

## T. Christina Zhao, Ph.D.

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Institute for Learning & Brain Sciences

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### Education

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- (2010-2015) **University of Washington, Ph.D.** in Speech and Hearing Sciences
- (2006-2010) **Pacific Lutheran University, B.S.** in Psychology (*summa cum laude*), minors in Biology and Piano Performance

### Positions

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- (2018 - present) **Research Scientist**, Institute for Learning & Brain Sciences (I-LABS), University of Washington
- (2015 - 2018) **Postdoctoral Fellow**, Institute for Learning & Brain Sciences (I-LABS), University of Washington, Advisor: Patricia K. Kuhl, Ph.D.
- (2010 - 2015) **Graduate Research Assistant**, Department of Speech and Hearing Sciences, University of Washington, Advisor: Patricia K. Kuhl, Ph.D.
- (2008 - 2010) **Undergraduate Research Assistant**, Neonatal Speech Perception, Pacific Lutheran University, Advisor: Christine Moon, Ph.D.
- (2009) **Undergraduate Research Assistant**, Developmental Psychobiology, New York Psychiatric Institute/Columbia Medical Center, Advisor: William Fifer, Ph.D.

### Publications

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#### Peer reviewed journals

- **Zhao, T. C.**, Masapollo, M., Polka, L., Ménard, L., & Kuhl, P. K. (2019). Effects of formant proximity and stimulus prototypicality on the neural discrimination of vowels: Evidence from the auditory frequency-following response. *Brain and Language*, 194, 77-83.  
<https://doi.org/10.1016/j.bandl.2019.05.002>
- Masapollo, M., **Zhao, T. C.**, Franklin, L., & Morgan, J. L. (2019). Asymmetric discrimination of non-speech tonal analogues of vowels. *Journal of Experimental Psychology: Human Perception and Performance*, 45(2), 285-300. doi: 10.1037/xhp0000603
- **Zhao, T. C.**, & Kuhl, P. K. (2018). Linguistic effect on speech perception observed at the brainstem. *Proceedings of the National Academy of Sciences*, 115 (35), 8716-8721. doi:10.1073/pnas.1800186115
- **Zhao, T. C.**, Lam, H. T. G., Sohi, H., & Kuhl, P. K. (2017). Neural processing of musical meter in musicians and non-musicians. *Neuropsychologia*, 106 (Supplement C), 289-297. doi:<https://doi.org/10.1016/j.neuropsychologia.2017.10.007>
- **Zhao, T. C.**, & Kuhl, P. K. (2016). Musical intervention enhances infants' neural processing of temporal structure in music and speech. *Proceedings of the National Academy of Sciences*, 113(19), 5212-5217. doi:10.1073/pnas.1603984113
- **Zhao, T. C.**, & Kuhl, P. K. (2015). Higher-level linguistic categories dominate over lower-level acoustics in lexical tone processing. *Journal of the Acoustical Society of America*, 138(2), EL133-EL137, doi: 10.1121/1.4927632

- **Zhao, T. C.**, & Kuhl, P. K. (2015). Effect of musical experience on learning lexical tone categories. *Journal of the Acoustical Society of America*, 137(3), 1452-1463, doi:10.1121/1.4913457
- **Zhao, T.**, Moon, C., Lagercrantz, H., & Kuhl, P. (2011). Prenatal Motherese? Newborn Speech Perception May Be Enhanced by Having a Young Sibling. *Psi Chi Journal of Undergraduate Research*, 16 (2), 90-94.

