

Matthew Wittbrodt

Education

2018– **Post-Doctoral Fellow**

Emory University School of Medicine, Atlanta GA

Adviser: J. Douglas Bremner, M.D

2018 **Ph.D. Applied Physiology**

Georgia Institute of Technology, Atlanta, GA

Dissertation: “Does dehydration affect brain structure, function, and cognitive-motor performance?”

Adviser: Mindy L. Millard-Stafford, Ph.D.

Coursework: Biostatistics, Cognitive Psychology, Movement Disorders, Human Neuroimaging, Human Physiology, Ion Channel Structure and Function

2012 **M.S. Exercise Physiology**

Western Michigan University, Kalamazoo, MI

Thesis: “The effect of *ad libitum* hydration on cognitive function following exercise in the heat”

Adviser: Christopher C. Cheatham, Ph.D.

2010 **B.S. Exercise Science, Clinical Exercise Emphasis**

Grand Valley State University, Allendale, MI

Research Experience

2018– **Post-Doctoral Fellowship**

Department of Psychiatry and Behavioral Sciences, Emory University School of Medicine

- Creating database and machine learning algorithms to use non-invasive biomarkers to predict invasive diagnostic measures
- Developing neuroimaging analyses to examine the efficacy of non-invasive vagal nerve stimulation to alleviate symptoms of emotional stress in PTSD patients
- Examining neural mechanisms and network analyses of mental stress-induced increases in cardiovascular disease risk
- Examining effects of latent variables on neural responses to mental stress in CAD patients
- Psychometric validation of a trauma inventory to examine allostatic load across the lifespan

2012–2018 **Exercise Physiology Lab**

School of Biological Sciences, Georgia Institute of Technology

- Collaborated with various faculty, staff, and research centers to execute interdisciplinary (applied physiology, neuroscience, psychology) research project investigating effect of a physiological stress (i.e., dehydration) on cognitive function and brain morphology using MRI and EEG
- Batch-analyzed MRI data with FSL and Freesurfer using Bash scripts on Linux cluster
- Collected and processed EEG data for event-related potential analysis
- Developed multiple cognitive paradigms with PsychoPy (Python) and E-Prime
- Lead team in systematic review and meta-analysis
- Statistically validated multiple technologies for potential clinical utility as hydration biomarkers

2010–2012 **Exercise Physiology Lab**

Department of Human Performance and Health Education, Western Michigan University

- Created custom multi-modal cognitive battery with Psychology Experiment Building Language (PEBL)
- Assessed validity of novel technology for localized sweat rate quantification
- Examined ergonomic properties of clothing textiles in hot environments

2008–2010 **Exercise Physiology Lab**

Department of Movement Science, Grand Valley State University

- Completed independent research project on psychological responses to exergames
- Coordinated with collegiate team to complete field-based experiments monitoring hydration levels in athletes during pre-season training

Teaching Experience

2013–2107 **(Senior) Teaching Assistant Fellow**

Center for Enhancement of Teaching and Learning, Georgia Institute of Technology

- Facilitate Graduate Teaching Assistant Orientation (30 students)
- Develop Breakout Grading and Classroom Management Sessions (40 students)

2012–2018 **Graduate Teaching Assistant**

School of Applied Physiology, Georgia Institute of Technology

Courses Taught:

- APPH 1040: Scientific Foundations of Health (approx. 200 students)
- APPH 1050: Science of Physical Activity and Healthy (approx. 150 students)
- APPH 2050: Introduction to Sport Science

Guest Lecturer / Instructor:

- APPH 3756: Physiology Lab
- APPH 4100: Exercise Physiology
- CETL 8000: Graduate Teaching Assistant Preparation

2011 **Adjunct Faculty**

Grand Valley State University, Allendale, MI

Course Taught:

- MOV 304: Physiology of Activity (3 Credits, Instructor of Record)

2010–2011 **Adjunct Faculty**

Kalamazoo Valley Community College, Kalamazoo, MI

Courses Taught:

