R., Jas, M., Brooks, T., Parkkonen, L., & Hämäläinen, M. (2013). Meg and eeg data analysis with mne-python. *Frontiers in Neuroscience*, *7*(267). doi:10.3389/fnins.2013.00267

2011 Hein, G., Lamm, C., Brodbeck, C., & Singer, T. (2011). Skin conductance response to the pain of others predicts later costly helping. *PLoS ONE*, *6*(8), e22759. doi:10.1371/journal.pone.0022759

Invited contributions

2018 Das, P., Brodbeck, C., Simon, J. Z., & Babadi, B. (2018). Cortical localization of the auditory temporal response function from MEG via non-convex optimization. In *Asilomar conference on signals, systems, and computers* (pp. 373–377).

2013 Brodbeck, C., & Silani, G. (2013). Gender and social emotions: A review of the neuroscientific literature on empathy and its link to psychopathy, antisocial behavior and alexithymia. In I. Latu, M. Mast, & S. Kaiser (Eds.), *Gender and emotion: An interdisciplinary perspective*. Bern: Peter Lang.

Presentations

2020 Brodbeck, C. (2020a). Time-locked cortical processing of continuous speech: From sound to words, and effects of selective attention. Invited talk at University of Toronto.

Brodbeck, C. (2020b). Time-locked cortical processing of continuous speech: From sound to words, and effects of selective attention. Invited talk at NeuroSpin, Paris.

2019 Brodbeck, C. (2019). Time-locked cortical processing of continuous speech: From sound to words, and effects of attention. Invited talk at UT Health.

Brodbeck, C., Hong, L. E., & Simon, J. Z. (2019a). Auditory cortex tracks acoustic onsets of ignored speech: A potential mechanism in stream segregation. Talk at the MEG North America Workshop.

Brodbeck, C., Hong, L. E., & Simon, J. Z. (2019b). Rapid time-locked lexical processing of attended but not of unattended continuous speech. Talk at CHSCOM 2019.

Brodbeck, C., Presacco, A., Kuchinsky, S., Anderson, S., & Simon, J. Z. (2019). Increased speech representation in older adults originates from early response in higher order auditory cortex. Symposium talk at ARO 2019.

Simon, J. Z., Brodbeck, C., Presacco, A., Kuchinsky, S., & Anderson, S. (2019). Over-representation of speech in older adults originates from early and late responses in auditory cortex. Talk at CHSCOM 2019.

2018 Brodbeck, C., Hong, L. E., & Simon, J. Z. (2018). MEG responses track lexical processing of continuous narrative speech. Poster presented at the 11th international conference on the Mental Lexicon.

Brodbeck, C., Presacco, A., Anderson, S., & Simon, J. Z. (2018). Over-representation of speech in older adults originates from early response in higher order auditory cortex. Talk at the International Symposium on Hearing 2018.

Brodbeck, C., Presacco, A., Kuchinsky, S., Anderson, S., & Simon, J. Z. (2018). Origins of cortical over-representation of speech in older adults. Poster presented at SPLASH 2018.

Brodbeck, C., & Simon, J. Z. (2018a). Tracking phoneme processing during continuous speech perception with MEG. Poster presented at ARO 2018.

Brodbeck, C., & Simon, J. Z. (2018b). Using MEG to follow the neural processing of continuous speech, from acoustics to comprehension. Invited talk at Portland Health and Science University.

Das, P., Brodbeck, C., Simon, J. Z., & Babadi, B. (2018). Direct cortical localization of the meg auditory temporal response function: A non-convex optimization approach. Poster presented at SfN 2018.

Matchin, W., Brodbeck, C., Hammerly, C., & Lau, E. (2018). The temporal dynamics of structure and content in the language network. Talk presented at the 31st CUNY sentence processing conference.

2017 Brodbeck, C., Presacco, A., & Simon, J. Z. (2017a). Neural source dynamics of brain responses to continuous speech: From acoustics to comprehension. Poster presented at SfN 2017.

Brodbeck, C., Presacco, A., & Simon, J. Z. (2017b). Neural source dynamics of brain responses to continuous stimuli with MEG: Speech processing from acoustics to comprehension. Poster presented at the SAND8 workshop.

Brodbeck, C., Presacco, A., & Simon, J. Z. (2017c). Tracking phoneme processing during continuous speech perception with MEG. Poster presented at the 6th International Conference on Auditory Cortex.

Brodbeck, C., & Simon, J. Z. (2017). Tracking phoneme processing during continuous speech perception with MEG. Poster presented at SNL 2017.

2016 Brodbeck, C. (2016). Unpacking the neural basis of reference resolution: MEG and EEG evidence. Invited talk at the RefNet round table.

Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2016a). Modality general and specific brain responses during reference resolution. Poster presented at the annual meeting of the Cognitive Neuroscience Society.

Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2016b). Modality general and specific brain responses during reference resolution. Poster presented at the 28th Annual CUNY Conference on Human Sentence Processing.

2015 Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2015). EEG can track the time course of successful reference resolution in small visual worlds. Poster presented at the 7th Annual Meeting of the Society for the Neurobiology of Language (SNL).

2014 Brodbeck, C., Gwilliams, L., & Pylkkänen, L. (2014). Reference resolution and prediction in a visual world: MEG evidence from English and Arabic. Talk given at the NYUAD Annual Research Conference.

Brodbeck, C., & Pylkkänen, L. (2014). Reference resolution in small visual worlds: The role of the medial parietal lobe. Talk given at the RefNet Workshop.

2013 Brodbeck, C., & Pylkkänen, L. (2013). MEG evidence for immediate reference resolution within a visual world. Poster presented at the 25th Annual CUNY Conference on Human Sentence Processing.

Honors and Awards

2018 **Student Presentation Award**, *11th International Conference on the Mental Lexicon*, one of two awards for the best trainee presentations.

2017 **Travel award**, *6th International Conference on Auditory Cortex*.

2017 **Travel grant**, *SAND8 Workshop*.

2016 **Dean's Student Travel Grant**, *New York University*.

2011–16 **Henry M. MacCracken Fellowship**, *New York University*.

Technical Skills

Programming
- High proficiency in Python
- Performance optimization with Cython
- Network protocols for distributed computation
- Intermediate proficiency in R, Matlab, Swift

Open source development
High proficiency with open source development (GitHub profile: github.com/christianbrodbeck)
- MNE-Python: contributor (martinos.org/mne)
- PySurfer: contributor (github.com/nipy/PySurfer)
- Eelbrain: primary developer (eelbrain.readthedocs.io)

Media
- Stimulus programming (Psychopy, Psychtoolbox, Presentation, E-Prime)
- Audio (Praat, Audacity)
- Graphics and layout (Affinity Designer, Affinity Photo, Affinity Publisher)
- Video (Final Cut) and 3d graphics (LightWave 3D)

Languages

German Native

English Fluent

French Basic
Arabic Basic