

# CHRISTINE M. EMBURY

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## RESEARCH BACKGROUND AND INTERESTS

Highly driven researcher, currently examining cognitive and motor processes in healthy and disease conditions including diabetes and dementia using neuroimaging techniques.

## EDUCATION

University of Nebraska Omaha (UNO), Omaha, NE

**Ph.D. in Neuroscience and Behavior Program**

2021

Dissertation: "Effects of Glycemic Control on Neurophysiology in Type 2 Diabetes"

University of Nebraska Omaha, Omaha, NE

**M.A. in Neuroscience and Behavior Program**

2019

Thesis: "The Impact of Type 1 Diabetes on Neurophysiology Serving Cognition"

University of Nebraska Omaha, Omaha, NE

**B.S. in Psychology and Neuroscience**

2012

Honors Thesis: "Dog Therapy as a Stress Buffer in an Induced Stress Event"

## PUBLICATIONS

Heinrichs-Graham E, Wiesman AI, **Embury CM**, Schantell MD, Joe TJ, Eastman JA, Wilson TW (2022). Differential impact of movement on the alpha and gamma dynamics serving visual processing. *J Neurophysiol*. doi: 10.1152/jn.00380.2021

Arif Y, **Embury CM**, Spooner RK, Okelberry HJ, Willett MP, Eastman JA, Wilson TW (2022). High-definition transcranial direct current stimulation of the occipital cortices induces polarity dependent effects within the brain regions serving attentional reorientation. *Hum Brain Mapp*. doi: 10.1002/hbm.25764

Killanin AD, **Embury CM**, Picci G, Heinrichs-Graham E, Wang YP, Calhoun VD, Stephen JM, Wilson TW (2022). Trauma moderates the development of the oscillatory dynamics serving working memory in a sex-specific manner. *Cereb Cortex*. doi: 10.1093/cercor/bhac008

Taylor BK, Frenzel MR, Eastman JA, **Embury CM**, Agcaoglu O, Wang YP, Stephen JM, Calhoun VD, Wilson TW (2022). Individual differences in amygdala volumes predict changes in functional connectivity between subcortical and cognitive control networks throughout adolescence. *Neuroimage*. doi: 10.1016/j.neuroimage.2021.118852

Taylor BK, Eastman JA, Frenzel MR, **Embury CM**, Wang YP, Calhoun VD, Stephen JM, Wilson TW (2021). Neural oscillations underlying selective attention follow sexually divergent developmental trajectories during adolescence. *Developmental Cognitive Neuroscience*. doi: 10.1016/j.dcn.2021.100961

Hoffman RM, **Embury CM**, Lew BJ, Heinrichs-Graham E, Wilson TW, Kurz MJ (2021). Cortical oscillations that underlie visual selective attention are abnormal in adolescents with cerebral palsy. *Scientific Reports*. doi: 10.1038/s41598-021-83898-3

Hoffman RM, Trevarrow MP, Bergwell HR, **Embury CM**, Heinrichs-Graham E, Wilson TW, & Kurz MJ (2021). Cortical oscillations that underlie working memory are altered in adults with cerebral palsy. *Clinical Neurophysiology*. doi: 10.1016/j.clinph.2020.12.029

Taylor BK, Frenzel MR, Eastman JA, **Embury CM**, Wang YP, Stephen JM, Calhoun VD, Badura-Brack AS, & Wilson TW (2020). Subclinical Anxiety and Posttraumatic Stress Influence Cortical Thinning During Adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*. doi: 10.1016/j.jaac.2020.11.020

Arif Y, Wiesman AI, O'Neill J, **Embury CM**, May P, Lew BL, Schantell M, Fox H, Swindells S, & Wilson TW (2020). The age-related trajectory of visual attention neural function is altered in adults living with HIV: A cross-sectional MEG study. *EBioMedicine*. doi: 10.1016/j.ebiom.2020.103065

