

Curriculum Vitae

Bart Rypma

- Office Address** University of Texas at Dallas
School of Behavioral and Brain Sciences
800 West Campbell Road
Green Hall, GR 41
Richardson, TX 75083-0686
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- Education**
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|------------------------|---|
| Ph.D. | Georgia Institute of Technology (major in psychology, minor in neuropsychology), June, 1994 |
| M.A. | Duke University (major in psychology), December, 1989 |
| B.A., <i>cum laude</i> | New York University (major in psychology), June, 1983. |
- Post-Doctoral Training**
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| 1994-2001 | Stanford University and University of Pennsylvania |
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- University Appointments**
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|--------------|---|
| 2019-present | Director, UT-Dallas BrainHealth Imaging Center |
| 2016-present | Professor at University of Texas at Dallas |
| 2014-present | Meadows Foundation Endowed Chair in Behavioral and Brain Sciences |
| 2006-2016 | Associate Professor at University of Texas at Dallas |
| 2001-2006 | Assistant Professor at Rutgers University |
- Hospital Appointments**
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| 2006-present | Associate Professor at University of Texas Southwestern Medical Center |
| 2001-2006 | Assistant Professor at University of Medicine and Dentistry of New Jersey |
- Other Professional Positions and Major Visiting Appointments**
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| 11/11-12/11 | Visiting Scientist, University of Medicine and Dentistry of New Jersey |
| 5/11-10/11 | <i>Gästforskare Sektor Psykologi, Karolinska Institutet</i> , Aging Research Center, Stockholm, Sweden |
| 5/00 –9/01 | Associate Research Scientist at University of California-Berkeley, Berkeley, CA |
- Honors and Awards**
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| 2014 | Meadows Foundation Endowed Chair in Behavioral and Brain Sciences |
| 2014 | Provost's Award for Faculty Excellence in Undergraduate Mentoring Nominee |
| 2013 | Caren and Vin Prothro-Dallas Foundation Award |
| 2007 | Metroplex Collaborative Fund Award |
| 2005 | Busch Biomedical Sciences Research Award |
| 2005 | Johnson & Johnson Pioneers in Science Award |
| 2003 | Siemens Award for Innovative Technology Research |
| 1999 | American Federation of Aging Research Award |
| 1994 | National Research Service Award |

1991	Georgia Tech Student Foundation Award
1982-84	Psychology Dept. Award for Distinguished Research
1983	University Honors Scholar
1983	Citrin Award for Outstanding Honors Thesis
1983	Dean's Outstanding Service Award
1983	Honors in Psychology
1982-83	Dean's List
1982	Psychology Dept. Award for Distinguished Research

Major Committee Assignments

2019-present	UT-Dallas BrainHealth Imaging Center Operations, Safety, and Feasibility Committee
2019-present	UT-Dallas BrainHealth Imaging Center Executive Advisory Board (chair)
2018-present	Resting State/Brain Connectivity Conference 2023 - Local Organizing Committee (chair)
2020-2022	Undergraduate Research-Match Processing Committee
2020-2021	Human Subjects Research Safety Working Group
2018-2020	UT-Dallas Committee on Qualifications for Promotion and Tenure
2017-2020	UTD Institutional Review Board (chair)
2017-2019	Doctoral Admissions Committee (chair)
2014-2017	UTSW Advanced Imaging Research Center Director Search Committee
2010-2016	UTSW Medical Student Reviewer Committee
2013-2017	UTD Graduate Curriculum Development Committee (chair)
2010-2011	Ad-hoc Neuroscience Track Committee (chair)
2009-2011	Graduate Quantitative Methods Committee
2009-2010	Dallas Aging & Cognition Conference Committee (co-chair)
2009-2011	UTD Faculty Search Committee
2008-2012	UTD Research Integrity Committee
2009-2012	UTD Institutional Review Board (vice chair)
2008-2012	UTD Center for Brain Health Research Advisory Committee
2006-present	UTSW Advanced Imaging Research Center Research Protocol Review Committee
2006-2013	UTD Graduate Curriculum Development Committee
2006-present	UTD-UTSW Faculty Liaison
2005	Rutgers University Psychology Department Needs and Goals Committee
2004-5	Rutgers University Computer Facilities Usage Committee
2004-5	Rutgers University Psychology Department Graduate Curriculum Committee
2003-4	Rutgers University Psychology Department Graduate Executive Committee
2002	Rutgers University Psychology Department Faculty Search Committee

Academic Committee Assignments

2023	University of Texas at Dallas School of Behavioral and Brain Sciences: Yuguang Zhao (chair)
2023	University of Texas at Dallas School of Behavioral and Brain Sciences: Mackenzie Taylor (chair)

2023 University of Texas at Dallas School of Behavioral and Brain Sciences:
Gayathri Batchalli Maruthy (chair)

2022 University of Texas at Dallas School of Behavioral and Brain Sciences:
Mark Zuppichini (chair)

2022 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dema Abdelkarim (chair)

2022 University of Texas at Dallas School of Behavioral and Brain Sciences:
Liang Han

2020 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Lyndahl Himes (chair)

2020 UTD Promotion and Tenure Committee for Dr. Noah Sasson

2020 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Monroe Turner (chair)

2019 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Erin Horne

2017 UTD Promotion and Tenure Committee for Dr. Chandramallika Basak
(chair)

2017 University of Texas at Dallas School of Brain and Behavioral Sciences:
Dr. Margaret O'Connell

2017 UTD Promotion Committee for Dr. Francesca Filbey

2016 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Ryan Brigante (chair)

2016 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Nicholas A. Hubbard (chair)

2015 University of Texas Southwestern Medical Center: Dr. Tina Jeon

2014 UTD Midprobationary Review Committee for Dr. Kristen Kennedy
(chair)

2014 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Ehsan Shokri

2013 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Tracy Wang

2012 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Asha Vas

2012 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Vaidehi Natu

2010 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Jack Birchfield

2010 University of Texas at Dallas School of Behavioral and Brain Sciences:
Dr. Jun-Yi Wang

2009 University of Texas Southwestern Medical Center: Dr. Julie Smith

2006	Rutgers University Center for Neuroscience: Dr. Helen Genova
2006	Rutgers University Psychology Department: Dr. Cory Finlay
2006	Rutgers University Psychology Department: Dr. Ricardo Carrion
2004	Rutgers University Psychology Department: Dr. Michael Patterson
2004	Rutgers University Psychology Department: Dr. Adi Zaimi
2003	Rutgers University Psychology Department: Dr. Gang Chen