- WPE 101: Principles of Healthy (2 Credits, Instructor of Record)
- WPE 153: Strength Training for Fitness (Instructor of Record)
- WPE 179: Cardio Training-Basic (Instructor of Record)

2010–2012 **Graduate Teaching Assistant**

HPHE Department, Western Michigan University, Kalamazoo, MI

- Created lesson plans to progress skill development

Courses Taught (sample):

- Healthy Living (2 Credits, Instructor of Record)
- Exercise Testing Laboratory item Skills and Instruction of Bowling (Instructor of Record)
- Wall Climbing Techniques
- Racket Sports (Instructor of Record)
- Golfing (Instructor of Record)
- Badminton (Instructor of Record)
- Health and Wellness Lecture (~ 150 students)

Professional Experience

2009–2010 **Exercise Technician**

Campus Recreation, Grand Valley State University, Allendale, MI

- Interviewed 50 clients for risk stratification and physical assessment
- Prescribed 75 client-tailored exercise programs
- Provided wellness coaching to 10 clients for improvement in overall health
- Developed informational material for a general public audience
- Communicated with other departments to enhance online incentive program

Manuscripts

1. **Wittbrodt, M.T.**, Vaccarino, V., Shah, A.J., Mayer, E.A., Bremner, J.D. Psychometric Properties of the Lifetime Trauma Inventory. (*Accepted - Health Psychology*)
2. Moazzami, K., **Wittbrodt, M.T.**, Lima, B.B., Levantsevy, O., Kaseer, B., Martini, A., Haffar, A., Nye, J., Quyyumi, A.A., Shah, A., Vaccarino, V., Bremner, J.D. Neural Correlates of Stress and Measures of Adiposity in Patients with Coronary Artery Disease. (*Accepted - Psychosomatic Medicine*)
3. Gurel, N.Z., Huang, M., **Wittbrodt, M.T.**, Jung, H., Ladd, S.L., Shandhi, M.H., Ko, Y., Shallenberger, L., Nye, J.A., Pearce, B., Vaccarino, V., Shah, A.J., Bremner, J.D., Inan, O.T. Quantifying Acute Physiological Biomarkers of Transcutaneous Cervical Vagal Nerve Stimulation in the Context of Psychological Stress. (*Accepted - Brain Stimulation*)
4. **Wittbrodt, M.T.**, Moazzami, K., Lima, B.B., Alam, Z.S., Corry, D., Hammadah, M., Campanella, C., Ward, L., Quyyumi, A.A., Shah, A.J., Vaccarino, V., Nye, J.A., Bremner, J.D. (2019). Early childhood trauma alters neurological responses to mental stress in patients with coronary artery disease. *Journal of Affective Disorders*. 254(1), 49-58.
5. Kasher, N., **Wittbrodt, M.T.**, Alam, Z.S., Lima, B.B., Nye, J.A., Campanella, C., Ladd, S., Hammadah, H., Shah, A.J., Raggi, P., Quyyumi, A.A., Vaccarino, V., Bremner, J.D. Sex differences in brain activation patterns with mental stress in patients with coronary artery disease. (2019). *Biology of Sex Differences*. 10(1), 35.
6. Shah, A., Chen, C., Campanella, C., Kasher, N., Evans, S., Reiff, C., Mishra, S., Hammadah, M., Lima, B.B., Wilmot, K., Al Mheid, I., Alkhoder, A., Isakadze, I., Levantsevy, S., Pimple, P.M., Garcia, E.V., **Wittbrodt, M.**, Nye, J., Ward, L., Lewis, T.T., Kutner, M., Raggi, P., Quyyumi, A., Vaccarino V.J., Bremner, J.D. (2018). Brain correlates of stress-induced peripheral vasoconstriction in patients with cardiovascular disease. *Psychophysiology*. e13291