### **Peer reviewed book chapters**

- Khalil, A., Mincev, V. H., Iversen, J., Musacchia, G., **Zhao, T. C.**, & Chiba, A. A. (2019). Music, Cognition and Education. *Learning in the Digital Age: Towards a Science of Learning for 21st Century Education*. Educational Research and Innovation. Kuhl, P. K., Lim, S-S., Guerriero, S. & Van Damme, D., Paris, OECD Publishing, <https://doi.org/10.1787/562a8659-en>.
- **Zhao, T. C.**, & Kuhl, P. K. (2017). Effects of enriched auditory experience on infants' speech perception during the first year of life. *PROSPECTS*, 1-13. doi:10.1007/s11125-017-9397-6

### **Fellowships & Additional Training**

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- (In Progress) Certificate in Data Science, University of Washington, Professional and Continuing Education.
- (2016) Hearst Fellowship in Research Translation, Outreach and Education.
- (2016) Acoustical Society of America School, Salt Lake City, Utah

### **Grants & Funding**

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- (2019-2020) NICHD Subaward: Biomarkers of Rhythmic Communication: Integrating Foundational and Translational Approaches (DP2HD098859) (Role: PI)
- (2018-2021) Research Grant: Effects of music exposure in infancy. *Overdeck Family Foundation* (Role: Co-PI)
- (2018-2019) Philanthropy Fund: Rhythm processing in infancy. *Ying Chang*
- (2017-2020) Research Grant: Development of executive function and its relation to language and brain. *Bezos Family Foundation* (Role: Co-PI)
- (2017) Philanthropy Fund: Music cognition. *Bard Richmond*
- (2009) Summer Research Grant for Undergraduates. *Psi Chi Honor Society for Psychology*

### **Awards & Honors**

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- (2018) Young Investigator Travel Grant, *Acoustical Society of America Women in Acoustics*
- (2017) Early Career Travel Award, *Acoustical Society of America*
- (2015) Student Travel Award, *Acoustical Society of America*
- (2015) GSFEI Graduate Student Travel Award, *University of Washington*
- (2010) Robert L. Solso Research Award, *Western Psychological Association*
- (2009) Who's Who among Students in American Universities and Colleges
- (2006-2010) Dean's List, *Pacific Lutheran University*
- (2006-2010) Provost Merit Scholarship, *Pacific Lutheran University*
- (2010) Forestine Wise Monsen Endowed Memorial Piano Scholarship, *Pacific Lutheran University*
- (2006-2010) Music Department Scholarship, *Pacific Lutheran University*

- (2007-2008) Math Department Scholarship, *Pacific Lutheran University*

## **Teaching**

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### **Thesis Mentor**

- Gloria Lam, Master Thesis in Speech-Language Pathology, SPHSC, Univ. of Washington (2018-2019)
  - Thesis title: Executive functions between monolingual and bilingual speakers (2019)
- Gloria Lam, Undergraduate Honors Thesis, SPHSC, Univ. of Washington (2016-2017)
  - Recipient of Mary Gates Undergraduate Research Scholarship (2017)
  - Thesis title: Relation between working memory and early music training (2017)

### **Research Mentor**

- Yeban Lee, Post bac Research Assistant (2018-2019)
- Eli Richmond, High School Research Intern (2017)
- Elisabeth DeRichmond, Research Intern (2016-2017)
- Nikhita Harazi, Undergraduate Research Assistant, Univ. of Washington (2016-2017)
- Harkirat Sohi, Ph.D. student in Health and Bioinformatics, Univ. of Washington (2016)
- Kira Pinard-Welyczko, Undergraduate Research Interns, Oberlin College (2015)
- Rochelle Wong, Undergraduate Research Assistant, Univ. of Washington (2015)
- Cassidy McDermott, Undergraduate Research Interns, Dartmouth Univ. (2015)

### **Co-Instructor**

- Capturing Brain Dynamics: a combined neuroscience and engineering approach
  - Supervisor: Adrian KC Lee, Sc.D. (2015)

### **Graduate Teaching Assistant**

- Introduction to Hearing Science, Supervisor: Lynne A. Werner, Ph.D. (2013)

### **Undergraduate Teaching Assistant**

- Introduction to Statistics/Advanced Statistics, Psychology Department (2010)
- Introduction to Psychology, Psychology Department (2009)
- Molecules, Cells, Organism Lab, Biology Department (2007)
- Calculus I/Calculus II, Math Department (2007-2010)

