Laura Gwilliams

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Education

2015–2020 *Ph.D.*, *Psychology* (focusing on Cognitive Neuroscience)

New York University, USA

Thesis Title: Towards a mechanistic account of speech comprehension

Supervisors: Alec Marantz and David Poeppel

GPA: 4.0/4.0

2012–2013 M.Sc., Cognitive Neuroscience of Language

Basque Center on Cognition, Brain and Language (BCBL), Spain

Supervisors: Arthur Samuel and Phillip Monahan

Grade: Excellent

2009–2012 B.A., Linguistics

Cardiff University, UK

Supervisor: Lise Fontaine

Grade: 1st class with honours

Research positions

2020-present Post-doctoral Fellow, Chang Lab

University of California, San Francisco

Supervisors: Edward Chang and Matthew Leonard

2013–2015 Research Assistant, Neuroscience of language lab

New York University Abu Dhabi

Supervisors: Alec Marantz and Liina Pylkkänen

Awards and Scholarships

2020	Dissertation Award, Society for the Neurobiology of Language
2020	Martin Braine Fellowship, New York University
2019	William Orr Dingwall Dissertation Fellowship
	Fellowship in the Cognitive, Clinical, and Neural Foundations of Language
2019	Facebook PhD Fellowship, Facebook (Finalist)
2018	Trainee Professional Development Award, Society for Neuroscience (SfN)
2018	Poster Prize, Salzburg Mind Brain Annual Meeting (SAMBA)
2018	Travel Award, Society for the Neurobiology of Language Conference
2018	Travel Award, Cognitive Modelling and Computational Linguistics
2017	Travel Award, Cognitive Computational Neuroscience Conference
2016	Dean's Travel Grant, New York University
2016	Travel Award, Society for the Neurobiology of Language Conference
2016	Helmsley Fellowship Cold Spring Harbor
	(Genetics and Neurobiology of Language Course attendance fee)
2015	Henry M. MacCracken Fellowship, New York University
	(Full funding of PhD tuition and maintenance)
2012	Tuition Waver, Basque Center on Cognition, Brain and Language
2012	Dell Hymes Commendation for Academic Achievement, Cardiff University
	(Awarded to the top graduating student within the department)

Publications

Preprints

- [1] **Gwilliams, L.**, King, JR., *Marantz, A. & *Poeppel, D. (under review). Neural dynamics of phoneme sequencing in real speech jointly encode order and invariant content. bioRxiv
- [2] *Lewis, G., *van Rijn, P., **Gwilliams, L**., Larrouy-Maestri, P., Poeppel, D. & Ghitza, O. (under review). NyU-BU contextually controlled stories Corpus: NUBUC. Zenodo

[3] **Gwilliams, L.**, & Wallisch, P. (under review). Immediate ambiguity resolution in speech perception based on prior acoustic experience. PsyArXiv