Membership in Honorary and Professional Societies

2014	Psychonomic Society
2012	International Society for Behavioral Neuroscience
2011	National Multiple Sclerosis Society
2010	International Society for Magnetic Resonance in Medicine
2006	Organization for Human Brain Mapping
1995	Society for Neuroscience
1995	Cognitive Neuroscience Society
1994	American Psychological Association
1994	Sigma Xi (Associate)
1982	Psi Chi

Major Research Interests

The cognitive and neurobiological mechanisms of human memory
 The neurobiological substrates of age-related changes in human memory
 Experimental methodology of functional magnetic resonance imaging

Grants and Fellowships

2020-2022	“A Resting-state brain connectivity conference at the University of Texas at Dallas” NIH R13 Grant to UTD.
2015-2022	“BOLD and its discontents: Age differences in the neurophysiology of fMRI signal” NIH R01 Grant to UTSW.
2018-2022	“Role of astrocytes in neural-vascular coupling and its dysfunction in Multiple Sclerosis” National Multiple Sclerosis Society Research Grant to UTD.
2016-2019	“Effects of neural-vascular coupling changes on cognitive performance in multiple sclerosis” National Multiple Sclerosis Society to UTD.
2011-2015	“Hemodynamic Response Function Changes In Multiple Sclerosis” National Multiple Sclerosis Society to UTSW.
2007-2011	“Aging of working memory: Biophysical and neural components” NIH R01 Grant to UTD.
2007-2010	“Attention and executive function in the cortical and subcortical circuitry of Gulf War Veterans” Veteran’s Administration Large Grant to UTSW.
2008-2012	“A pattern-based analysis of neural mediators of working memory deficits in autism” University of Texas at Dallas/University of Texas Southwestern Medical Center Grant for High-Risk Collaborative Research.

2006	"A psychometric approach to examining fMRI" University of Texas at Dallas Faculty Initiative Award.
2005-2006	"Neural correlates of age-related memory decline" Busch Biomedical Grant.
2005 -2006	"Neural, vascular and cognitive contributions to age-related memory decline." Johnson & Johnson Discoveries Grant.
2004-2006	"Aging effects on brain function: Real-time analysis of fMRI data" Siemens Innovative Technology Development Grant.
2001-2003	"Age-related changes in human working memory" NIH R03 Grant to Rutgers, The State University of New Jersey.
1999-2000	"Neural correlates of age-related changes in working memory" American Federation for Aging Research to Rutgers, The State University of New Jersey.
1994-1997	"Spatial cognition in aging and Alzheimer's Disease" NIH F32 Kirschstein Fellowship Grant to Stanford University.
1992	"Age-related differences in human spatial cognition" Sigma Xi Grants-in-Aid to Georgia Institute of Technology.
1991-1994	"Predoctoral Fellowship Training Grant" National Institute on Aging to Georgia Institute of Technology.
1987-1991	"Jacob K. Javits National Graduate Fellowship" US Department of Education to Duke University and Georgia Institute of Technology.

Teaching Experience

2010-present	Methods in Functional Neuroimaging
2006-present	Cognitive Neuroscience
2006	Special Topics Seminar: Working Memory and Executive Function
2003-2008	Cognitive Science
2003-2005	Cognitive Neuroscience Seminar
2002-2003	Special Topics Seminar: The Neuroscience of Memory
1996-97	Physiological Psychology
1994	General Psychology
1991	Introductory Psychology
1988	Cognitive Psychology
1982-83	Introductory Psychology (Undergraduate Teaching Assistant)

Editorial Experience

2019-present	Special Issue Guest Editor, "Aging and the neural-vascular complex," <i>Psychophysiology</i> .
2010-present	Editor, <i>Brain Connectivity</i>
2012-present	Academic Editor, <i>PLoS One</i>
2020	Ad-hoc Reviewer, <i>Proceedings of the National Academy of Sciences</i>
2020	Editorial Consultant, <i>Nature-Neuroscience</i>
2021	Ad-hoc Reviewer, <i>Cortex</i>
2018-present	Ad-hoc Reviewer, <i>Journal of Cerebral Blood Flow and Metabolism</i>

2018-present	Ad-hoc Reviewer, <i>Multiple Sclerosis Journal</i>
2005-present	Ad-hoc Reviewer, <i>Neurobiology of Aging</i>
2009-present	Ad-hoc Reviewer, <i>Journal of Neuroscience</i>
2003-present	Ad-hoc Reviewer, <i>Nature-Neuroscience</i>
2002-present	Ad-hoc Reviewer, <i>Cerebral Cortex</i>
2000-present	Ad-hoc Reviewer, <i>Human Brain Mapping</i>
1999-present	Ad-hoc Reviewer, <i>Journal of Cognitive Neuroscience</i>
1999-present	Ad-hoc Reviewer, <i>NeuroImage</i>
2013	Ad-hoc Reviewer, <i>JINS</i>
2009-2012	Consulting Editor, <i>Developmental Psychology</i>
2013-present	Ad-hoc Reviewer, <i>Neuropsychologia</i>
2012	Ad-hoc Reviewer, <i>Neuron</i>
2012-present	Ad-hoc Reviewer, <i>PLoS One</i>
2002-2019	National Institutes of Health F01, F02, R01 and Special-Emphasis Study Sections
2008	Ad-hoc Reviewer, <i>Psychological Review</i>
2008	Ad-hoc Reviewer, <i>Intelligence</i>
2006-2015	Ad-hoc Reviewer, <i>American Journal of Psychiatry</i>
2007-2015	Ad-hoc Reviewer, <i>Cognitive, Affective and Behavioral Neuroscience</i>
2007-2009	Ad-hoc Reviewer, <i>Nature</i>
2005-2009	Ad-hoc Reviewer, <i>Biological Psychiatry</i>
2002-2008	Ad-hoc Reviewer, <i>Brain Research</i>
2002-2012	Ad-hoc Reviewer, <i>Brain</i>
2000-2003	Reviewer, University of Michigan Pilot Grants Competition
1997- 2000	Reviewer, Applied Cognitive Aging Seed Grant Program
1995-2020	Ad-hoc Reviewer, <i>Psychology and Aging</i>
1995-2007	Ad-hoc Reviewer, <i>Journals of Gerontology</i>

