

LUIS HERNANDEZ-GARCIA, Ph.D.

Research Professor
 Radiology Department
 Department of Biomedical Engineering
 University of Michigan

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 Ann Arbor, MI 48109 - 2108

**PROFESSIONAL EXPERIENCE**

1991: Intramural Research Training Assistant
 National Inst. of Environmental Health Science, Research Triangle Park, NC:

1993-1994: Graduate Research Assistant
 UNC School of Nursing, Chapel Hill, NC

1994 - 1995: Graduate Research Assistant
 UNC Magnetic Resonance Imaging facility, Chapel Hill, NC

1995 - 1997: Graduate Research Assistant
 Nathan Kline Institute, Orangeburg, NY

1997 - 1999: Research Fellow
 Department of Neurosurgery, Wake Forest University Medical School, Winston-Salem, NC

1999 - 2006: Assistant Research Scientist
 FMRI Laboratory and Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI

2006-2016: Associate Research Professor
 FMRI Laboratory and Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI

2014-2021: Co-Director
 University of Michigan's Engineering Preclinical Imaging Center

2016-2022: Research Professor
 FMRI Laboratory and Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI

2022-present: Research Professor
 Radiology department, University of Michigan, Ann Arbor, MI

EDUCATION

1988- B.S. in Applied Science.
 1992: University of North Carolina, Chapel Hill, NC

1992- M.S. in Biomedical Engineering.
 1994: University of North Carolina, Chapel Hill, NC

1994- Ph.D. in Biomedical Engineering under the supervision of Dr. Craig A. Branch, Doctoral
 1998: Dissertation: " Validity of the Steady State Model for Arterial Spin Tagging Cerebral Perfusion Measurements".
 University of North Carolina, Chapel Hill , NC

HONORS and AWARDS

1988–1992: Dean's List.

1991: Intramural Research Training Assistantship at the National Institute of Environmental Health Science, RTP, NC.

1992: James Crawford Award in the Applied Sciences.
 1995: Magnex Scientific Graduate Fellowship in Medical Physics.
 1997-1998: International Society for Magnetic Resonance in Medicine Student Travel Stipend
 1998: University of North Carolina at Chapel Hill: Student Travel Award, April 1998

PROFESSIONAL AFFILIATIONS

Biomedical Engineering Society.
 International Society of Magnetic Resonance in Medicine.
 Organization for Human Brain Mapping.

PROFESSIONAL ACTIVITIES

Created and taught course at University of Michigan: “Special Topics in FMRI” (2003)
 Co-organized the Bi-weekly Functional Neuroimaging seminar, University of Michigan: (2000-2005)
 Organized the Midwest Regional Fall symposium on MRI, Ann Arbor, Michigan, (2007)
 Advisor, Biomedical Engineering Society, UM student chapter, (2000 – 2008)
 Academic Advisor, Biomedical Imaging track, Biomedical Engineering Department, University of Michigan, (2000 – present)
 Admissions Committee for University of Michigan’s summer FMRI course, (2005-present)
 Created and Distributed ORTHO and F-ASL (Matlab libraries for visualization, ROI time series analysis, Granger Causality analysis, Arterial Spin Labeling FMRI analysis, 2002-present)
 Advisory Board Member for Pediatric Functional Neuroimaging Research Network (NIH contract – RFP No. NIH-NICHD-CRMC-09-20, PI: Scott Holland) - Cincinnati Children’s Hospital (2009-present)
 Co-organized the Monthly Transcranial Magnetic Stimulation Working group, University of Michigan: (2011-2013)
 University of Michigan FMRI Laboratory Operations Committee (2000-2011)
 University of Michigan FMRI Laboratory Advisory Executive Committee (2011 – present)
 Advisory Board member for Advances in Neuropsychiatric Treatment Conference, San Francisco, CA, (2012)
 University of Michigan FMRI Laboratory Strategic Planning Committee (2012 – present)
 Co-director of UM Biomedical Engineering High Field MRI facility (2014 – present)
 UM College of Engineering curriculum committee (2016- 2017)
 BME directed research matching program (2016- present)
 FMRI Laboratory Safety coordinator (2017- present)
 UM Laboratory and Research Safety Committee (LRSC) – (2017-2019)
 FMRI Laboratory Animal research director (2017- 2022)
 Organized University of Michigan International workshop on Arterial Spin Labeling (March 2019)
 Organized, coordinated and co-authored a series of consensus and review paper, nicknamed the “**ASL grey papers**” in the journal Magnetic Resonance in Medicine and with the endorsement of the ISMRM Perfusion Study group (2020-2023).
 International Society for Magnetic Resonance in Medicine: Perfusion Study Group Secretary (2022-2023)
 International Society for Magnetic Resonance in Medicine: Perfusion Study Group vice-chair (2023-2024)
 Organizing Committee of ISMRM workshop on “MRI of Neuromodulation: Target Engagement, Neural Mechanism & Biomarker Development” (2022)

UM BME department: graduate education committee (GEC), (2022-2023)

Member of Open Source Initiative for Perfusion Imaging (OSIPI) and lead of educational task force (2023-)

Guest Editor of

JOURNAL REVIEWING

Magnetic Resonance in Medicine (2004-)

Neuroimage (2008 -)

IEEE- Transactions in Biomedical Engineering (2010-)

NMR in Biomedicine (2004 -)

Magnetic Resonance Imaging (2006 -)

Human Brain Mapping (2006 -)

Biological Psychiatry (2008-)

Biomedical Signal Processing and Control (2012-)

Journal of Magnetic Resonance Imaging (2012-)

American Journal of Neuroradiology (2014 -)

Journal of Pain (2014-)

Journal of Cerebral Blood Flow and Metabolism (2015 -)

Medical Physics (2014-)

Neuropsychopharmacology (2018-)

IEEE – Transactions in Medical Imaging (2021 -)

Nature Communications (2020-)

GRANT REVIEWING

National Institute on Drug Abuse (NIDA) Imaging – Science Track Award for Research Transition (I/START) program (2008)

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) ad hoc review panel (2009)

National Institutes of Health Emerging Technologies and Training in Neurosciences IRG - Challenge grants (2009)

National Science Foundation, Cognitive Neuroscience Section, Major Research Instrumentation (MRI) ad hoc review panel (2010).