Peer-reviewed articles

- [4] *Gwilliams, L., *Blanco-Elorrieta, E., Marantz, A. & Pylkkänen, L. (2020). Perceptual adaptation to accented speech: prefrontal cortex aids attunement in auditory cortices. *Nature Scientific Reports*. DOI: 10.1038/s41598-020-79640-0
- [5] **Gwilliams, L**. & King, JR. (2020). Recurrent processes support a cascade of hierarchical decisions. *eLife*. DOI: 10.7554/eLife.56603
- [6] Dikker, S., Assaneo, F., Gwilliams, L., Wang, L. Kösem, A. (2020). MEG and Language: Using Magnetoencephalography to Study the Neural Basis of Language. *Neuroimaging Clinics of North America*. DOI: j.nic.2020.01.004
- [7] Gwilliams, L. (2020). Hierarchical oscillators in speech comprehension: A commentary on Meyer, Sun & Martin. *Language, Cognition and Neuroscience*. DOI: 10.1080/23273798.2020. 1740749
- [8] **Gwilliams, L**. (2019). How the brain composes morphemes into meaning. *Philosophical Transactions of the Royal Society B*. DOI: 10.1098/rstb.2019.0311
- [9] Stockall, L., Manouildiou, C., Gwilliams, L., Neophytou, K., & Marantz, A. (2019). Prefix Stripping Re-Re-visited: MEG Evidence. Frontiers in Psychology. DOI: 10.3389/fpsyg.2019.01964
- [10] **Gwilliams, L.**, Linzen, T., Poeppel, D., & Marantz, A. (2018). In spoken word recognition the future predicts the past. *Journal of Neuroscience*. DOI: 10.1523/JNEUROSCI.0065-18.2018
- [11] **Gwilliams, L.**, Poeppel, D., Marantz, A., & Linzen, T. (2018). Phonological (un)certainty weights lexical activation. In *Proceedings of the 8th Workshop on Cognitive Modeling and Computational Linguistics (CMCL 2018)* (pp. 29-34). arXiv
- [12] **Gwilliams, L**. & Marantz, A. (2018). Morphological representations are extrapolated from morpho-syntactic rules. *Neuropsychologia*. DOI: 10.1016/j.neuropsychologia.2018.04.015
- [13] Brodbeck, C., **Gwilliams, L**. & Pylkkänen, L. (2016). Language in context: MEG evidence for modality general and specific responses to reference resolution. *eNeuro*. DOI: 10.1523/ENEURO.0145-16.2016
- [14] **Gwilliams, L.**, Lewis, G. & Marantz, A. (2016). Functional characterisation of letter-specific responses in time, space and current polarity using magneto-encephalography. *NeuroImage*. DOI: 10.1016/j.neuroimage.2016.02.057
- [15] Brodbeck, C., **Gwilliams, L**. & Pylkkänen, L. (2015). EEG can track the time course of reference resolution in small visual worlds. *Frontiers in Psychology*. DOI: 10.3389/fpsyg.2015.01787
- [16] **Gwilliams, L**. & Marantz, A. (2015). Tracking non-linear prediction in a linear speech stream: Influence of morphological structure on spoken word recognition. *Brain and Language*. DOI: 10.1016/j.bandl.2015.04.006
- [17] **Gwilliams, L.**, Monahan, P., & Samuel, A. (2015). Sensitivity to morphological composition: Evidence from grammatical and lexical decision tasks. *Journal of Experimental Psychology:*

- Language, Memory and Cognition. DOI: 10.1037/xlm0000130
- [18] **Gwilliams, L**. & Fontaine, L. (2015). Indeterminacy in process type classification. *Functions of Language*. DOI: 10.1186/s40554-015-0021-x
- [19] Politzer-Ahles, S. **Gwilliams, L**. (2015). Involvement of prefrontal cortex in scalar implicatures: Evidence from magnetoencephalography. *Language and Cognitive Neuroscience*. DOI: 10.1080/23273798.2015.1027235

Conference proceedings

- [20] **Gwilliams, L.**, & King, JR. (2017). Performance-optimized hierarchical models only partially predict neural responses during perceptual decision making. *NIPS workshop: Cognitively Informed Artificial Intelligence: Insights From Natural Intelligence* bioRxiv
- [21] **Gwilliams, L.**, & King, JR. (2017). Perceptual decision making unfolds in a processing cascade within and across brain regions. *Cognitive Computational Neuroscience*.

Book chapters

- [22] **Gwilliams, L**. & Davis, M.H. (under review). Extracting language content from speech sounds: An information theoretic approach. In *The Auditory Cognitive Neuroscience of Speech Perception*.
- [23] **Gwilliams, L**. & Marantz, A. (under review). Neural processing of morphological structure in speech production, listening and reading. In *Current Issues in the Psychology of Language*.
- [24] Stockall, L. & **Gwilliams, L**. (under review). Distributed morphology and neurolinguistics. In *The Cambridge Handbook of Distributed Morphology*.
- [25] King, JR., Gwilliams, L., Holdgraf, C., Sassenhagen, J., Barachant, A., Engemann, D., Larson, E. & Gramfort, A. (2020). Encoding and Decoding Framework to Uncover the Algorithms of Cognition. In *The Cognitive Neurosciences*.

Manuscripts

- [1] *Gwilliams, L., *Brooks, T., Gramfort, A. & Marantz, A. (in prep). Investigating stages of word recognition with concurrent eye-tracking and MEG recordings.
- [2] **Gwilliams, L.**, Marantz, A., Poeppel, D. & King, JR. (in prep). Parsing continuous speech into linguistic representations.
- [3] Iemi, L., **Gwilliams, L.**, Samaha, J., Auksztulewicz, R., Cycowicz, Y., King, JR., Thesen, T., Doyle, W., Devinsky, O., Schroeder, C.E., Melloni, L. & Haegens, S. (in prep). Prestimulus oscillations modulate information processing by suppressing neural excitability.