7. **Wittbrodt, M.T.**, Sawka, M.N., Mizelle, J.C., Wheaton, L.A., Millard-Stafford, M.L. (2018). Dehydration and Exercise-Heat Stress Independently Alters Brain Structure, Function, and Impairs Visuomotor Performance. *Physiological Reports*. 6(16), e13805
Media Coverage: Medical Express, SciTech Daily
8. **Wittbrodt, M.T.** & Millard-Stafford, M.L. (2018). Dehydration Impairs Cognitive Performance: A Meta-analysis. *Medicine and Science in Sport and Exercise*. 50(11), 2360-2368
Received widespread media attention: Forbes, Newsweek, Popular Science, NY Post, Reuters, Runners World, CNN, Women's Health
9. Millard-Stafford, M., Swanson, A.E., **Wittbrodt, M.T.** (2018). Nature vs. Nurture: Have Performance Gaps Between Men and Women Reached an Asymptote? *International Journal of Sports Physiology and Performance*. 13(4), 530-535.
10. **Wittbrodt, M.T.**, Espinoza, S., & Millard-Stafford, M.L. (2015). Biological Variation of Plasma Osmolality Obtained with Capillary Versus Venous Blood. *Clinical Chemistry and Laboratory Medicine*. 53(10), 1613-1619
11. **Wittbrodt, M.T.**, Millard-Stafford, M.L., Sherman, R.A., & Cheatham, C.C. (2015). Ad Libitum Fluid Replacement Attenuates Physiological Strain Resulting From Mild Hypohydration Without Impacting Cognitive Performance. *International Journal of Sport Nutrition and Exercise Metabolism*. 25(5), 439-447
12. DeSousa, J., Cheatham, C.C., & **Wittbrodt, M.T.** (2014). The effects of a moisture-wicking fabric garment on the physiological and perceptual responses during acute exercise in the heat. *Applied Ergonomics*. 45(6), 1447-1453
13. **Wittbrodt, M.T.**, Gurel, N.Z., Nye, J.A., Ladd, S., Shah, A.J., Shandhi, M.H., Huang, M., Alam, Z.S., Pearce, B.D., Murrah, N., Ko, Y., Shallenberger, L.H., Vaccarino, V., Inan, O.T., Bremner, J.D. Non-Invasive Vagal Nerve Stimulation Decreases Brain Activity During Trauma Scripts. (*Under Review - Brain Stimulation*)
14. **Wittbrodt, M.T.**, Moazzami, K., Shah, A.J., Lima, B.B., Hammadah, M., Mehta, P.K., Quyyumi, A.A., Vaccarino, V., Nye, J.A., Bremner, J.D. Neural Responses During Acute Mental Stress are Associated with Angina Pectoris. (*Under Review - Journal of Psychosomatic Research*)
15. Gurel, N.Z., **Wittbrodt, M.T.**, Jung, H., Ladd, S.L., Shah, A.J., Vaccarino, V., Bremner, J.D., Inan, O.T. Automatic Detection of Target Engagement in Transcutaneous Cervical Vagal Nerve Stimulation for Traumatic Stress Triggers. (*Under Review - Journal of Biomedical and Health Informatics*)
16. Gurel, N.Z., **Wittbrodt, M.T.**, Jung, H., Shandhi, M.H., Stagnaro, E.G., Ladd, S.L., Huang, M., Ko, Y., Shallenberger, L., Beckwith, J., Nye, J.A., Pearce, B.D., Vaccarino, V., Shah, A.J., Inan, O.T., Bremner, J.D. Transcutaneous Cervical Vagal Nerve Stimulation Blocks Sympathetic Responses to Stress in Posttraumatic Stress Disorder (*Under Review - Brain Stimulation*)

Book Chapters

1. Millard-Stafford M.L. & **Wittbrodt M.T.**. Chapter 29: Sex and Performance: Nature Versus Nurture. In: *Routledge Handbook of Sport and Exercise Systems Genetics*. Editors: Lightfoot, J.T., Hubal, M.J., Roth, S.R. Routledge Publishing. 1st edition. 2019.