Cognitive Neuroscience Program at the National Science Foundation (2008)

National Institutes of Health, Small Business Grants: Clinical Neurophysiology, Devices, Auditory Devices and Neuroprosthesis (2011)

American Association for the Advancement of Science (AAAS), reviewer for Saudi Arabian government's scientific funding agency "King Abdulaziz City for Science and Technology (KACST)" (2011)

National Institutes of Health, Biomedical Imaging and Technology (BMIT-B) study section ad hoc reviewer (2013)

National Institutes of Health, Biomedical Imaging and Technology (BMIT-B) study section charter member (2014-18)

National Science Foundation, Experimental Program to Stimulate Competitive Research (EPSCoR) (2015)

Canada Foundation for Innovation, John R. Evans Leaders Fund (2019)

National Institutes of Health, Emerging Imaging Technology (EITN) study section ad hoc reviewer (2020-21).

National Institutes of Health, Emerging Imaging Technology (EITN) study section charter member (2021-2025).

PEER REVIEWED PUBLICATIONS

1. Kadiiska MGB, Hanna PM, **Hernandez L**, Mason RP: In vivo evidence of Hydroxyl Radical Formation after Acute Copper and Ascorbic Acid Intake: Electron Spin Resonance - Spin Trapping Investigation. *Mol. Pharmacology*, 42 (2): 723-729, 1993.
2. **Hernandez L**, Waag BJ, Hsiao HS, Neelon, VM: Development of a New Non-Invasive Monitoring System for Sleeping Subjects. *Physiological Measurement*, 16, 161-167, 1995.
3. Branch CA, **Hernandez L**, Yongbi M, Helpert JA: Rapid and Continuous Monitoring of Cerebral Perfusion by MRI Arterial Spin Tagging with Line Scan Assessment, *NMR in Biomedicine* 11, 1-11, 1998.
4. Bastings EP, Gage HD, Greenberg JP, Hammond G, **Hernandez L**, Hamilton CA, Moody DM, Singh KD, Ricci PE, Pons TP, Good DC: Co-registration of Cortical Magnetic Stimulation and Functional Magnetic Resonance Imaging. *Neuroreport* 9, 1941-1946, 1998. PMID: 9674571
5. EP Bastings, Y-F Yen, GL Hammond, JH Burdette, HD Gage, JP Greenberg, DM Moody, L **Hernandez**, DC Good, S Mc Dermott, TP Pons. Serial co-registration of fMRI and TMS mapping during motor recovery after stroke. *Stroke* 2000; 31:290
6. Weaver KD, Branch CA, **Hernandez L**, Claramae HM, Quattrocchi KB: Effect of Leukocyte-Endothelial Adhesion Antagonism on Neutrophil Migration and Neurologic Outcome after Cortical Trauma. *The Journal of Trauma*, vol 48, n. 6, pp. 1081 -1090, 2000
7. **Hernandez L**, Badre DT, Noll DN, Jonides J: Temporal Sensitivity of Event Related fMRI. *Neuroimage*, 17, 2,p.1018-1026 , 2002.
8. Sylvester CY, Wager TD, Lacey SC, Jonides J, Smith EE, **Hernandez L**, Nichols TE : Switching Attention and Resolving Interference: fMRI Measures of Executive Functions. *Neuropsychologia*, 41, 357-370
9. **Hernandez-Garcia L**, Lee GR , Vazquez AL, Noll DC: Fast, Pseudo-Continuous Arterial Spin Labeling for Functional Imaging Using a Two-Coil System, *Magnetic Resonance in Medicine* ,51,3,p.577-585, 2004, PMID: 15004800
10. Wager TD, Vazquez AL, **Hernandez-Garcia L**, Noll DC: Accounting for Nonlinear BOLD Effects in fMRI: Parameter Estimates and a Model for Prediction in Rapid Event-related Studies, *Neuroimage* 2005 Mar; 25 (1) :206-18. PMID: 15734356
11. **Hernandez-Garcia L**, Lee GR , Vazquez AL, Noll DC: Quantification of Perfusion FMRI using a numerical model of Arterial Spin Labeling accounting for dynamic transit time effects. *Magnetic Resonance in Medicine*, 54, 4, 955-954, 2005. PMID: 16155868
12. Vazquez AL, Lee GR, **Hernandez-Garcia L**, Noll DC: Application of selective saturation to image the dynamics of arterial blood flow during brain activation using magnetic resonance imaging, *Magnetic Resonance in Medicine*, 55, 4, 816-825, 2006, PMID: 16506156
13. Mumford JA, **Hernandez-Garcia L**, Lee GR, Nichols TE: Estimation Efficiency and Statistical Power in Arterial Spin Labeling FMRI. *Neuroimage*, 33 (1), 103-114, 2006, NIHMS144610, PMID: 16860577
14. Vazquez AL, Cohen ER, Gulani V, **Hernandez-Garcia L**, Zheng Y, Lee GR, Kim SG, Grotberg JB, Noll DC: Vascular Dynamics and BOLD fMRI: CBF Level Effects and Analysis Considerations. *Neuroimage*, 32 (4), 1642-1655, 2006. PMID: 16860574.
15. Lee GR, **Hernandez-Garcia L**, Noll DC: Functional Imaging With Turbo-CASL: Transit Time and Multislice Imaging Considerations. *Magnetic Resonance in Medicine*, 57(4), 661-669, 2007. PMID: 17390351