Presentations

Invited talks

[1] **Gwilliams, L**. (2021, April). Decoding the neural architecture of speech comprehension. *University of Massachusetts Amherst*, Linguistics Department. Amherst, USA. (presented remotely).

- [2] **Gwilliams, L**. (2021, April). Computational models of speech comprehension using neural time series. *University of California, Davis*. Davis, USA. (presented remotely).
- [3] **Gwilliams, L**. (2021, March). Decoding the neural architecture of speech comprehension. *University of Oxford*. Oxford, UK. (presented remotely).
- [4] **Gwilliams, L**. (2021, January). Decoding the neural architecture of speech comprehension. *Institute of Neuroscience and Psychology, University of Glasgow*. Glasgow, UK. (presented remotely).
- [5] **Gwilliams, L**. (2020, December). MEG studies of morphological representations. *Mini-Workshop on Morphological Processing*. (presented remotely).
- [6] **Gwilliams, L**. (2020, December). Decoding the neural architecture of speech comprehension. *University of Maryland*. Maryland, USA. (presented remotely).
- [7] **Gwilliams, L**. & King, JR. (2020, October). Is it that simple? The use of linear models in cognitive neuroscience. *Cognitive Computational Neuroscience*. Generative Adversarial Collaborations Debate. (presented remotely).
- [8] **Gwilliams, L**. (2020, October). Rapid transformation of phoneme sequences into (sub)lexical units. *Society for the Neurobiology of Language*. Symposia presentation. (presented remotely).
- [9] **Gwilliams, L**. (2020, October). Towards a mechanistic account of speech comprehension. *Society for the Neurobiology of Language*. Dissertation award talk. (presented remotely).
- [10] **Gwilliams, L**. (2020, July). Neural dynamics of phoneme sequencing. *Martin Lab, Max Planck Institute for Psycholinguistics*. Nijmegen, The Netherlands (presented remotely).
- [11] **Gwilliams, L**. (2020, January). Recurrent processes emulate a cascade of hierarchical decisions. *Kriegeskorte Lab, Columbia University*. New York City, USA.
- [12] **Gwilliams, L**. (2019, September). How can we model the computations of human language perception? *Cognitive, computational neuroscience: Breakout session host*. Berlin, Germany.
- [13] **Gwilliams, L**. (2019, July). Transforming acoustic input into a hierarchy of linguistic representations. *Max Planck Institute for Empirical Aesthetics*. Frankfurt, Germany.
- [14] **Gwilliams, L**. (2019, June). Transforming acoustic input into a hierarchy of linguistic representations. *BCBL*. Donostia, Basque Country.
- [15] **Gwilliams, L**. (2019, May). Transforming acoustic input into a hierarchy of linguistic representations. *Bedny Lab, Johns Hopkins University*. Baltimore, USA.
- [16] **Gwilliams, L**. (2019, April). Towards a mechanistic account of speech comprehension in the human brain. *University of Maryland*. Maryland, USA.
- [17] **Gwilliams, L**. (2019, February). Transforming acoustic input into a hierarchy of linguistic representations. *École Normale Supérieure & Facebook AI Research*. Paris, France
- [18] **Gwilliams, L.** (2018, December). Parsing continuous speech into linguistic representations. *Mesgarani Lab, Columbia University*. New York, USA.
- [19] **Gwilliams, L**. (2018, November). Towards a mechanistic account of speech comprehension in the human brain. *brainLENS Lab*, *UCSF*. San Fransisco, USA.