Published Manuscripts

1. Klugah-Brown, B., Yu, Y., Hu, P., Agoalikum, E., Liu, C., Liu, X., Jang, X., Zeng, Y., Rypma, B., Michael, A., Li, X., Becker, B. and Biswal, B. (2022). Effect of surgical mask on fMRI signals during task and rest. *Nature Communications Biology*, 5, 1004.
2. Turner, M.P., Zhao, Y., Abdelkarim, D., Liu, P., Spence, J.S., Hutchison, J.L., Sivakolundu, D.K., Thomas, B.P., Hubbard, N.A., Xu, C., Lu, H., and Rypma, B. (2022). Altered linear coupling between stimulus-evoked blood flow and oxygen metabolism. *Cerebral Cortex*, 33, 135-151.
3. Fabiani, M., Rypma, B. and Gratton, G. (2021). Aging and cerebrovascular health: Structural, functional, cognitive, and methodological implications. *Psychophysiology*, 58, 13842.
4. Zhao, Y., Liu, P., Turner, M., Abdelkarim, D., Lu, H. and Rypma, B. (2021). The neural-vascular basis of age-related processing speed decline. *Psychophysiology*, 58, 13845.
5. Zimmerman, B., Rypma, B., Gratton, G., and Fabiani, M. (2021). Age-related changes in cerebrovascular health and their effects on neural function and cognition: A comprehensive review. *Psychophysiology*, 58, 13796.
6. Yabluchanskiy, A., Nyul-Toth, A., Gulej, R., Saunders, D., Towner, R., Turner, M., Zhao, Y., Abdelkarim, D., Rypma, B. and Tarantini, S. (2021). Age-related alterations in the

- cerebrovasculature affect neurovascular coupling and BOLD fMRI responses: Insights from animal models of aging. *Psychophysiology*, 58, 13718.
7. Hubbard, N.A., Turner, M.P., Sitek, K.R., West, K., Kaczmarzyk, J.R., Himes, L., Thomas, B.P., Lu, H., and Rypma, B. (2021). Resting cerebral oxygen metabolism demonstrates archetypal network topology. *Human Brain Mapping*, 42, 1952-1968.
 8. Himes, L., Hubbard, N., Maruthy, G.B., Gallagher, J., Turner, M. and Rypma, B. (2021). The relationship between trait mindfulness and emotional reactivity following mood-manipulation. *Mindfulness*, 12, 170-185.
 9. Shokri-Kojori, E., Bennett, I.J., Tomeldon, Z.A., Krawczyk, D.C. and Rypma, B. (2021). Differences in effects of aging on brain gray matter and white matter reveal insights into human intelligence. *Brain Research*, 1763, 147431.
 10. West, K.L., Sivakolundu, D.K., Zuppichini, M.D., Turner, M.T., Spence, J.S., Lu, H., Okuda, D.T. and Rypma B. (2021). Altered Task-Induced Cerebral Blood Flow and Oxygen Metabolism Underlies Motor Impairment in Multiple Sclerosis. *Journal of Cerebral Blood Flow and Metabolism*, 41, 182-193.
 11. West, K.L., Sivakolundu, D.K., Maruthy, G.B., Zuppichini, M.D., Liu, P., Thomas, B.P., Spence, J.S., Lu, H., Okuda, D.T. and Rypma, B. (2020). Baseline cerebral metabolism predicts fatigue and cognition in Multiple Sclerosis patients. *Neuroimage: Clinical*, 27, 102281.
 12. Sivakolundu, D.K., West, K.L., Zuppichini, M.D., Wilson, A., Moog, T.M., Blinn, A.P., Newton, B.D., Wang, Y., Stanley, T., Guo, X., Rypma, B. and Okuda, D.T. (2020). BOLD signal within and around white matter lesions distinguishes multiple sclerosis and non-specific white matter disease: A three-dimensional approach. *Journal of Neurology*, 267, 2888-2896.
 13. Sivakolundu, D.K., West, K.L., Zuppichini, M.D., Abdelkarim, D.A., Turner, M.P., Zhao, Y., Spence, J., Lu, H., Okuda, D.T. and Rypma, B. (2020). The neural-vascular basis of processing speed differences in humans: A model-systems approach using multiple sclerosis. *Neuroimage*, 215, 116812.
 14. Taneja, K., Liu, P., Cuimei, X., Turner, M., Zhao, Y., Abdelkarim, D., Thomas, B.P., Rypma, B. and Lu, H., (2020). Quantitative cerebrovascular reactivity in normal aging: Comparison between phase-contrast and arterial spin labeling MRI. *Frontiers in Neurology*, 11, 758.
 15. Sivakolundu, D.K., West, K.L., Maruthy, G.B., Zuppichini, M., Turner, M.P., Abdelkarim, D., Zhao, Y., Spence, J.S., Lu, H., Okuda, D.T. and Rypma, B. (2020). Reduced arterial compliance along the cerebrovascular tree predicts cognitive slowing in Multiple Sclerosis: Evidence for a neural-vascular uncoupling hypothesis. *Multiple Sclerosis Journal*, 26, 1486-1496.
 16. Thomas, B., Takashi, T., Sheng, M., Tseng, B., Womack, K., Cullum, M.C., Rypma, B., Zhang, R. and Lu, H. (2020). Brain perfusion change in patients with mild cognitive impairment after 12 months of aerobic exercise training. *Journal of Alzheimer's Disease*, 75, 617-631.
 17. Turner, M.P., Fischer, H., Sivakolundu, D.K., Hubbard, N.A., Zhao, Y., and Rypma, B. and Bäckman, L. (2020). Age-differential relationships among dopamine D1 binding potential, fusiform BOLD signal, and face-recognition performance. *Neuroimage*, 206, 116232.
 18. Abdelkarim, D., Zhao, Y., Turner, M.P., Sivakolundu, D.K., Lu, H. and Rypma, B. (2019). A neural-vascular complex of age-related changes in the human brain: Anatomy, physiology, and implications for neurocognitive aging. *Neuroscience and Biobehavioral Reviews*, 107, 927-944.