16. **Hernandez-Garcia, L.**, Lee, S., & Grissom, W. (2007). An approach to MRI-based dosimetry for transcranial magnetic stimulation. *Neuroimage*, 36(4), 1171-1178. PMID: 17509897
17. **Hernandez-Garcia, L.**, Lewis, D. P., Moffat, B., & Branch, C. A. (2007). Magnetization transfer effects on the efficiency of flow-driven adiabatic fast passage inversion of arterial blood. *NMR Biomed*, 20(8), 733-742. NIHMS144609, PMID: 17304639
18. Chowdhry P, Demeter EM, **Hernandez-Garcia L**: Optimizing CompCor in a cognitive ASL-FMRI experiment: A Sustained Attention Task. *NeuroImage*, Volume 47, Supplement 1, July 2009, Pages S59
19. **Hernandez-Garcia L**, Vazquez AL, Rowe DB: Complex analysis of arterial spin labeling based FMRI signals, *Magnetic Resonance in Medicine*, 62(6), 1597-1608, 2009. NIHMS144607. PMID: 19859934
20. **Tran**, TD, Heng W, Tandon, A, **Hernandez-Garcia, L**, Casey, KL: Evidence supporting a thalamocortical modulation of the temporal summation of heat pain in humans, *Pain*, Jul;150(1):93-102, 2010.
21. **Hernandez-Garcia L**, Jahanian H, Rowe DB: Quantitative Analysis of Arterial Spin Labeling FMRI Data Using a General Linear Model. *Magnetic Resonance Imaging*, 28 (7), Pages 919-927, 2010. [PMID: 20456889]
22. **Hernandez-Garcia L**, Hall TL, Gomez L, Michielssen E: A numerically optimized active shield for improved TMS targeting, *Brain Stimulation*, 2010 Oct;3(4):218-25. PMID: 20965451. [NIHMS 210101]
23. Jahanian H, Noll DC, **Hernandez-Garcia L**: B(0) field inhomogeneity considerations in pseudo-continuous arterial spin labeling (pCASL): effects on tagging efficiency and correction strategy 2011 , 65: 1570-1577; doi: 10.1002/mrm.22922. PMID 21446035.
24. **Hernandez-Garcia L**, Ulfarsson MO: Neuronal Event Detection in FMRI Time Series Using Iterative Deconvolution Techniques. *Magnetic Resonance Imaging*, 2011 Apr;29(3):353-64.. PMID: 21232893
25. Demeter E, **Hernandez-Garcia L**, Sarter M: Top-down control of attention: a continuous arterial spin labeling (ASL) study of the effects of distraction on sustained attention. *Neuroimage*, 2011 Jan 15;54(2):1518-29. PMID: 20851189
26. **Hernandez-Garcia L**, Jahanian H, Greenwald M, Zubieta JK, Peltier SJ: Real-Time Functional MRI Using Pseudo-Continuous Arterial Spin Labeling, *Magnetic Resonance in Medicine*, 2011 , 65: 1570-1577; doi: 10.1002/mrm.22922. PMID 21446035.
27. Demiralp E, Demiralp M, **Hernandez-Garcia L**: A Probabilistic Foundation for Dynamical Systems: Phenomenological Reasoning and Principal Characteristics of Probabilistic Evolution. *J. Mathematical Chemistry*, 2011, 1-11, doi:10.1007/s10910-011-9930-4.
28. Demiralp E, Demiralp M, **Hernandez-Garcia L** A Probabilistic Foundation for Dynamical Systems: Theoretical Background and Mathematical Formulation. *J. Mathematical Chemistry* 2012, vol. 50, n.4, pp. 850-869
29. Nielsen JF, **Hernandez-Garcia L**, Functional perfusion imaging using pseudocontinuous arterial spin labeling with low-flip-angle segmented 3D spiral readouts. *Magnetic Resonance in Medicine* 69, 382 (Apr 4, 2012).
30. Demiralp E, Jaeggi S, Buschkuehl M, Matta J, Thompson RJ, **Hernandez-Garcia L**, Feldman Barrett L, Ellsworth PC, Gotlib IH: Jonides J: Feeling Blue or Turquoise? Emotional Differentiation in Major Depressive Disorder. *Psychological Science* (2012), 23 (11); 1410-1416. (DOI: 0.1177 / 0956797612444903)
31. **Hernandez-Garcia L**, Buschkuehl M: Advances in Longitudinal fMRI diagnostic tests, *Expert Opinion on Medical Diagnostics*, (DOI:10.1517/17530059.2012.686995).
32. Schmithorst V , **Hernandez-Garcia L** , Vannest J, Rajagopal A, Lee G, Holland SK: Optimized Simultaneous ASL and BOLD Functional Imaging of the Whole Brain, *Journal of Magnetic Resonance Imaging*, (2013). doi: 10.1002/jmri.24273..