- [20] Gwilliams, L. (2018, October). From brain responses to algorithms: advances in parsing the computational architecture of perceptual decision making with MEG and machine learning. *Perception and Brain Dynamics Lab, NYU Langone Medical Center*. New York, USA.
- [21] **Gwilliams, L**. (2018, August). Towards a mechanistic account of speech comprehension in the human brain. *Trueswell Lab, University of Pennsylvania*. Philadelphia, USA.
- [22] **Gwilliams, L**. (2018, July). Towards a mechanistic account of speech comprehension in the human brain. *Max Planck Institute for Empirical Aesthetics*. Frankfurt, Germany.
- [23] **Gwilliams, L**. (2018, March). Back to the future: Investigating the neural mechanisms supporting speech comprehension. *Chang Lab*, *UCSF*. San Fransisco, USA.
- [24] **Gwilliams, L**. (2018, February). Back to the future: Investigating the neural mechanisms supporting speech comprehension. *Neuroscience Society, Columbia University*. USA.
- [25] **Gwilliams, L**. (2018, January). Postdictive processing in spoken word recognition. *Mesgarani Lab, Columbia University*. New York, USA.
- [26] **Gwilliams, L**. (2017, October). Decomposing hierarchical perceptual decision making. *Shadlen Lab, Columbia University*. New York, USA.
- [27] **Gwilliams, L**. (2017, June). In spoken word recognition the future predicts the past. *Cognition and Brain Sciences Unit, Cambridge University*. Cambridge, UK.
- [28] **Gwilliams, L**. (2016, November). In spoken word recognition the future predicts the past. *HLP Lab, University of Rochester*. New York, USA.
- [29] Gwilliams, L. & Marantz, A. (2016, February). Taking morphology seriously: MEG studies of morphological representations. *Presentation at 17th international morphology meeting*. Vienna, Austria.

Slide presentations

- [1] *Abrams, E., *Gwilliams, L. & Marantz, A. (2019, August). Tracking the building blocks of pitch perception in auditory cortex. Presentation at *The Society for Music Perception and Cognition conference (SMPC)*. New York, USA.
- [2] **Gwilliams, L**. & King, JR. (2018, August). From brain responses to algorithms: advances in parsing the computational architecture of perceptual decision making with MEG and machine learning. *Symposia presentation, BioMag.* Philadelphia, USA.
- [3] **Gwilliams, L.**, King, JR. & Poeppel, D. (2018, August). Parsing continuous speech into linguistic representations. Presentation at the *Society for the Neurobiology of Language Conference*. Québec City, Canada.
- [4] **Gwilliams,** L., Poeppel, D. & Marantz, A., Linzen, T. (2018, January). Phonological (un)certainty weights lexical activation. Presentation at *Cognitive Modelling and Computational Linguistics (CMCL)*. Salt Lake City, USA.
- [5] **Gwilliams, L.**, Linzen, T., Neophytou, K., Poeppel, D. & Marantz, A. (2016, September). Phonological commitment and sensitivity to subphonemic detail are independent. Presentation at *AM-LAP*. Bilbao, Basque Country.

- [6] Stockall, L., Manouilidou, C. **Gwilliams, L**. & Marantz, A. (2016, February). Un/Re-packing argument and event structure restrictions on prefixation: MEG evidence. *Workshop on the syntax of argument structure: empirical advancements and theoretical relevance*. Leipzig, Germany.
- [7] **Gwilliams, L**. & Marantz, A. (2015, June). Abstract representation of the root morpheme: A magnetoencephalography study of spoken Arabic. Presentation at *The 9th Morphological Processing Conference*. Potsdam, Germany.
- [8] **Gwilliams, L**. & Marantz, A. (2015, March). Decomposition of spoken Arabic words into root morphemes during processing: Evidence from magnetoencephalography. Presentation at *Linguistics in the Gulf 5 Conference*. Doha, Qatar.
- [9] Gwilliams, L. & Marantz, A. (2015, March). Letter specific sensitivities in the brain: located in time, space and current direction. Presentation at *The Neuroscience of Language Workshop*, Abu Dhabi, UAE.
- [10] **Gwilliams, L.** & Marantz, A. (2015, February). Non-linear processing of a linear speech stream. Presentation at *The NYUAD Annual Research Conference*, Abu Dhabi, UAE.
- [11] **Gwilliams, L**. & Fontaine, L. (2014, July). Ambiguity in process type selection in systemic functional linguistics. Presentation at *The 25th European Systemic Functional Linguistics Conference*. Paris, France.
- [12] Brodbeck, C., Gwilliams, L. & Pylkkänen, L. (2014, February). Reference resolution and prediction in a visual world: MEG evidence from English and Arabic. Presentation at *The NYUAD Annual Research Conference*. Abu Dhabi, UAE.