19. Sivakolundu, D.K., Hansen, M.R., West, K.L., Stanley, T., Wilson, A., McCreary, M., Turner, M.P., Pinho, M.C., Newton, B.D., Guo, X., *Rypma, B.* and Okuda, D.T. (2019). Three-dimensional lesion phenotyping and physiologic characterization inform myelination ability in Multiple Sclerosis. *Journal of Neuroimaging*, 29, 605-614.
20. West, K.L., Zuppichini, M.D., Turner, M.P., Sivakolundu, D.K., Zhao, Y., Abdelkarim, D., Spence, J.S. and *Rypma, B.* (2019). BOLD hemodynamic response function changes significantly with healthy aging. *NeuroImage*, 188, 198-207.
21. Turner, M.P., Hubbard, N.A., Sivakolundu, D.K., Himes, L.H., Hutchison, J.L., Hart, Jr., J., Spence, J.S., Frohman, E.M., Frohman, T.C., Okuda, D.T. and *Rypma, B.* (2019). Preserved canonicity of the BOLD hemodynamic response reflects healthy cognition: Insights into the healthy brain through the window of Multiple Sclerosis. *NeuroImage*, 190, 46-55.
22. Hubbard, N.A., Weaver, T.P., Turner, M.P. and *Rypma, B.* (2018). Re-examination of “release-from-PI” phenomena: Deficits in recall accuracy do not recover after a semantic switch. *Memory*, 26, 1191-1205.
23. Motes, M.A., Yezhuvath, U.S., Aslan, S., Spence, J.S., *Rypma, B.* and Chapman, S.B. (2018). Higher-order cognitive training effects on processing speed-related neural activity: A randomized trial. *Neurobiology of Aging*, 62, 72-81.
24. Hubbard, N.A., Turner, M.P., Ouyang, M., Himes, L., Thomas, B.P., Hutchison, J.L., Faghihahmadabadi, S., Davis, S.L., Strain, J.F., Spence, J., Krawczyk, D.C., Huang, H., Lu, H., Hart Jr., J., Frohman, T.C., Frohman, E.M., Okuda, D.T. and *Rypma, B.* (2017). Calibrated imaging reveals altered grey matter metabolism related to white matter microstructure and symptom severity in multiple sclerosis. *Human Brain Mapping*, 38, 5375-5390.
25. Hubbard, N.A., Sanchez, A.Y., Caballero, C., Ouyang, M., Turner, M.P., Himes, L., Faghihahmadabadi, S., Thomas, B.P., Hart, J., Huang, H., Okuda, D.T. and *Rypma, B.* (2017). Evaluation of visual-evoked cerebral metabolic rate of oxygen as a diagnostic marker in Multiple Sclerosis. *Brain Sciences*, 7, 6.
26. Hutchison, J.L., Hubbard, T.L., Hubbard, N.A., and *Rypma, B.* (2017). Ear advantage for musical location and relative pitch: Effects of musical training and attention. *Perception*, 46, 745-762.
27. Turner, M.P., Hubbard, N.A., Himes, L.M., Faghihahmadabadi, S., Hutchison, J.L., Bennett, I.J., Motes, M.A. and *Rypma, B.* (2016). Cognitive slowing in Gulf War Illness predicts executive network hyperconnectivity: Study in a population-representative sample. *Neuroimage: Clinical*, 12, 535-541.
28. Hubbard, N.A., Hutchison, J.L., Turner, M., Sundaram, S., Oasay, L., Robinson, D., Strain, J., Weaver, T., Davis, S.L., Remington, G.M., Huang, H., Biswal, B.B., Hart Jr., J., Frohman, T.C., Frohman, E.M. and *Rypma, B.* (2016). Asynchrony in executive networks predicts cognitive slowing in Multiple Sclerosis. *Neuropsychology*, 30, 75-86.
29. Hubbard, N.A., Turner, M., Hutchison, J.L., Ouyang, A., Davis, S.L., Remington, G., Sundaram, S., Brigante, R., Lee, J., Huang, H., Hart Jr., J., Frohman, E. and *Rypma, B.* (2016). Multiple Sclerosis-related white matter microstructural change alters the BOLD hemodynamic response (2016). *Journal of Cerebral Blood Flow and Metabolism*, 36, 1872-1884.
30. Akbar, N., Banwell, B., Sled, J.G., Binns, M.A., Doesburg, S.M., *Rypma, B.*, Lysenko, M. and Till, C. (2016). Brain activation patterns and cognitive processing speed in patients with