Published Abstracts

1. Moazzami, K., **Wittbrodt, M.T.**, Lima, B.B., Nye, J.A., Mehta, P.K., Quyyumi, A.A., Bremner, J.D., Shah, A.J., Vaccarino, V. (2019). Higher Activation of the Ventromedial Prefrontal Cortex During

Mental Stress Predicts Major Cardiovascular Disease Events in Patients With Coronary Artery Disease. *Circulation*. 140, Suppl_1

2. **Wittbrodt, M.T.**, Sawka, M.N., Mizelle, J.C., Lawson, R.R., Wheaton, L.A., Millard-Stafford, M.L. (2019). Dehydration Impairs Accuracy and Increases Brain Activity During a Rhythmic Bimanual Choice Reaction Time Task. *Medicine and Science in Sports and Exercise*. 51(6). 558-559.
3. Bremner J.D., Gurel N., **Wittbrodt M.T.**, Nye J.A., Alam Z.S., Herring I., Ladd S., Shallenberger L., Haffer A., Levantsevych O., Murrah N., Huang M., Ko Y., Pearce B., Shandhi M., Shah A., Vaccarino V., Non-invasive Vagal Nerve Stimulation Paired with Stress Exposure in Posttraumatic Stress Disorder (PTSD). *Brain Stimulation: Basic, Translational, and Clinical Research in Neuromodulation*. 12(2) 438.
4. Bremner, J.D., **Wittbrodt, M.T.**, Gurel, N.Z., Nye, J., Alam, A., Vaccarino, V., Ladd, S.L., Shallenberger, L.H., Huang, M., Ko, Y-Y., Pearce, B., Shandhi, M.H., Shah, A., Inan, O.T. (2018). Brain correlates of non-invasive Vagal Nerve Stimulation in stress. *NYC Neuromodulation/NANS Conference*, New York; p. 14
5. Millard-Stafford, M., & **Wittbrodt, M.T.** (2018). Effect Of Dehydration On Cognitive Functions: A Meta-analysis. *Medicine & Science in Sports & Exercise*. 50(5S), 341
6. **Wittbrodt, M.T.**, Sawka, M.N., Mizelle, J.C., Wheaton, L.A., Millard-Stafford, M.L. (2017). Hypohydration Alters Brain Morphology and Function While Impairing Fine Motor Performance. *The FASEB Journal*. 31(1S), 1087.7
7. **Wittbrodt, M.T.**, Mizelle, J.C., Wheaton, L.A., Sawka, M.N., Millard-Stafford, M.L. (2016). Hydration Effects on Brain Structure after Exercise-Heat Stress in Men and Women. *Medicine and Science in Sports and Exercise*. 48(5S).
8. **Wittbrodt, M.T.**, Mizelle, J.C., Wheaton, L.A., Sawka, M.N., Shinohara, M., Millard-Stafford, M.L. (2015). Exercise-induced Dehydration Alters Brain Activation During A Cognitive-motor Task. *Medicine and Science in Sports and Exercise*. 47(5S):501.
9. **Wittbrodt, M.T.**, O'Dea N., Jones, M.L., Buyckx, M., Millard-Stafford, M.L. (2014) Tear Osmolarity Versus Other Body Fluids In Assessment Of Hydration Status When Daily Water Intake Is Adequate. *Medicine and Science in Sports and Exercise*, 46(5S), 272-273.
10. **Wittbrodt, M.T.**, Cheatham, C.C., Sherman, R.A., Liu, Y. (2013) The Effect of Ad-Libitum Hydration on Cognition Following Exercise in the Heat. *Medicine and Science in Sports and Exercise*, 45(5S), 216-215.
11. Sherman, R.A., **Wittbrodt, M.T.**, LeBar, D.K. and Batterham, A.M. (2011). Hydration strategies, physiological responses and changes in body mass during pre-season soccer two-a-days. *Medicine and Science in Sports and Exercise*, 43 (5S), S335-336.
12. Beaudoin, C.B., **Wittbrodt, M.T.**, Cook, K., Beste, A. (2010). Does Exercise Identity Influence Psychological and Physiological Responses to Wii Fit and Wii Sport? *Medicine and Science in Sports and Exercise*, 42 (5S), S409.