Poster presentations

- [1] Lang, B., *Gwilliams, L., Blanco-Elorrieta, E. & Marantz, A. (2020, October). Do bilinguals better discriminate novel vowel contrasts? Neural correlates of perceptual assimilation using MEG decoding. Poster presented at *Society for Neurobiology of Language*. Virtual conference.
- [2] *Abrams, E., *Gwilliams, L. & Marantz, A. (2019, October). Tracking the building blocks of pitch perception in auditory cortex. Dynamic poster presented at *Society for Neuroscience*. Chicago, USA.
- [3] **Gwilliams**, L., Poeppel, D. & King, JR. (2019, March). Parsing continuous speech into linguistic representations. Poster presented at the *Cognitive Neuroscience Society Conference (CNS)*. San Fransisco, USA.
- [4] **Gwilliams, L.**, King, JR. Poeppel, D. (2018, November). Parsing continuous speech into linguistic representations. Poster presented at *Society for Neuroscience*. San Diego, USA.
- [5] **Gwilliams**, **L**. & King, JR. (2018, August). Identifying the neural architecture of perceptual decision making with normative, shallow and deep neural network approaches. Poster presented at *BioMag*. Philadelphia, USA.
- [6] **Gwilliams, L**. & King, JR. (2018, July). Perceptual decision making is supported by a hierarchical processing cascade in both biological and artificial neural networks. Poster presented at *cuttingEEG*. Paris, France.
- [7] **Gwilliams, L**. & King, JR. (2018, July). Perceptual decision making is supported by a hierarchical processing cascade in both biological and artificial neural networks. Poster presented at the

- Salzburg Mind Brain Annual Meeting (SAMBA). Salzburg, Austria.
- [8] **Gwilliams, L**. & King, JR. (2018, March). Perceptual decision making is supported by a hierarchical processing cascade in both biological and artificial neural networks. Poster presented at the *Cognitive Neuroscience Society conference (CNS)*. Boston, USA.
- [9] *Gwilliams, L., *King, JR. & Poeppel, D. (2017, November). Decoding how the human brain parses continuous speech into linguistic representations. Dynamic poster presented at the *Society for Neuroscience*. Washington D.C., USA.
- [10] **Gwilliams, L**. & King, JR. (2017, November). Uncovering the cascade of computations involved in ambiguity resolution: Decoding from MEG and neural network activity. Poster presented at the *2017 Society for the Neurobiology of Language Conference*. Baltimore, USA.
- [11] **Gwilliams, L**. & King, JR. (2017, September). Perceptual decision making unfolds in a processing cascade within and across brain regions. Poster presented at *Annual Conference on Cognitive Computational Neuroscience*. New York, USA.
- [12] **Gwilliams, L**. Linzen, T., Neophytou, K., Poeppel, D. Marantz, A. (2016, September). Phonological commitment and sensitivity to subphonemic detail are independent Presentation at the *Society for the Neurobiology of Language*. London, UK.
- [13] Mow, J., **Gwilliams, L.**, Khalighinsjad, B., Mesgarani, N. & Marantz, A. (2016, September). Encoding and organisation of phonemes by feature in STG. Poster presentation at the *Society for the Neurobiology of Language*. London, UK.
- [14] **Gwilliams, L**. Linzen, T., Neophytou, K., Warnke, L., Poeppel., D & Marantz, A. (2016, April). Early and asymmetric sensitivity to phonological boundaries and within-category variation across hemispheres. Poster presented at the *2016 CNS Annual meeting*. New York, USA
- [15] Brodbeck, C., **Gwilliams, L**. & Pylkkänen, L. (2016, April). Amodal reference resolution in medial parietal cortex. Poster presented at the *2016 CNS Annual meeting*. New York, USA
- [16] **Gwilliams, L**. Linzen, T., Neophytou, K., Warnke, L., Poeppel., D & Marantz, A. (2016, March). Phoneme ambiguity is reflected very early in primary auditory cortex. Poster presented at the *29th Annual CUNY Conference on Human Sentence Processing*. Florida, USA
- [17] Brodbeck, C., **Gwilliams, L**. & Pylkkänen, L. (2016, March). Modality general and specific brain responses during reference resolution. Poster presented at the *29th Annual CUNY Conference on Human Sentence Processing*. Florida, USA
- [18] **Gwilliams,** L. & Marantz, A. (2015, October). Representations stems you can't see: An MEG study of morphological decomposition. Poster presented at the *Society for the Neurobiology of Language Conference*. Chicago, USA
- [19] Stockall, L., **Gwilliams, L**. Manouilidou, C. & Marantz, A. (2015, October). Access to lexical category and verb argument structure in the early stages of processing morphologically complex words: MEG investigations of prefixation. Poster presented at the *Society for the Neurobiology of Language Conference*. Chicago, USA
- [20] Gaston, P., Gwilliams, L. & Marantz, A. (2015, October). The time-course of cohort restriction in syntactic context: MEG evidence for a single auditory word-form. Poster presented at the Society for the Neurobiology of Language Conference. Chicago, USA