- pediatric-onset multiple sclerosis. *Journal of Clinical and Experimental Neuropsychology*, 38, 393-403.
31. Hubbard, N.A., Turner, M.P. and Rypma, B. (2016). MS-related white matter alters BOLD hemodynamics. *Multiple Sclerosis Journal*, 22, 39.
 32. Hubbard, N.A., Hutchison, J.L., Hambrick, D.Z. and Rypma, B. (2016). The enduring effects of depressive cues on working memory. *Journal of Affective Disorders*, 15, 190-208.
 33. Rypma, B., Fisher, H., Rieckmann, A., Hubbard, N.A., Nyberg, L. and Bäckman, L. (2015). Dopamine D1 binding potential predicts fusiform activity during face-recognition performance. *Journal of Neuroscience*, 35, 14702-14707.
 34. Hubbard, N.A., Faso, D.J., Krawczyk, D.C. and Rypma, B. (2015). Dual roles of trait rumination in problem solving. *Personality and Individual Differences*, 86, 321-325.
 35. Hutchison, J.L., Hubbard, T.L., Hubbard, N.A., Brigante, R.M. and Rypma, B. (2015). Minding the Gap: An experimental assessment of musical segmentation models. *Psychomusicology*, 25, 103-115.
 36. Hubbard, N.A., Hutchison, J.L., Turner, M., Montroy, J., Bowles, R.P. and Rypma, B. (2015). Depressive thoughts limit working memory capacity in dysphoria. *Emotion and Cognition*, 6, 1-17.
 37. Samudra, N., Ivleva, E.I., Hubbard, N.A., Rypma, B., Sweeney, J., Clementz, B.A., Keshavan, M.S., Pearlson, G.D. and Tamminga, C.A. (2015). Alterations in hippocampal-cortical connectivity across psychosis diagnoses. *Psychiatry Research: Neuroimaging*, 233, 148-157.
 38. Rao, N.K., Motes, M.A. and Rypma, B. (2014). Investigating the neural bases for intra-subject cognitive efficiency using functional magnetic resonance imaging. *Frontiers in Human Neuroscience*, 8, 840.
 39. Hubbard, N.A., Turner, M.P., Robinson, D.M., Sundaram, S., Oasay, L., Hutchison, J.L., Ouyang, A., Huang, H. and Rypma, B. (2014). Attenuated BOLD hemodynamic response predicted by degree of white matter insult, slows cognition in Multiple Sclerosis. *Multiple Sclerosis Journal*, 20, 267.
 40. Kannurpatti, S.S., Motes, M.A., Biswal, B.B. and Rypma, B. (2014). Assessment of unconstrained cerebrovascular reactivity marker for large age-range fMRI studies. *PLoS One*, 9, e88751.
 41. Hutchison, J.L., Hubbard, N.A., Brigante, R.M., Turner, M., Sandoval, T.I., Hillis, G.A.J., Weaver, T. and Rypma, B. (2014). The efficiency of region of interest analysis methods for detecting group differences in fMRI. *Journal of Neuroscience Methods*, 226, 57-65.
 42. Hubbard, N.A., Hutchison, J.L., Motes, M.A., Shokri-Kojori, E., Brigante, R.M., Haley, R.W. and Rypma, B. (2014). Central executive dysfunction and deferred prefrontal processing in veterans with Gulf War Illness. *Clinical Psychological Science*, 2, 319-327.
 43. Di, X., Rypma, B. and Biswal, B.B. (2014). Correspondence of executive function related functional and anatomical alterations in aging brain. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 48C, 41-50.
 44. Yuan, R., Di, X., Kim, E.H., Barik, S. and Rypma, B. and Biswal, B.B. (2013). Regional homogeneity of resting-state fMRI contributes to both neurovascular and task activation variations. *Magnetic Resonance Imaging*, 31, 1492-1500.

45. Bennett, I.J. and Rypma, B. (2013). Advances in functional neuroanatomy: A review of combined DTI and fMRI studies in healthy younger and older adults. *Neuroscience and Biobehavioral Reviews*, 37, 1201-1210.
46. Hutchison, J.L., Shokri-Kojori, E., Lu, H. and Rypma, B. (2013). A BOLD perspective on age-related flow-metabolism coupling and neural efficiency changes in human visual cortex. *Frontiers in Psychology*, 4, 244.
47. Bennett, I.J., Rivera, H.G. and Rypma, B. (2013). Isolating age-group differences in working memory load-related neural activity: Assessing the contribution of working memory capacity using a partial-trial fMRI method. *Neuroimage*, 72, 20-32.
48. Di, X., Kannurpatti, S.S., Rypma, B. and Biswal, B.B. (2013). Calibrating BOLD fMRI activation with neurovascular and anatomical constraints. *Cerebral Cortex*, 23, 255-263.
49. Hutchison, J.L., Lu, H. and Rypma, B. (2013). Neural mechanisms of age-related slowing: The $\Delta\text{CBF}/\Delta\text{CMRO}_2$ ratio mediates age-differences in BOLD signal and human performance. *Cerebral Cortex*, 23, 2337-2346.
50. Shokri-Kojori, E., Motes, M., Rypma, B. and Krawczyk, D. (2012). The network architecture of cortical processing in visuo-spatial reasoning. *Nature Scientific Reports*, 2, 411.
51. Kannurpatti, S.S., Rypma, B. and Biswal, B.B. (2012). Prediction of task-related BOLD fMRI with amplitude signatures of resting-state fMRI. *Frontiers in Systems Neuroscience*, 6:7.
52. Hutchison, J.L., Hubbard, T.L., Ferrandino, B., Brigante, R., Wright, J.M. and Rypma, B. (2012). Auditory memory distortion for spoken prose. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 38, 1469-1489.
53. Bennett, I.J., Motes, M.A., Rao, N.K. and Rypma, B. (2012). Relationships between white matter integrity and visual search in healthy aging. *Neurobiology of Aging*, 33, 433.e21-e31.
54. Prabhakaran, V., Rypma, B., Narayanan, N.S., Meier, T.B., Austin, B.P., Nair, V.A., Naing, L., Thomas, L.E. and Gabrieli, J.D. (2011). Capacity-speed relationships in prefrontal cortex. *PLoS One*, 6, e27504.
55. Lu, H., Hutchison, J., Xu, F. and Rypma, B. (2011). The relationship between M in calibrated fMRI and the physiologic modulators of fMRI. *Open Neuroimage Journal*, 5, 112-119.
56. Kannurpatti, S.S., Motes, M.A., Rypma, B. and Biswal, B.B. (2011). Non-neural BOLD variability in block and event-related paradigms. *Magnetic Resonance Imaging*, 29, 140-146.
57. Motes, M.A., Biswal, B.B. and Rypma, B. (2011). Age-dependent relationships between prefrontal cortex activation and processing speed. *Cognitive Neuroscience*, 2, 1-10.
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Submitted Manuscripts

- Zuppichini, M.D., Sivakolundu, D.K., West, K.L., Okuda, D. and Rypma, B. (2021). Cerebellar-Parahippocampal Connectivity is Associated with Verbal Memory Impairment in Multiple Sclerosis. Submitted.
- Zuppichini, M., Sivakolundu, D.K., West, K.L., Okuda, D.T. and Rypma, B. (2021). Visual, cognitive, and motor components of processing speed in multiple sclerosis: Cognitive speed alone explains verbal, visuospatial, and working memory ability. Submitted.
- Zhao, Y., Turner, M. P., Motes, M.A., Hubbard, N. A., and Rypma, B. (2021) Domain-general frontal-parietal mechanisms underlying working memory-processing speed relationships: A multivariate fMRI analysis. Submitted.
- Okuda, D.T., Stanley, T., McCreary, M., Wilson, A., Santoyo, J., Hansen, M.R., Pinho, M., Yu, F., Newton, B.D., Billiet, T., Claes, J., Van Hecke, W., Ribbens, A., Zeydan, B., Kantarci, O., Rypma, B., Guo, X. and Moog, T. (2021). Black or African Americans Experience Disparate Pontine Surface Texture Changes and Brainstem Atrophy in Early Multiple Sclerosis. Submitted.