Arif Y, Spooner RK, Wiesman AI, **Embury CM**, Proskovec AL, & Wilson TW (2020). Modulation of Attention Networks Serving Reorientation in Healthy Aging. *Aging*. doi: 10.18632/aging.103515

Taylor BK, **Embury CM**, Heinrichs-Graham E, Frenzel MR, Eastman JA, Wiesman AI, Wang YP, Calhoun VD, Stephen JM, & Wilson TW (2020). Neural oscillatory dynamics serving abstract reasoning suggest robust sex differences in

- typically-developing children and adolescents. *Developmental Cognitive Neuroscience*, 42. doi: 10.1016/j.dcn.2020.100770
- Koshy SM, Wiesman AI, Proskovec AL, **Embury CM**, Schantell M, Eastman JA, Heinrichs-Graham E, & Wilson TW (2020). Numerical working memory alters alpha-beta oscillations and connectivity in the parietal cortices. *Human Brain Mapping*. doi: 10.1002/hbm.25043
- Stephen JM, Solis I, Janowich J, Stern M, Frenzel MR, Eastman JA, Mills MS, **Embury CM**, Coolidge NM, Heinrichs-Graham E, Mayer A, Liu J, Wang YP, Wilson TW, & Calhoun VD (2020). The Developmental Chronecto-Genomics (Dev-CoG) study: A multimodal study on the developing brain. *Neuroimage*. doi: 10.1016/j.neuroimage.2020.117438
- Badura-Brack AS, Mills MS, **Embury CM**, Khanna MM, Klanecky Earl A, Stephen JM, Wang YP, Calhoun VD, & Wilson TW (2020). Hippocampal and parahippocampal volumes vary by sex and traumatic life events in children. *Journal of Psychiatry & Neuroscience*. doi: 10.1503/jpn.190013
- Koshy SM, Wiesman AI, Spooner RK, **Embury CM**, Rezich MT, Heinrichs-Graham E, & Wilson TW (2020). Multielectrode Transcranial Electrical Stimulation of the Left and Right Prefrontal Cortices Differentially Impacts Verbal Working Memory Neural Circuitry. *Cerebral Cortex*, 30(4), 2389-2400. doi: 10.1093/cercor/bhz246
- Embury CM**, Heinrichs-Graham E, Lord GH, Drincic AT, Desouza CV, & Wilson TW (2019). Altered motor dynamics in type 1 diabetes modulate behavioral performance. *Neuroimage Clinical*.
- Mills MS, **Embury CM**, Klanecky AK, Khanna MM, Calhoun VD, Stephen JM, Wang YP, Wilson TW, & Badura-Brack AS (2019). Traumatic events are associated with diverse psychological symptoms in typically-developing children. *Journal of Child & Adolescent Trauma*.
- Embury CM**, Wiesman AI, Proskovec AL, Mills MS, Heinrichs-Graham E, Wang YP, Calhoun VD, Stephen JM, & Wilson TW (2019). Neural dynamics of verbal working memory processing in children and adolescents. *Neuroimage*, 185, 191-197. doi: 10.1016/j.neuroimage.2018.10.038
- Embury CM**, Wiesman AI, McDermott TJ, Proskovec AL, Heinrichs-Graham E, Lord GH, Brau KL, Drincic AT, Desouza CV, & Wilson TW (2019). The impact of type 1 diabetes on neural activity serving attention. *Human Brain Mapping*, 40(4), 1093-1100. doi: 10.1002/hbm.24431
- Embury CM**, Wiesman AI, Proskovec AL, Heinrichs-Graham E, McDermott TJ, Lord GH, Brau KL, Drincic AT, Desouza CV & Wilson TW (2018). Altered brain dynamics in patients with type 1 diabetes during working memory processing. *Diabetes*, 67(6), 1140-1148. doi: 10.2337/db17-1382
- Khanna MM, Badura-Brack AS, McDermott TJ, **Embury CM**, Wiesman AI, Shepherd A, Ryan TJ, Heinrichs-Graham E, & Wilson TW (2017). Veterans with post-traumatic stress disorder exhibit altered emotional processing and attentional control during an emotional Stroop task. *Psychol Med*, 1-11. doi: 10.1017/S0033291717000460
- Embury CM**, Dyavarshetty B, Lu Y, Wiederin JL, Ciborowski P, Gendelman HE, & Kiyota T (2016). Cathepsin B Improves  $\beta$ -Amyloidosis and Learning and Memory in Models of Alzheimer's Disease. *J NeuroImmune Pharmacol*, 1-13. doi: 10.1007/s11481-016-9721-6
- Dong W, **Embury CM**, Lu Y, Whitmire SM, Dyavarshetty B, Gelbard HA, Gendelman HE, & Kiyota T (2016). The mixed-lineage kinase 3 inhibitor URM-099 facilitates microglial amyloid- $\beta$  degradation. *J Neuroinflammation*, 13, 184. doi: 10.1186/s12974-016-0646-z
- Kiyota T, **Morrison CM**, Tu G, Dyavarshetty B, Weir RA, Zhang G, Xiong H, & Gendelman HE (2015). Presenilin-1 familial Alzheimer's disease mutation alters hippocampal neurogenesis and memory function in CCL2 null mice. *Brain Behav Immun*, 49, 311-321. doi: 10.1016/j.bbi.2015.06.014
- Kiyota T, Zhang G, **Morrison CM**, Bosch ME, Weir RA, Lu Y, Dong W, & Gendelman HE (2015). AAV2/1 CD74 gene transfer reduces  $\beta$ -amyloidosis and improves learning and memory in a mouse model of Alzheimer's disease. *Mol Ther*, Advance online publication. doi: 10.1038/mt.2015.142