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- [21] Oseki, Y., **Gwilliams, L.**, Blanco-Elorrieta, E., Gaston, P., Pylkkänen, L. & Marantz, A. (2015, October). Neural Dynamics of Morphological and Phrasal Composition. Poster presented at the *Society for the Neurobiology of Language Conference*. Chicago, USA
- [22] Brodbeck, C., **Gwilliams, L**. & Pylkkänen, L. (2015, October). EEG can track the time course of successful reference resolution in small visual worlds. Poster presented at the *Society for the Neurobiology of Language Conference*. Chicago, USA
- [23] **Gwilliams, L.**, Lewis, G. & Marantz, A. (2014, August). Revealing the cortical dynamics of letter string perception. Poster presented at the *Society for the Neurobiology of Language Conference*. Amsterdam, Netherlands
- [24] Linzen, T., Gaston, P., **Gwilliams, L**. & Marantz, A. (2014, August). Competition and prediction in the auditory processing of morphologically complex words. Poster presented at the *Society for the Neurobiology of Language Conference*. Amsterdam, Netherlands.
- [25] *Gwilliams, L., Monahan, P, & Samuel, A. (2013, June). Why an Avalanche is faster than an Explosion. Poster presented at *The 8th international morphological processing conference*. Cambridge, UK.
- [26] *Gwilliams, L., Monahan, P., & Samuel, A. (2013, March). Decompositional processing of nominalisations. Poster presented at the *Basque Center on Cognition, Brain and Language (BCBL)*. San Sebastian, Spain.

Teaching

2018-2020 *Tutor*, New York University

Advanced Stats, Undergraduate

Instructor: Pascal Wallisch

2018 Teaching Assistant, New York University

Cognition, Undergraduate

Instructor: Pascal Wallisch

2018 Guest Lecturer, Columbia University

Cognitive Neuroscience, Undergraduate

2017 Guest Lecturer, New York University

Problem of Babel, Undergraduate

Instructor: Alec Marantz

2016 *Teaching Assistant*, New York University

Mathematical Tools for Cognitive and Neural Science, Graduate

Instructor: Eero Simoncelli

2016 Guest Lecturer, New York University

Neural Bases of Language: Auditory Lexical Access, Undergraduate

Instructor: Liina Pylkkänen

2016 Guest Lecturer, New York University

Neural Bases of Language: Perceptual Attunement, Undergraduate

Instructor: Liina Pylkkänen

2016 Guest Lecturer, New York University

Linguistics as a Cognitive Science, Undergraduate

Instructor: Alec Marantz

Supervision

2020 Praxal Patel, Center for Data Science Summer Project, New York University

Project: Developing automated neural data analysis tools for neuro-typical and a-

typical populations

2019–2020 Ben Lang, Research Assistant, New York University

2019–2020 Ellie Abrams, Research Assistant, New York University

2017 *Jessa Alexander*, Intern, New York University

2017 Anna Cho, Honours student, New York University

Project: Neurological mechanisms of perceptual attunement to accented speech

2015–2016 Lena Warnke, Honours student, New York University

Project: *Unconscious*, *arbitrary visual symbols as a cue for phoneme identification*

Service

2020–present Review editor Frontiers in Psychology

Ad-hoc Reviewer PNAS, eLife, PLOS Biology, Journal of Neuroscience, Neu-

roImage, Human Brain Mapping, Cognition, Frontiers in Neuroscience, Glossa, Experimental Psychology, European Journal of Neuroscience, Cerebral Cortex, Psychonomic Bulletin & Paving & Proin & Language, PLOS ONE, Cortex

letin & Review, Brain & Language, PLOS ONE, Cortex