33. Gomez L, Cajko F, **Hernandez-Garcia L**, Grbic L, Michielssen E: Numerical Analysis and Design of Single-Source Multi-Coil TMS for Deep and Focused Brain Stimulation, *IEEE Transactions in Biomedical Engineering*, 2013, 60(10), 2771-2782. PMID: 23708768
34. **Hernandez-Garcia L**, Bhatia VR, Prem Kumar K, Ulfarsson M: Magnetic Resonance Imaging of time-varying magnetic fields from therapeutic devices, *NMR in Biomedicine*, 2013, 26(6), 718-724 (PMID: 23355446, NIHMS443960 , DOI: 10.1002/nbm.2919)
35. Jahanian H, Peltier SJ, Noll DC, **Hernandez-Garcia L**: "Arterial cerebral blood volume-weighted functional MRI using pseudocontinuous arterial spin tagging (AVAST)," *Magn. Reson. Med.*, 73: 1053-1062, (2015). (DOI:10.1002/mrm.25220)
36. Allen SP, Hall TL, Cain CA , **Hernandez-Garcia L**: Controlling Cavitation-Based Image Contrast in Focused Ultrasound Histotripsy Surgery. *Magn Reson Med*. 2015, 73: 204-213. doi: 10.1002/mrm.25115
37. Alsop DC, Detre JA, Golay X, Günther M, Hendrikse J, **Hernandez-Garcia L**, Lu H, MacIntosh BJ, Parkes LM, Smits M, van Osch MJP, Wang JJ, Wong EC, Zaharchuk G: Recommended Implementation of Arterial Spin Labeled Perfusion MRI for Clinical Applications: A consensus of the ISMRM Perfusion Study Group and the European Consortium for ASL in Dementia, *Mag. Res. Med.*, 73, p. 102-106 (2015), DOI 10.1002/mrm.25197
38. Buschkuehl, M., **Hernandez-Garcia, L.**, Jaeggi, S. M., Bernard, J. A., & Jonides, J. (2014). Neural effects of short-term training on working memory. *Cognitive, Affective & Behavioral Neuroscience*. doi:10.3758/s13415-013-0244-9
39. Schmithorst, V. J., Vannest, J., Lee, G., **Hernandez-Garcia, L.**, Plante, E., Rajagopal, A., & Holland, S. K. (2015). Evidence that neurovascular coupling underlying the BOLD effect increases with age during childhood. *Human brain mapping*, 36(1), 1-15.
40. Gomez, L. J., Yucel, A. C., **Hernandez-Garcia, L.**, Taylor, S. F., & Michielssen, E. (2015). Uncertainty quantification in transcranial magnetic stimulation via high-dimensional model representation. *Biomedical Engineering, IEEE Transactions on*, 62(1), 361-372.
41. Allen, S, **Hernandez-Garcia, L**, Cain, C, Hall T: MR-Based Detection of individual Histotripsy Bubble Clouds Formed in Tissues and Phantoms. *Magnetic Resonance in Medicine*. 76: 1486–1493, (2016)
42. Shah YS, **Hernandez-Garcia L**, Jahanian H, Peltier SJ, "Support vector machine classification of Arterial Volume-weighted Arterial Spin Tagging (AVAST) images", *Brain and Behavior*, 6, 1-8 (2016).
43. Allen, S; Vlasisavljevich, E; Shi, J; **Hernandez-Garcia, L**; Cain, Charles; Xu, Zhen; Hall, Timothy: "The Response of MRI Contrast Parameters in In Vitro Tissues and Tissue Mimicking Phantoms to Fractionation by Histotripsy". *Physics in Medicine and Biology*. (2017), v.62, n. 17, p. 7167-7180
44. **Hernandez-Garcia L**, Lahiri A, Schollenberger J. *NeuroImage Recent progress in ASL*. *Neuroimage* 2018;1–14. doi: 10.1016/j.neuroimage.2017.12.095.
45. Wright, K. L., Jiang, Y., Ma, D., Noll, D. C., Griswold, M. A., Gulani, V., & **Hernandez-Garcia, L.** (2018). Estimation of perfusion properties with MR Fingerprinting Arterial Spin Labeling. *Magnetic resonance imaging*, 50, 68-77.
46. **Hernandez-Garcia, L**, Nielsen, JF, Noll, DC: Improved sensitivity and temporal resolution in perfusion fMRI using velocity selective inversion ASL. (2018) *Magnetic Resonance in Medicine*, 00, 1-12. <https://doi.org/10.1002/mrm.27461>
47. Taylor, S. F., Ho, S. S., Abagis, T., Angstadt, M., Maixner, D. F., Welsh, R. C., & **Hernandez-Garcia, L.** (2018). Changes in brain connectivity during a sham-controlled, transcranial magnetic stimulation trial for depression. *Journal of affective disorders*, 232, 143-151.
48. Fan J, Tso IF, Maixner DF, Abagis T, **Hernandez-Garcia L**, Taylor SF. Segregation of salience network predicts treatment response of depression to repetitive transcranial magnetic stimulation. *NeuroImage Clin*. 2019;22:101719. doi: 10.1016/J.NICL.2019.101719.

