

Elizabeth Heller Murray, PhD, CCC-SLP
Department of Communication Sciences and Disorders
College of Public Health, Temple University, Philadelphia, PA
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Research Employment:

Assistant Professor Temple University, Philadelphia, PA Director: Vocal Development Lab	8/2020 - present
Postdoctoral Researcher Guenther Lab, Boston University, Boston, MA PI: Frank Guenther	6/2019 –7/2020
Doctoral Research Assistant Stapp Lab for Sensorimotor Rehabilitation Engineering, Boston University, Boston, MA PI: Cara Stepp	8/2013-5/2019
Research Assistant Massachusetts General Hospital Center for Laryngeal Surgery and Voice Rehabilitation, Boston, MA PI: James Heaton, Robert Hillman	2/2012-8/2013
Lab Manager Infant and Child Cognition Lab, Boston College, Boston, MA PI: Sara Cordes	8/2009-6/2011
Research Assistant Emory University Voice Center, Atlanta, GA PI: Edie Hapner	9/2008-8/2009
Research Assistant Infant and Child Lab, Emory University, Atlanta, GA PI: Philippe Rochat	9/2007-8/2009

Education:

Boston University , Boston, MA Ph.D. in Speech, Language and Hearing Sciences <i>Dissertation Title:</i> Vocal motor control in school-age children with and without vocal fold nodules	2019
Massachusetts General Hospital Institute of Health Professions , Boston, MA M.S. in Speech-Language Pathology, Concentration in Voice Disorders <i>Thesis Title:</i> Naturalness of electrolarynx speech produced with electromyographic versus manual control	2013
Emory University , Atlanta, GA Bachelor of Arts in Psychology/ Linguistics Joint Major	2009

Professional Memberships and Service:

<i>Editorial Board Member:</i> American Journal of Speech-Language Pathology (AJSLP)	2022-present
<i>Handling Editor:</i> Journal of Speech, Language, and Hearing Science (JSLHR)	2022
<i>Program Committee Member:</i> ASHA 2021 Convention, Speech Science	2022
<i>Program Committee Member:</i> ASHA Convention, Voice and Upper Airway	2018, 2021
<i>Editorial Board Member:</i> ASHA SIG 19, Speech Science	2021
<i>Editorial Board Member:</i> Journal of Voice	2014-2021
<i>Member:</i> ASHA, SIG 19, Speech Science	2015-present
<i>Member:</i> ASHA, SIG 03, Voice and Voice Disorders	2014-present
<i>Professional Development Committee:</i> ASHA, SIG 03, Voice and Voice Disorders	1/2016-12/2019

Awards, Honors, and Research Funding:

Co-I on R01 “Non-nutritive suck and Vocal Onset Time: Examination of Oromotor Control” Grant from NIDCD (PI: Zimmerman). Heller Murray will examine vocal development in children 3 months – 3 years of age	2021-present
The Sataloff Award for Young Investigators Award from the Voice Foundation to recognize excellence from a young researcher	2021
T32 Postdoctoral Researcher, NIDCD	2019-2020
F31 Ruth L. Kirschstein National Research Service Award (NRSA) <i>Vocal Motor Control in Children with Vocal Nodules (1F31DC016197)</i> \$39,536/year for up to three years of funding	2017-2019
Hariri Graduate Fellowship, Hariri Institute for Computing, Boston University \$10,000 awarded to students pursuing computational and data-driven research	2016
Council of Academic Programs in Communication Sciences and Disorders (CAPCSD) PhD Scholarship \$20,000 scholarship to support pursuit of academic career	2016
Boston University, Speech, Language, and Hearing Science Travel Award \$1200 for travel to the 2015 <i>American Speech and Hearing Association (ASHA) Convention</i>	2015
ASHFoundation New Century Scholars Doctoral Scholarship \$10,000 scholarship to support pursuit of teacher-investigator career in an academic environment	2015
Dudley Allen Sargent Research Fund \$4,400 to support proposal “effect of visual feedback on velopharyngeal port control”	2014
Boston University, Speech, Language, and Hearing Science Travel Award \$400 for travel to present at the 2014 <i>American Speech and Hearing Association (ASHA) Convention</i>	2014
Sargent College Doctoral Fellowship	2013
Kenneth N. Stevens Student Research Award	2013
Boston University, Speech, Language, and Hearing Science Travel Award \$200 for travel to present at the 2014 <i>Conference on Motor Speech</i>	2013
Christopher Norman Education Fund \$124 in support for Master’s Thesis at Massachusetts General Hospital Institute of Health Professions	2012