Thesis Manuscripts

- Rypma, B. (1994). Spatial cognitive processes and aging. Doctoral thesis, Georgia Institute of Technology.
- Rypma B. (1989). Investigations of attention and aging. Master's Thesis, Duke University.
- Rypma, B. (1983). Investigations of the pseudo-homophone effect in the lexical decision task. Honors Thesis, New York University.

Colloquia and Invited Talks

- Rypma, B. (2021). Neural-vascular coupling: Effects of age and consequences for neural efficiency and processing speed. Fifth Annual INOVA Art and Science of Brain Health Conference, Falls Church, VA.

- Rypma, B. (2021). What does the fMRI BOLD response measure? UT-Southwestern Advanced Imaging Research Center Research Seminar, UT-Southwestern Medical Center, Dallas, TX.
- Rypma, B. (2020). Neurovascular coupling: The brain basis of processing speed decline in aging. Psychology Dept. Colloquium, University of Nebraska – Lincoln, Lincoln, NE.
- Rypma, B. (2020). The neural-vascular complex and its role in cognitive aging. Psychology Dept. Colloquium, Louisiana State University, Shreveport, LA.
- Rypma, B. (2019). Age-related changes in the neurovascular unit: Neural activity, vascular activity and their roles in cognitive aging. Psychology Dept. Colloquium, Stony Brook University, Brookhaven, NY.
- Rypma, B. (2019). A failure to communicate: Age-related changes in neurovascular coupling, neural efficiency, and processing speed. Friedman Brain Institute Translational Neuroscience Seminar Series, Mount Sinai Medical Center, New York City, NY.
- Rypma, B. (2018). A neural-vascular complex of age-related changes in the human brain. Symposium presentation at the Society for Psychophysiological Research, Quebec City, Canada.
- Rypma, B. (2018). The physiologic basis of cognitive slowing. CAMRI Seminar Series, Baylor College of Medicine, Houston, TX.
- Rypma, B. (2017). Neural-vascular aging and its consequences for cognitive aging. Psychiatry Grand Rounds, University of Vermont Medical Center, Burlington, VT.
- Rypma, B. (2016). Cortical network efficiency underlies individual differences in processing speed. Invited symposium: 20 years of resting-state, contributions to understanding cognition. *Cognitive Neuroscience Society*, New York City, NY.
- Brigante, R. and Rypma, B. (2015). Metaphorical Priming of Music Concepts. Auditory Perception, Cognition and Action Meeting, Chicago, IL.
- Rypma, B. (2014). The role of neurovascular coupling changes in fMRI group-comparison studies. The Mahadevan Pillai Memorial Lectures: fMRI: Seeking New Frontiers, Department of Neuroimaging and Intervention Radiology, National Institute of Mental Health and Neuroscience, Bangalore, India.
- Rypma, B. (2014). A neural-vascular complex of age-related changes in the human brain. Reprogramming the Human Brain Symposium, Center for Brain Health, University of Texas at Dallas and University of Texas Southwestern Medical Center, Dallas, TX.
- Rypma, B. (2012). Connectivity dynamics underlying age differences in processing speed. Third Biennial Conference on Resting State Brain Connectivity, Magdeburg, Germany.

- Rypma, B. (2012). Measurement issues in neurocognitive aging: CBF/CMRO₂ mediation of age-related BOLD-signal changes. International Society for Behavioral Neuroscience, Half Moon Bay, CA.
- Rypma, B. (2012). Age-differential modulation of neural activity by dopamine during face recognition: A multimodal neuroimaging study using PET and fMRI. Cognitive Aging Conference, Atlanta, GA.
- Rypma, B. (2012). Taking the measure of neurocognitive aging: CBF/CMRO₂ mediation of age-related BOLD differences. University of Texas at Dallas Center for Vital Longevity, Dallas, TX.
- Rypma, B. (2011). CBF/CMRO₂ mediation of age-related changes in neural activity. Workshop on Plasticity and Aging, Nordic Center of Excellence, *Turun Yliopisto*, Turku, Finland.
- Rypma, B. (2011). Measuring age-related neural efficiency changes using constituents of the BOLD signal. Department of Neuroscience, *Karolinska Institutet*, Stockholm, Sweden.
- Rypma, B. (2011). Working memory, processing speed, and the neural basis of age-related cognitive change. Aging Research Center, *Karolinska Institutet*, Stockholm, Sweden.
- Rypma, B. (2010). A neural efficiency basis for age-related changes in performance. International Congress on Aging and Cognition, Dortmund, Germany.
- Rypma, B. (2010). Decision-making in the adolescent brain: A vortex of change. Symposium on Civil Commitment of Juvenile-Only Sex Offenders at the 118th Annual Meeting of the American Psychological Association, San Diego, CA.
- Rypma, B. (2010). Resting-state connectivity, effective state connectivity, and their relations to task performance. The Second Biennial Conference on Resting State Connectivity, Milwaukee, WI.
- Rypma, B. (2010). PFC mediation of age-related changes in processing efficiency. Dallas Aging and Cognition Conference, Center for Vital Longevity, University of Texas at Dallas, Dallas, TX.
- Rypma, B. (2008). Using Granger Causality Analysis to test hypotheses of individual differences in brain-behavior relationships. Workshop on Connectivity in the Resting Brain, Otto von Guericke University, Magdeburg, Germany.
- Rypma, B. (2008). Improving cognitive processes: What should be targeted? Center for Healthy Minds, Sarasota, FL.
- Rypma, B. (2007). Using fMRI to investigate the neural basis of working memory. Conference on Integrating Imaging and Genetics in Cognition, Royal Dutch Academy of Arts and Sciences, Amsterdam, Netherlands.