49. Schollenberger, J, Figueroa, CA, Nielsen, J-F, **Hernandez-Garcia, L.** Practical considerations for territorial perfusion mapping in the cerebral circulation using super-selective pseudo-continuous arterial spin labeling. *Magn Reson Med.* 2019; 8(2): 1– 13. <https://doi.org/10.1002/mrm.27936>
50. Lahiri A, Fessler JA, **Hernandez-Garcia L.** Optimizing MRF-ASL scan design for precise quantification of brain hemodynamics using neural network regression. *Magn Reson Med.* 2019;(May 2019):1979-1991. doi:10.1002/mrm.28051
51. Clement P, Castellaro M, Okell T, Thomas D, Gorgolewski C, Appelhoff S, Petr J, Chappell M, Mutsaerts H-J , et al.. ASL-BIDS, the brain imaging data structure extension for arterial spin labeling. *Magn. Reson. Mater. Physics, Biol. Med.* 2019;32:S147--8. doi: 10.1007/s10334-019-00754-2.
52. Taylor SF, Lee TG, Jonides J, Tso IF, **Hernandez-Garcia L.** Theta Burst Transcranial Magnetic Stimulation of Fronto-Parietal Networks: Modulation by Mental State . *J Psychiatry Brain Sci.* 2020;5(3):e200011. doi:10.20900/jpbs.20200011
53. Guo J , Das S, and Hernandez-Garcia L. "Comparison of Velocity-Selective Arterial Spin Labeling Schemes." *Magnetic Resonance in Medicine*, 2020, 85(4), 2027-2039. doi:10.1002/mrm.28572.
54. Schollenberger, J., Harold Osborne, N., **Hernandez-Garcia, L.** & Figueroa, C. A. "A Combined Computational Fluid Dynamics and Arterial Spin Labeling MRI Modeling Strategy to Quantify Patient-Specific Cerebral Hemodynamics in Cerebrovascular Occlusive Disease". *Front. Bioeng. Biotechnol.* 9, 689 (2021).
55. Clement, Patricia, Petr, Jan, Dijsselhof, Mathijs B J, Padrela, Beatriz, Pasternak, Maurice, Dolui, Sudipto, Jarutyte, Lina, Pinter, Nandor, **Hernandez-Garcia, Luis**, Jahn, Andrew, Keil, Vera CA : Beginner's Guide to Arterial Spin Labeling (ASL) Image Processing. *Front. Radiol.* 2022;2:19. doi: 10.3389/fradi.2022.929533.
56. Qin, Qin, Alsop, David C., Bolar, Divya S., **Hernandez-Garcia, Luis**, Liu, Dapeng, Meakin, James A, Nayak, Krishna S., Schmid, Sophie, van Osch, Matthias J.P., Woods, Joseph G., Wong, Eric C., Zhao, Moss Y., Zaharchuk, Greg, Zun, Zungho, Guo, Jia, on behalf of the ISMRM Perfusion StudyGroup, Velocity-selective arterial spin labeling perfusion MRI : A review of the state of the art and recommendations for clinical implementation. *Magn. Reson. Med.* 2022:1–20. doi: 10.1002/mrm.29371.
57. **Luis Hernandez-Garcia**, Veronica Aramendia-Vidaurreta, Divya S. Bolar, Weiying Dai, Maria A. Fernández-Seara, Jia Guo, Ananth J. Madhuranthakam, Henk Mutsaerts, Jan Petr, Qin Qin, Jonas Schollenberger, Yuri Suzuki, Manuel Taso, David L. Thomas, Matthias J. P. van Osch, Joseph Woods, Lirong Yan, Ze Wang, Li Zhao, Moss Y. Zhao, Thomas W. Okell: "Recent Technical Developments in ASL: A Review of the State of the Art." *Magnetic Resonance in Medicine* 2022. Vol 88,(5), p 2021-2042, doi: 10.1002/mrm.29381.
58. Lee,S, Meyer BP, **Luis Hernandez-Garcia, L**, Kurpad, SN, Schmit, BD, Budde, MD: Comparison and optimization of pCASL and VSASL for Rat Thoracic Spinal Cord MRI at 9.4T, *Mag. Res. Med.*, 2023,p 1-13. doi:10.1002/mrm.29603
59. Taylor, S., Gu, P., Simmonite, M., Lasagna, C., Tso, I., Lee, T., Vesia, M. and **Hernandez-Garcia, L.** "Lateral prefrontal stimulation of active cortex with theta burst transcranial magnetic stimulation affects subsequent engagement of the frontoparietal network." *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* (2023).
60. Schollenberger, Jonas, Drew J. Braet, **Luis Hernandez-Garcia**, Nicholas H. Osborne, and C. Alberto Figueroa. "A magnetic resonance imaging-based computational analysis of cerebral hemodynamics in patients with carotid artery stenosis." *Quantitative Imaging in Medicine and Surgery* 13, no. 2 (2023): 1126.
61. Hong, T, **Hernandez-Garcia, L**, Fessler,JA: "A Complex Quasi-Newton Proximal Method for Image Reconstruction in Compressed Sensing MRI". *IEEE Transactions on Computational Imaging* (2024)
62. Woods, JG, Achten, E, Asllani, I, Bolar, DS, Dai, W, Detre, JA, Fan, AP, Fernández-Seara, M, Golay, X, Günther, M, Guo J, **Hernandez-Garcia L**, Ho ML, Juttukonda MR, Lu H, MacIntosh

- BJ, Madhuranthakam A, Mutsaerts HJ, Okell TW, Parkes LM, Pinter N6, Pinto J, Qin Q, Smits M, Suzuki Y, Thomas DL, Van Osch MJP, Wang DJJ, Warnert, EAH, Zaharchuk G, Zelaya F, Zhao M, Chappell MA: Recommendations for Quantitative Cerebral Perfusion MRI using Multi-Timepoint Arterial Spin Labeling: Acquisition, Quantification, and Clinical Applications, *Magn. Res. Med* (2024).
63. Qin, Qin, David C. Alsop, Divya S. Bolar, Luis Hernandez-Garcia, James Meakin, Dapeng Liu, Krishna S. Nayak et al. "Erratum to: Velocity-selective arterial spin labeling perfusion MRI: A review of the state of the art and recommendations for clinical implementation (*Magn Reson Med*. 2022; 88: 1528-1547)." *Magnetic resonance in medicine* (2024).