## **Invited Talks**

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### **Seminar**

- Examining Infant Auditory Perception using MEG technology. *Department of Psychology, National Taiwan University, Taiwan* (2019)
- Characterizing effects of early auditory experience on auditory perception. *Seminars in Neuroscience Series: Brain, Mind, and Society, Brain Institute, Vanderbilt University, Nashville, TN* (2017)
- Characterizing effects of early auditory experience on auditory perception. *Department of Cognitive, Linguistic & Psychological Sciences, Brown University, RI* (2017)
- Musical experience enhances infants' neural processing of temporal structure in music and speech. *Department of Linguistics, Stockholm University, Stockholm, Sweden* (2015)
- Musical experience enhances infants' neural processing of temporal structure in music and speech. *Department of Psychology, Paris Rene Decartes University, Paris, France* (2015)

- Musical experience enhances infants' neural processing of temporal structure in music and speech. *Integrated Brain Imaging Center (IBIC)*, University of Washington, Seattle (2015)
- Effect of Musical Experience on Learning Lexical Tone Categories. *State Key Laboratory of Cognitive Neuroscience and Learning*, Beijing Normal University, China (2011)

### **Guest Lecturer**

- Development of speech perception (Course: Development of Auditory System). *Speech and Hearing Sciences Department*, University of Washington (2013, 2015)
- Effect of musical experience on learning lexical tone categories (Course: Psychology of Music). *Music Education Department*, University of Washington (2012)

## **Conference Presentations**

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### **Session Chair**

- Music, Speech and the Brain (2018). Special Session at the Acoustical Society of America Meeting, Victoria, Canada, November 5-9.

### **Oral Presentations**

- **Zhao, T.**, & Kuhl, P. K. (2019). Speech perception frameworks revisited using the complex auditory response. *Special Session at the Acoustical Society of America Meeting*, San Diego, Dec 2-6.
- **Zhao, T.**, & Kuhl, P. K. (2018). Music, speech and temporal processing. *Special Session at the Acoustical Society of America Meeting*, Victoria, Canada, November 5-9.
- Khalil, A. K., Feindler, C. O., **Zhao, T.**, & Mussachia, G. M. (2017). It's About Time: Music, Rhythm and Learning. *Panel session at SXSWedu*, Austin, TX, March 6-9.
- **Zhao, T.**, & Kuhl, P. K. (2016). Music intervention enhances infants' neural processing of temporal structure in music and speech. *Symposium at the International Congress of Infant Studies*, New Orleans, May 26-28.
- Kuhl, P. K., & **Zhao, T.** (2016). Why People Learn Socially: Brains, Babies and Development. *Network for Science of Learning Awardee's Meeting*, Washington D.C. Feb 8-10.
- **Zhao, T.**, & Kuhl, P. K. (2015). Music intervention enhances infants' neural processing of temporal structure in music and speech. *Auditory Development: From Cochlea to Cognition Conference*, Seattle, August 14-15.
- **Zhao, T.**, & Kuhl, P. K. (2015). Music intervention enhances infants' neural processing of temporal structure in music and speech. *International Symposium on Science for Education* (Satellite conference for the *International Brain Research Organization Conference*), Rio de Janeiro, July 5-6.

### **Poster Presentations**

- **Zhao, T. C.**, & Kuhl, P.K. (2019) Music rhythm processing reflected in the autonomic nervous system. *Society for Music Perception and Cognition conference*, NYC, August 5-7.
- **Zhao, T. C.**, Masapollo, M., Mernard, L., & Polka, L. (2018). Effects of formant proximity and language experience on subcortical neural encoding of vowels in adulthood. *Acoustical Society of America Meeting*, Victoria, November 5-9.
- Masapollo, M., **Zhao, T. C.**, Mernard, L., & Polka, L. (2018). Neurophysiological correlates of directional asymmetries in adult vowel perception: An auditory brainstem study. *Society for the Neurobiology of Language*, Quebec City, August 16-18.