- Rypma, B. (2007). The challenge of change: How are cognitive functions preserved in the aging human brain? Reprogramming the Human Brain Symposium, Center for Brain Health, University of Texas at Dallas and University of Texas Southwestern Medical Center, Dallas, TX.
- Rypma, B. (2006). Individual differences in working memory: Effects of age and processing speed. Neurology-Psychiatry Grand Rounds, University of Texas-Southwestern Medical Center, Dallas, TX.
- Rypma, B. (2005). Neural mechanisms of working memory: Investigating effects of age and individual differences using event-related fMRI. University of Texas-Southwestern Medical Center Colloquium, Dallas, TX.
- Rypma, B. (2004). Individual differences in working memory: Effects of age and processing speed. Institute for Research in Cognitive Science Colloquium, University of Pennsylvania, Philadelphia, PA.
- Rypma, B. (2004). Dissociating age-related changes in working memory strategy and efficiency using event-related fMRI. 2nd International Conference on Working Memory, Kyoto, Japan
- Rypma, B. (2004). Dissociating age-related changes in cognitive strategy and neural efficiency using fMRI. Symposium on Neuroimaging of Individual Differences at the 34th Annual Meeting of the Society for Neuroscience, San Diego, CA.
- Rypma, B. (2003). Isolating the neural mechanisms of age-related changes in working memory: Effects of age and individual differences. Symposium presentation "Attention and working memory changes with aging" at the Society for Psychophysiological Research, Chicago, IL.
- Rypma, B. (2002). Dissociating age-related changes in cognitive strategy and neural efficiency using event-related fMRI. Cognitive Aging Conference, Atlanta, GA.
- Rypma, B. (2002). The neuroscience of individual differences in working memory performance. Kessler Rehabilitation Institute, West Orange, NJ.
- Rypma, B. (2001). Brain-behavior relationships and age-related changes in working memory. Psychology Dept. Colloquium, Barnard College, New York, NY.
- Rypma, B. (2001). Individual differences in human working memory: A neuroscience perspective. Psychology Dept. Colloquium, University of California - Davis, Davis, CA.
- Rypma, B. (2001). Age-related changes in human working memory: The role of individual differences in processing speed. Psychology Dept. Colloquium, University of Arizona, Tucson, AZ
- Rypma, B. (2000). Studies of individual differences in working memory using fMRI. Psychology Dept. Colloquium, University of California - Berkeley, Berkeley, CA.

- Rypma, B. (2000). The neural mechanisms of mental storage. Psychology Department Colloquium, San Diego State University, San Diego, CA.
- Rypma, B. (2000). Isolating the neural mechanisms of age-related changes in human working memory. Psychology Dept. Colloquium, University of Illinois, Urbana-Champaign, IL.
- Rypma, B. (1999). Isolating neural mechanisms of age-related cognitive change using fMRI. Psychology Department Colloquium, University of Delaware, Newark, DE.
- Rypma, B. (1999). FMRI studies of human working memory. *Universitätsklinikum Ulm*, Ulm, Germany.
- Rypma, B. (1999). Studies of working memory processes using fMRI. Psychology Department Colloquium, University of Aberdeen, Aberdeen, Scotland.
- Rypma, B. (1999). Neural correlates of human working memory: FMRI studies. Psychology Department Colloquium, Brooklyn College, Brooklyn, NY.
- Rypma, B., Prabhakaran, V., Smith, J.A.L., Desmond, J.E., Glover, G.H., and Gabrieli, J.D.E. (1997). Neural correlates of mathematical reasoning: An fMRI study of word-problem solving. Cognitive Science '97 Symposium on brain imaging: Measurement, modeling and high-level cognition, Stanford University, Palo Alto, CA.
- Rypma, B. (1996). FMRI of object identification and memory. Neuroradiology Grand Rounds, Mt. Sinai Medical Center, New York City, NY.
- Rypma, B. (1993). What do studies of mental rotation tell us about cognitive aging? Fourth Annual Sigma Phi Omega Conference for Gerontology and Geriatrics, University of Georgia, Athens, GA.

Abstracts

1. Zhao, Y., Abdelkarim, D., Turner, M.P., Liu, P., Hazel, K., Lu, H. & Rypma, B. (2023). Age differences in neurovascular coupling underlie working memory demand-dependent BOLD effects. Dallas Aging and Cognition Conference.
2. Taylor, M., Turner, M.P, West, K.L., Abdelkarim, D., Zhao, Y. & Rypma, B. (2023). Hemodynamic response variability and its relationship to behavior in younger and older adults. Dallas Aging and Cognition Conference.
3. Abdelkarim, D., Turner, M. P. Zhao, Y. Sivakolundu, D. West, K. Thomas, B. P. Lu, H. Rypma B. (2022). The Effects of Age on Relationships Between Neuropsychological Performance and Cerebral Oxygen Metabolism and Blood Flow International Neuropsychological Society Annual Meeting, New Orleans, LA.
4. Taylor, M., Turner, M.P, West, K.L., Abdelkarim, D., Zhao, Y. & Rypma, B. (2022). Hemodynamic response variability and its relationship to the BOLD signal in younger and older adults. Society for Neuroscience Annual Meeting, San Diego, CA.