Journal Publications: (*denotes student mentee)**First Author:**

Colletti, L.* & **Heller Murray, E.S.** Voice Onset Time in Children With And Without Vocal Fold Nodules, *under review*

Heller Murray, E.S., Chao, A.*, Colletti, L.* A Practical Guide to Calculating Cepstral Peak Prominence in Praat, *in press, Journal of Voice*. Preprint: <https://osf.io/yvp4s/>

Heller Murray, E.S. & Chao, A.* (2021). The relationships among vocal variability, vocal-articulatory coordination, and dysphonia in children, *Journal of Voice*, DOI: [10.1016/j.jvoice.2021.06.008](https://doi.org/10.1016/j.jvoice.2021.06.008)

Heller Murray, E.S., Segawa, J.A., Karahanoglu, F.I. Tocci, C., Tourville, J.A., Nieto-Castanon, A., Tager-Flusberg, H., Manoach, D.S., Guenther, F.H. (2022). Increased intra-subject variability of neural activity during speech production in people with autism spectrum disorder, *Research in Autism Spectrum Disorders*, 95, 101955, DOI: <https://doi.org/10.1016/j.rasd.2022.101955>

Heller Murray E.S., Lewis, J.*, & Zimmerman, E. (2021). Non-nutritive suck and voice onset time: examining infant oromotor coordination. *PLOS ONE*, 16(4), e0250529, DOI: [10.1371/journal.pone.0250529](https://doi.org/10.1371/journal.pone.0250529)

Heller Murray, E.S. & Stepp, C.E. (2020). Relationships between vocal pitch perception and production: a developmental perspective. *Scientific Reports, a Nature Publishing Group*, 10(1), pp1-10, DOI: [10.1038/s41598-020-60756-2](https://doi.org/10.1038/s41598-020-60756-2)

Heller Murray, E.S., Segina, R.S., Harvey Woodnorth, G, Stepp, C.E. (2020). Relative fundamental frequency in children with and without vocal fold nodules. *Journal of Speech, Language, and Hearing Research*, 63(2), pp361-371, DOI: [10.1044/2019_JSLHR-19-00058](https://doi.org/10.1044/2019_JSLHR-19-00058)

Heller Murray, E.S., Hseu, A.F., Nuss, R.C., Harvey Woodnorth, G, Stepp, C.E. (2019). Vocal pitch discrimination in children with and without vocal fold nodules. *Applied Sciences*, 9(15), pp3042, DOI: [10.3390/app9153042](https://doi.org/10.3390/app9153042)

Heller Murray, E.S., Lupiani, A.A., Segina, R.A., Kolin, K.L., Stepp, C.E. (2019). Pitch shifting with the commercially available eventide eclipse: intended and unintended changes to the speech signal. *Journal of Speech, Language, and Hearing Research*, 62(7), pp2270-2279, DOI: [10.1044/2019_JSLHR-S-18-0408](https://doi.org/10.1044/2019_JSLHR-S-18-0408)

Heller Murray, E.S., Lien, Y.A.S., Van Stan, J.H., Mehta, D.D., Hillman, R.E., Noordzij, J.P., Stepp, C.E. (2017). Relative fundamental frequency distinguishes between phonotraumatic and non-phonotraumatic vocal hyperfunction. *Journal of Speech, Language, and Hearing Research*, 60(6), pp1507-1515, DOI: [10.1044/2016_JSLHR-S-16-0262](https://doi.org/10.1044/2016_JSLHR-S-16-0262)

Heller Murray, E.S., Michener, C., Enflo, L., Cler, G.J., Stepp, C.E. (2017). Impact of glottal configuration on speech breathing. *Journal of Voice*, 32(4), pp420-427, DOI: [10.1016/j.jvoice.2017.07.001](https://doi.org/10.1016/j.jvoice.2017.07.001)

Heller Murray, E.S., Girouard, K.L., Cler, M.J., Stepp, C.E. (2016). Development of an electronic documentation system for voice therapy: a new teaching and clinical research tool. *Perspectives of the ASHA Special Interest Groups*, 1(3), pp63-73, DOI: [10.1044/persp1.SIG3.63](https://doi.org/10.1044/persp1.SIG3.63)