## **ABSTRACTS AND PRESENTATIONS**

- Embury CM**, Lord GH, Drincic AT, Desouza CV, & Wilson TW (2019). Altered Motor Dynamics during Response Competition in Adults with Type 1 Diabetes [Abstract]. 26<sup>th</sup> Annual Meeting of the Cognitive Neuroscience Society, San Francisco, California.
- Embury CM**, Beadle JN, Lord GH, Drincic AT, Desouza CV, & Wilson TW (2019). The Impact of Type 1 Diabetes on Neural Dynamics [Abstract]. The University of Nebraska Omaha's 2019 Student Research and Creative Activity Fair.
- Embury CM**, McDermott TJ, Wiesman AI, Brau KG, Desouza CV, Drincic AT, & Wilson TW (2018). Altered Oscillatory

- Dynamics of Visual Selective Attention Processing in Patients with Type 1 Diabetes [Abstract]. The 21<sup>st</sup> International Conference on Biomagnetism, Philadelphia, Pennsylvania.
- Embury CM**, Wiesman AI, Proskovec AL, Heinrichs-Graham E, Wang YP, Calhoun VD, Stephen JM, & Wilson TW (2018). Sex and Developmental Differences in Neural Component Recruitment During Verbal Working Memory Processing [Abstract]. The 21<sup>st</sup> International Conference on Biomagnetism, Philadelphia, Pennsylvania.
- Embury CM**, McDermott TJ, Wiesman AI, Brau KG, Desouza CV, Drincic AT, & Wilson TW (2018). Altered Neural Dynamics During a Flanker Attention Task in Patients with Type 1 Diabetes [Abstract]. The American Diabetes Association 78<sup>th</sup> Scientific Sessions, Orlando, Florida.
- Embury CM**, Wiesman AI, Proskovec AL, Heinrichs-Graham E, Wang YP, Calhoun VD, Stephen JM & Wilson TW (2018). Sex Differences in the Oscillatory Dynamics Serving Visual Working Memory in Development: a MEG Study [Abstract]. 25<sup>th</sup> Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, USA.
- Mills MS, **Embury CM**, Warren DE, Robinson AM, Meredith CK, Manker BR, Khanna MM, Klanecky AK, Calhoun VD, Stephen JM, Wang YP, Wilson TW, & Badura-Brack AS. (2018). Amygdala, Hippocampal, and Parahippocampal Volumes Vary By Sex and Traumatic Life Events in Healthy Children. [Abstract] Association for Psychological Science (APS) Annual Convention 2018, San Francisco, CA, USA.
- Mills MS, **Embury CM**, Robinson AM, Meredith CK, Manker BR, Khanna MM, Klanecky AK, Brown JR, Calhoun VD, Stephen JM, Wang YP, Wilson TW, & Badura-Brack AS. (2018). Number of Traumatic Life Events Are Associated with Psychological Symptoms in a Community Sample of Healthy Children. [Abstract] APS Annual Convention 2018, San Francisco, CA, USA.
- Embury CM**, Proskovec AL, Heinrichs-Graham E, McDermott TJ, Wiesman AI, Lord GH, Brau KL, Drincic AT, Desouza CV, & Wilson TW (2017). Altered MEG Oscillatory Dynamics during Working Memory Processing in Patients with Type 1 Diabetes [Abstract]. 23<sup>rd</sup> Annual Meeting of the Organization for Human Brain Mapping, Vancouver, British Columbia, Canada.