5. Turner, M.P, Zhao, Y., Abdelkarim, D., Liu, P., Spence, J., Hutchison, J.L., Sivakolundu, D.K., Thomas, B.P., Hubbard, N.A., Lu, H. & Rypma, B. (2022). A tale of two systems: Altered linear coupling between blood flow and oxygen metabolism in the aging human brain. Society for Neuroscience Annual Meeting, San Diego, CA.
6. Abdelkarim, D., Turner, M. P. Zhao, Y. Sivakolundu, D. West, K. Thomas, B. P. Lu, H. & Rypma B. (2021). Relationships between cerebral metabolic rate of oxygen consumption during task and at rest in older adults. Society for Neuroscience Annual Meeting.
7. Zhao, Y., Abdelkarim, D., Turner, M.P., Hutchison, J.L., Sivakolundu, D.K., West, K.L., Thomas, B.P., Liu, P., Lu, H., Spence, J. & Rypma, B. (2021). *Age-related changes in neural-vascular coupling modulate load-induced parametric effects among younger and older adults in visual and cognitive tasks*. Society for Neuroscience Annual Meeting, Chicago, IL.
8. Zhao, Y., Abdelkarim, D., Turner, M. P., West, K. L., Hutchison, J., Sivakolundu, D. K., Thomas, B. P., Liu, P., Spence, J., Lu, H., & Rypma, B. (2020). Age-related differences in relationships between fMRI-measured cerebral baseline blood flow and processing speed. Psychonomic Society Annual Meeting.
9. Zuppichini, M.D., West, K.L., Sivakolundu, D.K., Okuda, D. & Rypma, B. (2019). Cerebellar Connectivity Changes Related to Cognition in Multiple Sclerosis. *Society for Neuroscience*, Chicago, IL.
10. Zhao, Y., Hubbard, N., Turner, M. P., Motes, M. P., & Rypma, B. (2019, November). Distributed neural activity during digit-symbol performance discriminates individual differences in working memory. *Psychonomic Society Annual Meeting*, Montréal, QC, Canada.
11. West, K.L., Sivakolundu, D.K., Maruthy, G.B., Zuppichini, M.D., Lu, H., Okuda, D.T. & Rypma, B. (2019). Baseline brain oxygen metabolism predicts fatigue in Multiple Sclerosis. *Society for Neuroscience*, Chicago, IL.
12. Zuppichini, M.D., West, K.L., Sivakolundu, D.K., Maruthy, G., Okuda, D. & Rypma, B. (2019). Verbal Memory Impairment in Multiple Sclerosis is explained by processing speed. *European Committee for Treatment and Research in Multiple Sclerosis*, Stockholm, Sweden.
13. West, K.L., Sivakolundu, D.K., Maruthy, G.B., Zuppichini, M.D., Lu, H., Okuda, D.T. & Rypma, B. (2019). Baseline brain oxygen metabolism predicts fatigue in Multiple Sclerosis. *European Committee for Treatment and Research in Multiple Sclerosis Annual Meeting*, Stockholm, Sweden.
14. Rypma, B., Sivakolundu, D. K., West, K. L., Zuppichini, M. D., Batchalli, G. M., Abdelkarim, D., Turner, M. P., Zhao, Y., Romero, R., Rao, S., & Okuda, D. (2019, October). Neural-vascular uncoupling in the hippocampus of multiple sclerosis patients: Could it explain multiple sclerosis-related memory deficits? *Society for Neuroscience Annual Meeting*, Chicago, IL.
15. West, K.L., Sivakolundu, D.K., Zuppichini, M.D., Maruthy, G.B., Lu, H., Okuda, D.T. & Rypma, B. (2019). Evaluating brain oxygen metabolism and cognition in multiple sclerosis. *International Society for Magnetic Resonance in Medicine*, Montreal, Canada.
16. Zuppichini, M.D., West, K.L., Sivakolundu, D.K. & Rypma, B. (2019). Relapsing-Remitting Multiple Sclerosis Patients with Slowed Cognitive Processing Speed are Impaired on Verbal, Visuospatial, and Working Memory measures. *Annual Meeting of the Consortium of Multiple Sclerosis Centers*, Seattle, WA.

17. Turner, M. P., Zhao, Y., Abdelkarim, D., West, K. L., Hutchison, J., Thomas, B. P., Lu, H., & Rypma, B. (2019). *Regional variation in neurovascular coupling changes: Effects of age and task demand*. Society for Neuroscience Annual Meeting, Chicago, IL.
18. West, K.L., Sivakolundu, D.K., Zuppichini, M.D., Maruthy, G.B., Okuda, D., Lu, H. & Rypma, B. (2019). Evaluating brain oxygen metabolism and cognition in multiple sclerosis. *International Society for Magnetic Resonance in Medicine*, Montréal, Canada.
19. Sivakolundu, D.K., West, K., Zuppichini, M., Abdelkarim, D., Turner, M., Zhao, Y., Hart Jr., J., Lu, H., Okuda, D. & Rypma, B. (2019) Neural-Vascular Uncoupling: The Pathophysiology of Cognitive Slowing in Multiple Sclerosis. *Americas Committee for Treatment and Research in Multiple Sclerosis Forum*, Dallas, TX.
20. West, K., Sivakolundu, D., Zuppichini, M., Turner, M., Himes, L., Turner, M., Lu, H., Okuda, D. & Rypma, B. (2019). Neural-Vascular Uncoupling Mediates Motor Performance Decline in Multiple Sclerosis. *Americas Committee for Treatment and Research in Multiple Sclerosis Forum*. Dallas, TX.
21. Zuppichini, M.D., West, K.L., Sivakolundu, D.K., Okuda, D., Hart, J., Spence, J. & Rypma, B. (2019). Processing Speed Explains Verbal Learning and Memory Ability in Relapsing-Remitting Multiple Sclerosis. *Americas Committee for Treatment and Research in Multiple Sclerosis Forum*, Dallas, TX.
22. Sivakolundu, D.K., West, K.L., Zuppichini, M., Abdelkarim, D., Turner, M., Zhao, Y., Hart, J., Okuda, D.T. & Rypma, B.(2018) Neural-vascular uncoupling explains cognitive slowing in multiple sclerosis. *European Committee for Treatment and Research in Multiple Sclerosis*. Berlin, Germany.
23. Sivakolundu, D. K., West, K. L., Batchalli, G. M., Zuppichini, M. D., Turner, M. P., Abdelkarim, D., Zhao, Y., Spence, J., Lu, H., Okuda, D., & Rypma, B. (2019). Reduced arterial compliance along the cerebrovascular tree predicts cognitive impairment in multiple sclerosis: Evidence for neural-vascular uncoupling hypothesis. *Society for Neuroscience Annual Meeting*, Chicago, IL.
24. Abdelkarim, D., Sivakolundu, D. K., Turner, M. P., Zhao, Y., West, K. L., Lu, H., & Rypma, B. (2019). Layer specific arteriovenous compliance in aging and age-related cognitive slowing. *Society for Neuroscience Annual Meeting*, Chicago, IL.
25. Abdelkarim, D.H., Turner, M.P., Sivakolundu, D.K., Zhao, Y., West, K.L, Thomas, B.P., Lu, H. & Rypma, B. (2018). Age-related decline in arterio-venous compliance and relationships to cognitive performance. *Society for Neuroscience*. San Diego.
26. Himes, L., Hubbard, N., Turner, M., Batchalli Maruthy, G. & Rypma, B. (2018). Connectivity differences with subgenual anterior cingulate cortex during self-referential processing in depressed and healthy participants. *Society for Neuroscience*. San Diego.
27. Sivakolundu, D., West, K.L, Abdelkarim, D.H., Zuppichini, M.D., Turner, M.P., Zhao, Y., Hart, J., Lu, H., Okuda, D. & Rypma, B. (2018). Neural-vascular uncoupling explains cognitive slowing in Multiple Sclerosis. *Society for Neuroscience*. San Diego.
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