Heller Murray, E.S., Mendoza, J.O., Gill, S.V., Perkell, J.S., Stepp, C.E. (2016). Effects of biofeedback on control and generalization of nasalization in typical speakers. *Journal of Speech, Language, and Hearing Research*, 59(5), pp1025-1034, DOI: [10.1044/2016_JSLHR-S-15-0286](https://doi.org/10.1044/2016_JSLHR-S-15-0286)

Heller Murray, E.S., Hands, G.L., Calabrese, C., Stepp, C.E. (2016). Effects of adventitious acute vocal trauma: relative fundamental frequency and listener perception. *Journal of Voice*, 30(2), pp177-185, DOI: [10.1016/j.jvoice.2015.04.005](https://doi.org/10.1016/j.jvoice.2015.04.005)

Middle Author:

Kearney, E., Nieto-Castanon, A., Falsini, R., Daliri, A., **Heller Murray, E.S.**, Smith, D., Guenther, F.H. Quantitatively Characterizing Reflexive Responses to Pitch Perturbations *Under Review*

Frankford, S.A., Masapollo, M., Cai, S., Tourville, J.A., Nieto-Castanon, A., **Heller Murray, E.S.**, Guenther, F.H. The Neural Circuitry Underlying the “Rhythm Effect” in Stuttering. *Journal of Speech, Language, and Hearing Research*. In press.

Daliri, A., **Heller Murray, E.S.**, Blood, A. J., Burns, J., Noordzij, J. P., Nieto-Castanon, A., Tourville, J.A., & Guenther, F. H. (2020). Auditory Feedback Control Mechanisms Do Not Contribute to Cortical Hyperactivity Within the Voice Production Network in Adductor Spasmodic Dysphonia. *Journal of Speech, Language, and Hearing Research*, 63(2), pp421-432.

Kearney, E., Nieto-Castañón, A., Weerathunge, H.R., Falsini, R., Daliri, A., Abur, D., Ballard, K.J., Chang, S.E., Chao, S.C., **Heller Murray, E.S.** and Scott, T.L., 2020. A Simple 3-Parameter Model for Examining Adaptation in Speech and Voice Production. *Frontiers in Psychology*, 10, pp2995.

Lien, Y.A.S., Calabrese, C., Michener, C.M., **Heller Murray, E.S.**, Van Stan, J.H., Mehta, D.D., Hillman, R.E., Noordzij, J.P., Stepp, C.E. (2017). Validation of an Algorithm for Automated Estimation of Relative Fundamental Frequency. *Annals of Otology, Rhinology, and Laryngology*, 126(10), pp712-716.

McKenna V.S., **Heller Murray E.S.**, Lien Y.A.S., Stepp C.E. (2016). The Relationship Between Relative Fundamental Frequency and a Kinematic Estimate of Laryngeal Stiffness in Healthy Adults. *Journal of Speech, Language, and Hearing Research*, 59(6), pp1283-1294.

McKenna, V.S., **Heller Murray, E.S.**, Lien, Y.A.S., & Stepp, C.E. (2016). Acoustic and Kinematic Estimates of Laryngeal Stiffness. *The Journal of the Acoustical Society of America*, 139(4), pp2193-2193.

Lien, Y.A.S., Calabrese, C.R., Carolyn, C.M., **Heller Murray, E.S.**, Van Stan, J.H., Mehta, D.D., Hillman, R.E., Noordzij, J.P., Stepp C.E. (2015). Voice Relative Fundamental Frequency via Neck-Skin Acceleration In Individuals With Voice Disorders. *Journal of Speech, Language, and Hearing*, 58(8), pp1482-1487.

Hurst, M., Monahan, K., **Heller, E.S.**, and Cordes, S. (2014). 123s & ABCs: Developmental Shifts in Logarithmic to Linear Responding Reflect Fluency with Sequence Values. *Developmental Science*, 17(6), pp892-904.

Cordes, S., Goldstein, A., **Heller, E.S.** (2014). Sets Within Sets: The Influence of Set Membership on Numerical Estimates. *Journal of Experimental Psychology: Human Perception and Performance*, 40(1), pp94-105

Frigerio, A., Hadlock, T., **Heller, E.S.**, Heaton, J. (2014). "Infrared-Based Blink Detecting Glasses For Facial Pacing: Towards A Bionic Blink." *JAMA Facial Plastic Surgery*, 16(3), pp211-218.

Hohman, M., Kim, S., **Heller, E.S.**, Frigerio, A., Heaton, J., Hadlock, T. (2013). Determining the Threshold for Asymmetry Detection in Facial Expression. *The Laryngoscope*, 124(4), pp860-865.