Conference Presentations

1. **Wittbrodt, M.T.**, Sawka, M.N., Mizelle, J.C., Lawson, R.R., Wheaton, L.A., Millard-Stafford, M.L. (2019). Dehydration Impairs Accuracy and Increases Brain Activity During a Rhythmic Bimanual Choice Reaction Time Task. Poster Presentation at the ACSM Annual Meeting, Orland, FL, May 2019

2. **Wittbrodt, M.T.**, Sawka, M.N., Mizelle, J.C., Wheaton, L.A., Millard-Stafford, M.L. (2017). Hypohydration Alters Brain Morphology and Function While Impairing Fine Motor Performance. Poster Presentation at Experimental Biology, Chicago, IL, April 2017
3. **Wittbrodt, M.T.**, Mizelle, J.C., Wheaton, L.A., Sawka, M.N., Millard-Stafford, M.L. (2016). Hydration Effects on Brain Structure after Exercise-Heat Stress in Men and Women. Poster Presentation at the ACSM Annual Meeting, Boston, MA, May 2016
4. **Wittbrodt, M.T.** Dehydration and Neurocognition: What do we really know? Tutorial Session at the SEACSM Annual Meeting, Greenville, SC, Feb 2016
5. **Wittbrodt, M.T.**, Mizelle, J.C., Wheaton, L.A., Sawka, M.N., Shinohara, M., Millard-Stafford, M.L. Exercise-Induced Dehydration Alters Brain Activation During a Cognitive-Motor Task. Poster Presentation at the ACSM Annual Meeting, San Diego, CA, May 2015
6. **Wittbrodt, M.T.**, Espinoza, S., Millard-Stafford, M.L. Biological Variation Of Plasma Osmolality Obtained With Skin Puncture Versus Venipuncture. Oral Presentation at the SEACSM Annual Meeting, Jacksonville, FL, February 2015
7. **Wittbrodt, M.T.**, O'Dea N., Jones, M.L., Buyckx, M., Millard-Stafford, M.L. Tear Osmolarity Versus Other Body Fluids In Assessment Of Hydration Status When Daily Water Intake Is Adequate. Thematic Poster Presentation at the ACSM Annual Meeting, Orlando, FL, May 2014
8. **Wittbrodt, M.T.**, O'Dea N., Jones, M.L., Millard-Stafford, M.L. Tear Osmolarity Versus Other Body Fluids In Assessment Of Hydration Status When Daily Water Intake Is Adequate. Poster Presentation at the SEACSM Annual Meeting, Greenville, SC, February 2014
9. **Wittbrodt, M.T.**, Cheatham, C.C., Sherman, R.A., Liu, Y. The Effect of Ad-Libitum Hydration on Cognition Following Exercise in the Heat. Thematic Poster Presentation at the ACSM Annual Meeting, Indianapolis, IN, June 2013
10. **Wittbrodt, M.T.**, Cheatham, C.C., Sherman, R.A., Liu, Y. The Effect of Ad-Libitum Hydration on Cognition Following Exercise in the Heat. Poster Presentation at the SEACSM Annual Meeting, Greenville, SC, February 2013
11. Beaudoin, C. (co-presenter), **Wittbrodt, M.** (co-presenter), Cook, K., Beste, A. Does Exercise Identity Influence Psychological and Physiological Responses to Wii Fit and Wii Sport? Poster Presentation at the ACSM Annual Meeting, Baltimore, MD, June 2010
12. **Wittbrodt, M.T.**, LeBar, D.K., Sherman, R.A. Hydration Strategies, Physiological Responses and Changes in Body Mass During Pre-Season Soccer Two-A-Days. Oral Presentation, MWACSM Annual Meeting, Indianapolis, IN, November 2010
13. **Wittbrodt, M.T.** Comparing the Psychological and Physiological Effects of Wii Active and a Normal Circuit Training Routine in College Students. Poster Presentation, Student Scholarship Day, Grand Valley State University, Allendale, MI, May 2010
14. **Wittbrodt, M.T.**, Beste, A. Does Exercise Identity Influence Psychological and Physiological Responses to Wii Fit and Wii Sport? Oral Presentation, Michigan ACSM Annual Conference, Gaylord, MI, February 2010
15. Beaudoin, C.B. (co-presenter), **Wittbrodt, M.T.** (co-presenter), Cook, K., Beste, A. Does Exercise Identity Influence Psychological and Physiological Responses to Wii Fit and Wii Sport? Poster Presentation, West Michigan Undergraduate Science Research Conference, Grand Rapids, MI, October 2009