INVITED BOOK CHAPTERS AND ARTICLES

1. **Hernandez L**, Wager TD, Jonides J: "Introduction to Functional Brain Imaging" in Stevens' *Handbook of Experimental Psychology, Third Edition. Volume 4: Methodology in Experimental Psychology*. Edited by John Wixted and Hal Pashler, John Wiley and Sons, Inc New York, NY, 2002.
2. Wager TD, **Hernandez-Garcia L**, Jonides J: "Elements of Functional Neuroimaging", in Cacioppo, J. T., Tassinary, L. G., & Berntson, G. G: *Handbook of psychophysiology (3rd ed ed.)*. New York: Cambridge University Press.(2007)
3. **Hernandez-Garcia L**, Peltier SJ, Grissom W: "fMRI Hardware" in M. Filippi (ed.): *fMRI Techniques and Protocols*, Neuromethods, vol 41, Humana Press, 2009.
4. **Hernandez-Garcia L**, Jahanian H: "Perfusion Based Functional MRI" in *Functional Magnetic Resonance Imaging / Book 1*, edited by Papageorgiou TD, Christopoulos G, Smirnakis S, InTech Open Access Publisher,. ISBN 979-953-307-775-7. 2014
5. **Hernandez-Garcia L**, Muckley M: "fMRI Artifacts and their Correction" in *Brain Mapping: An Encyclopedic Reference* edited by A. Toga., Elsevier Pubublishing, Oxford, UK, 2015
6. **Hernandez-Garcia, L.**, Peltier, S., & Grissom, W. (2016). Introduction to Functional MRI Hardware. In *fMRI Techniques and Protocols* (pp. 29-67). Humana Press, New York, NY.
7. **Hernandez-Garcia L**, Lahiri A, Schollenberger J. *NeuroImage* Recent progress in ASL. *Neuroimage* 2018;1–14. doi: 10.1016/j.neuroimage.2017.12.095.

INVITED LECTURES

- 1) **Hernandez-Garcia, L** : "The Long Road toward Perfusion based fMRI". University of Michigan Symposium on functional MRI, September 2002.
- 2) **Hernandez-Garcia L**, Granovsky Y, Wang H, Casey K: "Thalamic and Cortical Responses during Pain: Time Series Analysis". University of Michigan Symposium on functional MRI, September 2003.
- 3) **Hernandez-Garcia L**: "Arterial Spin Labeling for Quantitative Functional MRI". Proceedings of the IEEE-EMBS meeting, San Francisco, CA, 2004
- 4) **Hernandez-Garcia L** : "Fast, Quantitative, Arterial Spin Labeling for functional MRI". Invited lecture at Purdue University's Biomedical Engineering Department seminar. November 2005.
- 5) **Hernandez-Garcia L** : "Footprints of Causality". University of Michigan Symposium on functional MRI, September 2006.
- 6) **Hernandez-Garcia L** : "The Footprints of Causality in FMRI Data". Duke University Brain Imaging and Analysis Center Seminar, March 2007.

- 7) **Hernandez-Garcia, L:** “Fast, Quantitative, Arterial Spin Labeling for functional MRI”. Invited lecture at Oakland University’s Physics Department seminar. November 2007.
- 8) **Hernandez-Garcia, L:** “Some interesting Topics in Non-invasive Human Brain Research”. Invited lecture at University of Michigan’s BMES, Feb. 2008.
- 9) **Hernandez-Garcia, L:** “Arterial Spin Labeling for FMRI: principles and current topics”, Cincinnati Children’s Hospital Medical Center, Radiology Department, Jan. 2010.
- 10) **Hernandez-Garcia, L:** “Arterial Spin Labeling for FMRI: principles and current topics”, Invited Lecture at Laboratorio de Analisis de Imagen Medica y Bioingenieria , Universidad Rey Juan Carlos, Madrid, Spain, Jun. 2010.
- 11) **Hernandez-Garcia, L:** “Overcoming the degradation of ASL by off-resonance effects”. Invited lecture at University of Pittsburgh’s Radiology Department, June 2010.
- 12) **Hernandez-Garcia, L:** “Longitudinal FMRI in Neuropsychiatric disorders using Arterial Spin Labeling”, Advances in Neuropsychiatric Treatment Conference, San Francisco, CA, Sept. 22-23, 2011
- 13) **Hernandez-Garcia, L:** “Longitudinal FMRI using Arterial Spin Labeling”, guest lecture at Albert Einstein College of Medicine’s MRRC. Oct. 24, 2011.
- 14) **Hernandez-Garcia, L:** “Arterial Spin Labeling-Based Real-Time fMRI”, Organization for Human Brain Mapping Educational Course, Beijing, China, 2012.
- 15) Wang JJ, Golay X, **Hernandez-Garcia L** , Zaharchuk G, Alsop D: “Recommended Implementation of Arterial Spin Labeling Perfusion MRI for Clinical Applications: Reaching Consensus , ISMRM virtual meeting, July 25, 2013.
- 16) **Hernandez-Garcia, L:** “Functional ASL: Perfusion based functional MRI using arterial spin labeling” Organization for Human Brain Mapping Educational Course, Hamburg, Germany, 2014 (Course organizer and speaker)
- 17) **Hernandez-Garcia L:** “ASL Acquisition Methods”. ISMRM annual meeting 2019, Montreal, QC, Canada. Basic Perfusion Educational Course.
- 18) **Hernandez-Garcia L:** “Quantitative hemodynamic imaging using velocity selective ASL fingerprinting and neural nets”. Imaging Cerebral Physiology webinar. School of Life Sciences, The University of Nottingham Medical School, Nottingham, United Kingdom. Jan 27, 2022
- 19) **Hernandez-Garcia L :** “Recent technical developments in ASL: A Review of the State of the Art”, ISMRM Perfusion Study Group workshop , “Perfusion MRI from Head to Toe”, Los Angeles, CA, USA, March 4-8, 2022
- 20) **Hernandez-Garcia L:** “New Developments in Arterial Spin Labeling”. British and Irish Chapter of the ISMRM educational series, April 8th, 2022
- 21) **Hernandez-Garcia L:** “Functional imaging and neuromodulation of the human brain: the long road to an effective closed-loop system”, University of Michigan Biomedical Engineering Society Symposium, May 4th, 2023.
- 22) **Hernandez-Garcia, L:** “Toward layer specific FMRI at 3T : velocity selective ASL and blood volume imaging”, guest lecture at Northwestern University’s Center for Translational Imaging, Sep. 5, 2023.