Kim, S., **Heller, E.S.**, Hohman, M., Hadlock, T., Heaton, J. (2013). Detection and Perceptual Impact of Side-To-Side Facial Movement Asymmetry. *JAMA Facial Plastic Surgery*, 15(6), pp411-416.

Kim, S.W., **Heller, E.S.**, Hohman, M.H., Hadlock, T.A., & Heaton, J.T. (2013). The Effect of Side-to-Side Movement Timing Asymmetry on the Perception of Dynamic Facial Movement Naturalness. *JAMA facial plastic surgery*, 15(6), 411.

Book Chapters:

Heller Murray, E.S., Harvey Woodnorth, G. 2020. *Clinical Approach to Acoustic Assessment*. In McMurray, J.S., Hoffman, M.R., Braden, M.N. (Eds.) *Multidisciplinary Management of Pediatric Voice and Swallowing Disorders*, Springer International Publishing

Heller Murray, E.S., Harvey Woodnorth, G. 2020. *Clinical Approach to Aerodynamic Assessment*. In McMurray, J.S., Hoffman, M.R., Braden, M.N. (Eds.) *Multidisciplinary Management of Pediatric Voice and Swallowing Disorders*, Springer International Publishing

Conference Presentations (*denotes student mentee):

Heller Murray, E.S., Chao, A.*, & Quinn, O.*. "The relationship between vocal onset time and vocal onset *fo* in children," *Conference on Motor Speech*. Charleston (remote presentation), February 2022, [poster presentation].

Colletti, L.* & **Heller Murray, E.S.** "Comparison of cepstral peak prominence methods with and without voice detection using Praat. *The Voice Foundation's 51th Annual Symposium: Care of the Professional Voice*, June 2022

Heller Murray, E.S. & Chao, A.*, "The relationship between dysphonia and acoustic measures of vocal and articulatory variability in children's speech," *Boston Speech Motor Control Symposium*, June 2021, Philadelphia, PA [poster presentation].

Heller Murray, E.S. & Chao, A.*, "Impact of pediatric dysphonia on the relationship between vocal variability and variability of vocal-articulatory coordination," *The Voice Foundation's 50th Annual Symposium: Care of the Professional Voice*, June 2021, [podium presentation].

Heller Murray, E.S. & Stepp, C.E. "Vocal pitch perception and production in children and adults," *Conference on Motor Speech*. Santa Barbara, CA, February 2020, [podium presentation].

Heller Murray, E.S., Hseu, A.F., Nuss, R.C., Harvey Woodnorth, G, Stepp, C.E., "Vocal pitch discrimination in children with and without vocal fold nodules," *The 13th International Conference on Advances in Quantitative Laryngology, Voice and Speech Research*, June 2019, Montreal Quebec, Canada, [podium presentation].

Heller Murray, E.S., Kolin, K.R., Harvey Woodnorth, G., Stepp, C.E. "Relative Fundamental Frequency Differences between Children with and without Vocal Fold Nodules," *American Speech and Hearing Association (ASHA) Convention*, November 2018, Boston, Massachusetts, [podium presentation].

Heller Murray, E.S., Lupiani, A.A., Kolin, K.R., Stepp, C.E. “Accuracy of the Commercially Available Eventide Eclipse to Perturb Auditory Feedback of Fundamental Frequency,” *11th International Conference on Voice Physiology and Biomechanics*, August 2018, East Lansing, Michigan, [poster presentation].

Stepp C.E., **Heller Murray E.S.**, Abur D., Lester-Smith R.A., Daliri A., Noordzij J.P., Lupiani A.A. “Auditory-motor impairment as an underlying basis of hyperfunctional voice disorders,” *7th International Conference on Speech Motor Control*, July 2017, Groningen, the Netherlands, [poster presentation].

Heller Murray, E.S., Girouard, K.L., Cler, M.J., Stepp, C.E. “Development of an electronic documentation system for voice therapy: A new teaching and clinical research tool,” *American Speech and Hearing Association (ASHA) Convention*, November 2016, Philadelphia, PA, [podium presentation].

Heller Murray, E.S., Michener, C.M., Enflo, L., Cler, M.J., Stepp, C.E. “The impact of glottal closure on speech breathing,” *10th International Conference on Voice Physiology and Biomechanics*, March 2016, Vina del Mar, Chile, [podium presentation].