- Embury CM**, Proskovec AL, Heinrichs-Graham E, McDermott TJ, Wiesman AI, Wang YP, Calhoun VD, Stephen JM, & Wilson TW (2017). Developmental Alterations in the Oscillatory Dynamics serving Visual Working Memory: A MEG Study [Abstract]. 23<sup>rd</sup> Annual Meeting of the Organization for Human Brain Mapping, Vancouver, British Columbia, Canada.
- Embury CM**, Brau KG, Wiesman AI, Desouza CV, Drincic AT, & Wilson TW (2017). Disease Duration Affects Brain Networks Serving Working Memory Function in Type I Diabetes Mellitus [Abstract]. American Diabetes Association's 77<sup>th</sup> Scientific Sessions, San Diego, CA.
- Brau KG, **Embury CM**, Drincic AT, Desouza CV, & Wilson TW (2017). Brain Abnormalities in Type I Diabetes: Magnetoencephalographic Evidence [Abstract]. 99<sup>th</sup> Annual Meeting of the Endocrine Society, Orlando, FL.
- Kiyota T, **Morrison CM**, Lu Y, Dong W, Dyavarshetty B, & Gendelman HE (2015). Modeling CD74 directed APP trafficking for Alzheimer's disease. [Abstract] 45<sup>th</sup> Annual Meeting of the Society for Neuroscience, Chicago, IL.
- Kiyota T, **Morrison CM**, Kurczy ME, Ivanisevic J, Zhang G, Epstein AA, Boska MD, Siuzdak G, & Gendelman HE (2015). Presenilin-1 familial Alzheimer's disease mutation alters hippocampal neurogenesis and memory function in CCL2 null mice. [Abstract] The 12<sup>th</sup> International Conference on Alzheimer's and Parkinson's Diseases, Nice, France.
- Kiyota T, Zhang G, **Morrison CM**, Bosch ME, Weir RA, Higgins EE, & Gendelman HE (2014). Amyloid reductions by AAV-mediated CD74 gene delivery in an Alzheimer's disease mouse model. [Abstract] 44<sup>th</sup> Annual Meeting of the Society for Neuroscience, Washington, DC.
- Kiyota T, **Morrison CM**, Zhang G, Weir RA, Boska MD, & Gendelman HE (2013). A synergistic effect of presenilin 1 mutant and CCL2 deficiency leads to cognitive dysfunction and brain atrophy in a mouse model of Alzheimer's disease. [Abstract] 43<sup>rd</sup> Annual Meeting of the Society for Neuroscience, San Diego, CA.
- Morrison CM**, Fields N, & Strasser R (2013). Human-Animal Interactions Can Attenuate Salivary Cortisol Levels in College Students Exposed to an Induced Stress Event. [Abstract and Poster] 22<sup>nd</sup> Annual International Society for Anthrozoology Conference, Chicago, IL.
- Morrison CM** (2012). Dog Therapy as a Stress Buffer in an Induced Stress Event. [Poster] 2012 Joint Nebraska Psychological Society and the Association for Psychological and Educational Research in Kansas Convention, Hastings, NE.
- Fields N, **Morrison CM**, & Strasser R (2012). The Effects of Stress Reduction Techniques on Stress Reactivity and Cortisol Levels. [Presentation] UNO Honors Symposium, Omaha, NE.