PRESENTATIONS

- 1) **Hernandez L., Branch CA:** Flow Velocity and MTC on the Efficiency of Adiabatic Fast Passage Inversion: Practical Considerations for Quantitative CBF Imaging. International Society for Magnetic Resonance in Medicine 1997 Annual Meeting.

- 2) **Hernandez**, L, Waag, BJ, Hsiao, HS, Neelon, VM: Non-Invasive Monitoring of Respiration in Sleeping Patients. Second Carolina Conference on Biomedical Engineering, 1994.
- 3) **Hernandez** L, Weaver KW, Branch CA: MRI of Acute Brain Trauma. 1995 Annual Research Review, University of N. Carolina at Chapel Hill Biomedical Engineering Dept.
- 4) **Hernandez** L, Branch CA, Helpen JA: Measurement of CBF with Arterial Spin Labeling: Microsphere Correlate and Error Analysis. International Society for Magnetic Resonance in Medicine 1998 Annual Meeting.
- 5) **Hernandez** L, Branch CA: Theoretical Effects of Magnetization Transfer on Inversion Efficiency in Steady State Arterial Inversion for Measurement of Cerebral Perfusion. International Society for Magnetic Resonance in Medicine 1998 Annual Meeting.
- 6) Branch CA, **Hernandez** L, Yongbi MN, Helpen JA: Line Scan Perfusion Measurement with Arterial Spin Labeling. International Society for Magnetic Resonance in Medicine 1998 Annual Meeting.
- 7) Branch CA, **Hernandez** L, Yongbi MN, Helpen JA: Estimation of Arterial Arrival Time and Cerebral Response Characteristics of Perfusion Measurements with Arterial Spin Labeling. International Society for Magnetic Resonance in Medicine 1998 Annual Meeting.
- 8) Bastings EP, **Hernandez** L, Greenberg JP, Hammond G, Good DC, Ricci P, Santago P, Gage HD: Does the Intact Hemisphere Participate in Hand Motor Recovery After Stroke? Evidence from TMS/fMRI Co-Registration. International Symposium on Transcranial Magnetic Stimulation, 1998.
- 9) Burdette, J, **Hernandez** L, Yen Y: Reproducibility of Motor fMRI: Spiral vs EPI. American Society of Neuroradiology Annual Meeting 1999.
- 10) **Hernandez** L, Yen YF, Bastings EP, Hammond G, Good DC, Greenberg JP, Pons TP, Ricci PE, Moody DM. : Functional Recovery of Motor Cortex after Stroke: functional MRI and Transcranial Magnetic Stimulation. International Society for Magnetic Resonance in Medicine 1999 Annual Meeting.
- 11) Simeral JD, Yen YF, **Hernandez** L, Pons TP, Hampson RE, Deadwyler SA :Comparison of Independent Component Analysis (ICA) and Statistical Parametric Mapping (SPM) Procedures in an fMRI Visual Activation Study. International Society for Magnetic Resonance in Medicine 1999 Annual Meeting.
- 12) Yen YF, **Hernandez** L, Burdette JH: Comparison of Reproducibility and Sensitivity of Motor Activation with Functional MRI Using EPI vs. Spiral Trajectory. International Society for Magnetic Resonance in Medicine 1999 Annual Meeting.
- 13) Yen YF, Takahashi A.M., Martin E.M., Burdette JH, **Hernandez** L, Moody DM: Quantitative Evaluation of Vasomotor Reactivity by Acetazolamide Challenge Using FAIR Perfusion MRI. International Society for Magnetic Resonance in Medicine 2000 Annual Meeting.
- 14) Martin EM, Yen YF, Takahashi AM, Burdette JH, **Hernandez** L, Moody DM. The cerebral stress test—reproducibility of vasomotor reactivity using quantitative perfusion with arterial spin labeling technique and acetazolamide challenge. Proceedings of the American Society of Neuroradiology 38th Annual Meeting, Atlanta, Georgia. April 3-8, 2000.
- 15) Branch CA, **Hernandez** L, Lewis DP: Degradation of Efficiency of Steady State Arterial Inversion due to Magnetization Transfer in the Blood: Further Evidence. International Society for Magnetic Resonance in Medicine 2000 Annual Meeting.
- 16) Burdette JH, Yen YF, Takahashi AM, Martin EM, Field AS, **Hernandez** L. Arterial spin labeling perfusion MRI: Applications to acute cerebral infarction. 86th Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, Illinois, November 26-December 1, 2000. Abstract: Radiology 2000;217:421 Suppl S.
- 17) Field AS, Yen Y-F, Martin EM, Burdette JH, Takahashi AM, **Hernandez** L, Moody D. Reproducibility of cerebral vasoreactivity measurements using flow-sensitive alternating inversion recovery (FAIR) perfusion MR and acetazolamide challenge. 86th Scientific Assembly and Annual