Heller Murray, E.S., Lien, Y-A. S., Van Stan, J. H., Mehta, D. D., Hillman, R. E., Noordzij, J.P., Stepp, C.E. “Relative fundamental frequency distinguishes between phonotraumatic and non-phonotraumatic vocal hyperfunction,” *10th International Conference on Voice Physiology and Biomechanics*, March 2016, Vina del Mar, Chile, [podium presentation].

Lien Y.S., Calabrese C., Michener C.M., **Heller Murray E.S.**, Van Stan J., Mehta D.D., Hillman R.E., Noordzij J.P., Stepp C.E. “Automated algorithms for voice relative fundamental frequency: Validation and applications in assessing voice disorders,” *American Speech and Hearing Association (ASHA) Convention*, November 2015, Denver, CO, [podium presentation].

Heller Murray E.S., Hands G.L., Calabrese C.R., Stepp C.E. “Effects of adventitious vocal trauma: Relative fundamental frequency and listener perception,” *44th Annual Symposium: Care of the Professional Voice, Voice Foundation*, May 2015, Philadelphia, PA, [podium presentation].

Heaton, J.T., **Heller Murray, E.** “Preliminary testing of a wireless electromyographically controlled electrolarynx voice prosthesis,” *Combined Otolaryngology Spring Meetings (COSM)*, April 2015, Boston, MA.

Heller Murray, E.S., Mendoza, J., Stepp C.E. “Effects of normalized nasal acceleration feedback on control and generalization of nasalance,” *American Speech and Hearing Association (ASHA) Convention*, November 2014, Orlando, FL, [podium presentation].

Anand, S., **Heller Murray, E.S.**, Stepp C.E. “Vocal loudness discrimination deficits in individuals with Parkinson’s disease,” *American Speech and Hearing Association (ASHA) Convention*, November 2014, Orlando, FL, [podium presentation].

Nagle, K., **Heller Murray, E.S.**, Heaton, J.T. “Association between acoustic and perceptual measures of question intonation for EMG-activated electrolaryngeal speech,” *American Speech and Hearing Association (ASHA) Convention*, November 2014, Orlando, FL, [poster presentation].

Heller Murray, E.S., Stepp, C.E. “The role of feedback on discrimination of vocal sound pressure levels,” *Conference on Motor Speech*, February 2014, Sarasota, FL, [poster presentation].

Kim, S.W., **Heller, E.S.**, Hohman, M.H., Hadlock, T.A., and Heaton, J.T. “Detection and Perceptual Impact of Side-to-Side Facial Movement Asymmetry,” *Combined Otolaryngology Spring Meeting*, 2014, Orlando, FL, [poster presentation].

Hohman, M.H., Kim, S.W., **Heller, E.S.**, Heaton, J.T., and Hadlock, T.A. “Determining the threshold for detection of asymmetry in facial movements,” *Combined Otolaryngology Spring Meeting*, 2014, Orlando, FL, [poster presentation].

Recent Teaching Experience:

Anatomy and Physiology of the Speech and Hearing Mechanism. Fall 2021, Spring 2022, Undergraduate level, Temple University, Philadelphia, PA

Pediatric Voice Disorders. 2021, Guest lecture, Master's level class "Voice Disorders," Temple University Philadelphia, PA

Structural resonance disorders and Assessment of voice disorders. 2018, Guest lecture, Master's level class "Advanced Speech Science," Boston University Sargent College, Boston, MA.

Functional Speech Anatomy. 2016 & 2017, Guest lecture, Doctoral level class "Anatomy of Speech and Hearing," Speech and Hearing Bioscience and Technology, Harvard University, Boston, MA.

Certification and Professional Development Courses:

ASHA Certification (14065605)	05/24/2016 - <i>present</i>
Pennsylvania License of Speech-Language Pathology (SL015568)	12/30/2020- <i>present</i>
Massachusetts License of Speech-Language Pathology (SP-9845-SL)	4/20/2016- <i>present</i>
Certification of Clinical Competence, Speech-Language Pathology <i>Boston Children's Hospital</i>	2016
Certificate of Completion Langmore Advanced FEES course	2014
Competency for Independent Performance of Endoscopy Competency determined by Dr. Susan Langmore	2014

Selected Clinical Experience:

Boston Children's Hospital , Outpatient Voice and Cleft, Boston, MA <i>Speech-Language Pathologist</i>	10/2014-05/2019
Massachusetts General Hospital Center for Laryngeal Surgery and Voice Rehabilitation: MGH Voice Center , Outpatient Voice Clinic, Boston MA <i>Voice Evaluation Administrator, Analyst, and Student Clinician</i>	11/2011-8/2013