Fields N, Buttner AP, **Morrison CM**, & Plachter E (2011). Assessing Social Attachment Variables in a Biting Dog Population. [Poster] UNO Research & Creative Activity Fair, Omaha, NE.

**Morrison CM**, Plachter E, Fields N, & Buttner AP (2011). Assessment of Training Factors on Dog Bites. [Poster] UNO Research & Creative Activity Fair, Omaha, NE.

### AWARDS

- UNO Graduate Research and Creative Activity (GRACA) Grant
- UNO Funding for Undergraduate Scholarly Experience (FUSE) Grant
- UNO Dean's List (Undergraduate)
- UNO Regent's Scholarship (Undergraduate)

**RELEVANT EMPLOYMENT HISTORY***Institute for Human Neuroscience, DICON Lab*

Boys Town National Research Hospital

**Graduate Research Assistant/Postdoctoral Research Fellow****January 2021 – Present**

- Performed data analysis using BESA software and Matlab-based toolboxes and scripts including SPM, further stats performed in SPSS, JASP, and R
- Integrated new analysis pipelines and software, expanding available research questions from the data
- Developed measures to better analyze data across populations

*Department of Neurological Sciences, Center for MEG*

University of Nebraska Medical Center

**Graduate Research Assistant****June 2016 – January 2021**

- Acquired data on Elekta 306-sensor MEG with direct participant contact from consent to completion
- Performed data analysis using BESA software and Matlab-based toolboxes and scripts including SPM, further stats performed in SPSS, JASP, and R
- Developed measures to be used in studies, assisted in participant recruitment and sub-study organization

*Department of Pharmacology and Experimental Neuroscience*

University of Nebraska Medical Center

**Research Technologist/Laboratory Manager****November 2012 – June 2016**

- Performed all laboratory work duties including:
  - Morris Water Maze (MWM) and Radial Arm Water Maze (RAWM) behavioral testing
  - IHC/IF staining, microscopy, and stereological analysis
  - Extraction and maintenance of murine primary neurons, neural progenitor cells and microglia
  - DNA/RNA extraction and PCR/rt-qPCR; Western Blot; ELISA
  - AAV and adenoviral treatment in cell culture and in our mouse model of Alzheimer's
- Developed and implemented new protocols and techniques for the lab
- Taught lab procedures and techniques to high school and undergraduate summer students and volunteers, graduate students, post-docs and technicians

*Neurological Sciences Floor*

The Nebraska Medical Center

**Clerk/Patient Care Technician****November 2009 – November 2012**

- Exposure to patient population within research interests
- Provided care and assistance with activities of daily living (ADLs) for patients
- Other responsibilities included monitoring epileptic patients during EEG study, entering doctor orders, training new employees, and other duties under the direction of nurses and doctors

*Department of Psychology*

University of Nebraska at Omaha

**Researcher****Volunteer: November 2010 – August 2012****Paid: August 2011 – December 2011**

- Completed thesis research project under direction of advising professor with financial support from the FUSE grant
- Analyzed salivary cortisol levels of participants before, during and following an induced stress event by ELISA and measured self-reported stress levels by validated stress surveys
- Performed data analyses by StatView and SPSS
- Administered cognitive tests examining the recognition speed of words and non-words in student participants
- Assessed correlations between dog bite incidences and training or social factors using surveys given by Nebraska Humane Society officers