- **Zhao, T., & Kuhl, P. K. (2017).** Effects of linguistic experience on brainstem encoding of speech sounds. *Acoustical Society of America Meeting*, Boston, June 25-29.
- **Zhao, T., & Kuhl, P. K. (2016).** Temporal structure processing reflected by mismatch negativity. *Acoustical Society of America Meeting*, Salt Lake City, May 23-28.
- **Zhao, T., & Kuhl, P. K. (2015).** Music intervention enhances infants' neural processing of temporal structure in music and speech. *Organization for Human Brain Mapping Conference*, Honolulu, June 14-18.
- **Zhao, T., & Kuhl, P. K. (2015).** Top-down linguistic categories dominate over bottom-up acoustics in lexical tone processing. *Acoustical Society of America Meeting*, Pittsburgh, May 18-21, 2015.
- **Zhao, T., & Kuhl, P. K. (2013).** Effects of early musical training on infants' neural processing of temporal information in music and speech. *Acoustical Society of America Meeting*, San Francisco, Dec 2-6.
- **Zhao, T., & Kuhl, P. K. (2012).** Effect of Musical Experience on Learning Lexical Tone Categories. *Acoustical Society of America Meeting*, Hong Kong, May 13-19.
- **Zhao, T., Wright, R., & Kuhl, P. K. (2012).** Modeling Mandarin Tone 2 and Tone 3 from Natural Productions with Variability. *Acoustical Society of America Meeting*, Hong Kong, May 13-19.
- **Zhao, T., Moon, C., Lagercrantz, H., Loan, L., & Kuhl, P. K. (2010).** Prenatal motherese? Newborn speech perception may be enhanced by having a young sibling. *Annual Meeting of the Western Psychological Association*, Cancun, Mexico, April 22-25.
- **Zhao, T., Moon, C., Lagercrantz, H., Loan, L., & Kuhl, P. K. (2010).** Prenatal motherese? Newborn speech perception may be enhanced by having a young sibling. *Madigan Research Day Conference*, Fort Lewis, WA, April 30.
- **Zhao, T., & Valencia, S. (2009).** Auditory Perception/ Explicit and Implicit Perceptions of Accented Peers in Academic Contexts. *Annual meeting of the Western Psychological Association*, Portland, OR. April 23-26.

## **Service Activities**

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### **Executive Committee & Advisory Board**

- Advisory Board for Thingyverse (a Seattle based nonprofit organization to design and bring theatre to infants)
- Women in Acoustics (WIA) Committee, Acoustical Society of America (2018-)
- Cascadia Acoustical Society of America (CASA, 2015-2018)
- Seattle Student Chapter of the Acoustical Society of America (SSCASA, 2013-2015)
- Pacific Lutheran University Chapter of Psi Chi, the National Honor Society of Psychology, (2008-2010)

### **Ad-hoc Reviewer for Journals/Books**

Psychophysiology; Springer: Speech Perception, Production and Acquisition - Multidisciplinary Approaches in Chinese language; Translational Psychiatry; Current Biology; Neuropsychologia; Journal of Speech, Language & Hearing Research (JSLHR); Journal of Acoustical Society of America (JASA); Frontier: Psychology; Psychomusicology: Music, Mind and Brain; Frontier: Human Neuroscience; Cognitive Research: Principles and Implications; Grey Matter, University of Washington Neuroscience Journal for Undergraduates

**External Reviewer for Grant Applications**

Hong Kong Innovation and Technology Commission; University of Rochester Del Monte  
Neuroscience Pilot Grant Program

**Outreach**

- Creator: I-LABS Outreach Module: Early Music Experience (2017)
- Consultant/Contributor: Pacific Science Center Exhibitions: Career Machine (2018), mental health benefits of play (2016)
- Volunteer: Engineering Discovery Day (2015-2017), Paws on Science (2014-2015), BRIDGES Children's Grief Counseling Program (2008-2009)

**Selected Media Coverage**

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[NBC News](#), [CBS News](#), [Daily Mail \(UK\)](#), [The Guardian \(UK\)](#), [Xinhua Net \(China\)](#), [South China Morning Post \(Hong Kong\)](#), [Hindustan Times \(India\)](#), [Yahoo News](#), [Seattle Times](#), [Discover Magazine](#), [Seattle's Child Magazine](#)