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- ## Grants / Funding

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- ## Awards

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Conference Awards

- Semifinalist, Student Award Poster Presentation (Master's), Southeast American College of Sports Medicine Annual Meeting, 2013
- Outstanding Undergraduate Slide Presentation, Midwest American College of Sports Medicine Annual Meeting, 2010

Institution Awards

- Finalist, Outstanding Graduate Teaching Assistant Award, Center for the Enhancement of Teaching and Learning, Georgia Tech, 2013 & 2015
- Rising Star Award, WMU College of Education and Human Development, 2012
- Graduate Research and Creative Scholar Award, WMU Graduate College, 2012
- Outstanding Student, Exercise Science, Grand Valley State University, 2010

Technical Skills

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|----------------------------|--|
| Languages | R (tidyverse, ggplot2), Python (matplotlib, scikit-learn, pandas, numpy), Matlab, \LaTeX , Bash, SQL (in progress) |
| Research Software | FSL, FreeSurfer, EEGLab, SPM, SPSS, Zotero, EndNote, Academic Databases, Anaconda |
| General Software | Windows, macOS, Linux, AWS, pgAdmin, Microsoft Office, Oracle Virtual Box |
| Web-based learning modules | Udemy and Coursera Courses: <ul style="list-style-type: none">◦ IBM Data Science Professional Certificate (9 courses: Python, SQL)◦ Polynomial Regression, R, and ggplot◦ Comprehensive Linear Modeling & Linear Mixed-Effects Models with R◦ Linear Mixed-Effects Models with R◦ Machine Learning A-Z: Hands-On Python & R In Data Science◦ Python for Data Science and Machine Learning Bootcamp◦ Biology Meets Programming: Bioinformatics of Beginners (with Python)◦ Introduction to Data Science with Python◦ Data Management and Visualization (with SAS)◦ Automate the Boring Stuff with Python |

Professional Development

Student Leadership

- President, Promoting Applied Physiology Education and Research, Georgia Tech, 2015 - 2018
- President, Exercise Science Club, Grand Valley State University, 2009 - 2010
- Student Representative, Faculty Search Committee, Movement Science Department, Grand Valley State University, 2010

Ad hoc Reviewer

- European Journal of Nutrition
- International Journal of Sports Physiology and Performance
- International Journal of Sports Medicine
- Journal of Neurophysiology
- Journal of Psychosomatic Research
- Medicine & Science in Sport & Exercise
- Nutrients
- Scandinavian Journal of Medicine & Science in Sports
- Scientific Reports

Professional Membership

- Member, American Physiological Association, 2013 - 2018
- Member, American College of Sports Medicine, 2009 - 2018

Public Presentations

1. Have PhD, Will Travel. (2018). Panel presentation at the Georgia Tech School of Biological Sciences.
2. TV Segment about Dehydration and Brain Function. (2018). *FOX 5 Atlanta*.
3. If You're Off Your Game, You Could Be Mildly Dehydrated. (2018). Radio Interview (30 min), *Top of Mind, BYU Radio*.
4. Being Cre**T**ative. *Pecha Kucha* presentation at the 2015 Georgia Tech Teaching Assistant Orientation (~ 300 attendees)

Community Service

Go Further, Jump Higher, Be Stronger

- Developed and Organized Physiology Exhibit for General Audiences
- Exhibitor, 2014-17 Atlanta Science Festival Exploration Expo (30,000 attendees)
- Featured Scientific Exhibitor, 2014-2016 Paws for a Cause Invitational Gymnastic Meet (1000 attendees)

Volunteering

- Kids Day, Grand Valley State University Movement Science Department
- Kids Club Day, Grand Valley State University Athletic Department