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- 18) Helpert JA, Branch CA, Huang N, **Hernandez L**: Impaired Autoregulation with Hyperglycemia. International Society for Magnetic Resonance in Medicine 2000 Annual Meeting.
 - 19) Badre DT, Jonides J, **Hernandez L**, Noll DC, Smith EE, Chenevert TL: Behavioral and neuroimaging evidence of dissociable switching mechanisms in executive functioning. J. Cognitive Neurosci. 108-108 2E Suppl. S, 2000
 - 20) Vazquez AL, **Hernandez L**, Noll DN: Biomechanical Model of Brain Vasculature. International Society for Magnetic Resonance in Medicine 2001 Annual Meeting.
 - 21) **Hernandez L**, Noll DN, Badre DT: Temporal Shift Sensitivity of Event Related fMRI. International Society for Magnetic Resonance in Medicine 2001 Annual Meeting
 - 22) Sylvester CY, Lacey SC, Jonides J, Wager TD, Smith EE, **Hernandez L**: Switching Tasks and Resolving Interference are Distinct Processes. Annual meeting of the Psychonomic Society. 2001
 - 23) Wager TD, Noll DC, **Hernandez-Garcia L**, Nichols TE, Bryck R, Smith EE, Jonides J : Characterizing the nonlinearities of the BOLD responses in human visual cortex, Human Brain Mapping Annual Meeting, 2001
 - 24) Sylvester CYC, Lacey SC, Jonides J, Wager TD, Smith EE, **Hernandez L** :Switching tasks and resolving interference are distinct processes. 42nd Annual Meeting of the Psychonomic Society.
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 - 26) Wager TD, Jonides J, Smith EE, **Hernandez L**, Noll DC: Response conflict and cognitive control: Item and set-related activations in a stroop-like task. J. Cognitive Neurosci. 128-128 E32 Suppl. S, APR 2002
 - 27) **Hernandez-Garcia L**, Peltier S, Kroger JK, Berman M, Noll DC: Neuronal inhibition and the negative BOLD response. Human Brain Mapping annual meeting, 2003.
 - 28) Lee GR, **Hernandez-Garcia L**, Vazquez A, Noll D: A Fast Perfusion Measurement for Functional Imaging Using Double-Coil AST, . International Society for Magnetic Resonance in Medicine 2003 Annual Meeting
 - 29) **Hernandez-Garcia L**, Lee GR, Vazquez AL, Noll DC: Modeling the ASL Signal Under Dynamically Changing Perfusion and Arterial Transit Time: Considerations for Event Related FMRI. International Society for Magnetic Resonance in Medicine 2004 Annual Meeting.
 - 30) Vazquez AL, Lee GR, **Hernandez-Garcia L**, Noll DC: Arterial Volume Imaging by Saturation: A New MRI Method for Dynamic CBV Imaging, International Society for Magnetic Resonance in Medicine 2004 Annual Meeting.
 - 31) Lee GR, **Hernandez-Garcia L**, Noll DC: Effects of Activation Induced Transit Time Changes On Functional Turbo ASL Imaging. International Society for Magnetic Resonance in Medicine 2004 Annual Meeting.
 - 32) Vazquez AL, Lee GL, **Hernandez-Garcia L**, Noll, DC: Arterial Volume Imaging by Saturation (AVIS): A New MRI Method for Dynamic Cerebral Blood Volume Imaging, Organization for Human Brain Mapping, Meeting, 2004
 - 33) Matre D, Tran TD, **Hernandez L**, Morrow TJ, Casey KL: The contribution of A-delta fibers to pain at threshold: an fMRI analysis. Proceedings of the Society for Neuroscience annual meeting, 2004.
 - 34) **Hernandez-Garcia L**, Nichols TD, Noll DC: Estimation Efficiency and Bias in ASL-based functional MRI : Frequency Responses of the differencing methods. Human Brain Mapping annual meeting, 2005
 - 35) **Hernandez-Garcia L**, Nichols TD, Lee GR, Noll DC: Dependence of the Estimation Efficiency and Bias in perfusion-based functional MRI on the Frequency Response of the differencing method. International Society for Magnetic Resonance in Medicine 2005, 1581

- 36) Vazquez AL, Gulani V, Lee GR, **Hernandez-Garcia L**, Noll DC: Estimating Dynamic CMRO₂ Changes From CBF and BOLD fMRI Data, International Society for Magnetic Resonance in Medicine 2005.
- 37) Mumford J, **Hernandez L**, Nichols T: Maximizing Power with Arterial Spin Labeling fMRI, Joint Statistical Meetings, 2005
- 38) Tran TD, Wang H, Aashoo T, **Hernandez-Garcia L**, Casey KL: Thalamocortical mechanisms modulating temporal summation of heat pain. International Association for the Study of Pain Annual Meeting, 2005.
- 39) Lee GR, L. **Hernandez-Garcia L**, Noll DC . Effect of Tag Dispersion On Fast ASL Methods, Proc. International Society for Magnetic Resonance in Medicine 2006. p. 671
- 40) Lee, S, **Hernandez-Garcia L**, Grissom W: MRI based measurement of magnetic field distribution generated by transcranial magnetic stimulation coils . Proc. International Society for Magnetic Resonance in Medicine 2006.
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- 45) Rowe DB, **Hernandez-Garcia L**, Lee GR : Complex analysis of ASL fMRI data yields more focal activation, Proc. International Society for Magnetic Resonance in Medicine 2007, p. 1422
- 46) Hall T, Lee GR, **Hernandez-Garcia L**: Relaxation Properties of Cavitation Induced Tissue Lesions, International Society for Magnetic Resonance in Medicine 2007, p. 1118
- 47) Lee GR, **Hernandez-Garcia L**: Rapid Measurement of Transit Time, CBF, M0 and T1 With Turbo-CASL, Proc. International Society for Magnetic Resonance in Medicine 2007, p. 3483
- 48) **Hernandez-Garcia L**, Ulfarsson MO, Scott DJ, Zhang H: Detection of Causal Relationships in BOLD FMRI using Dominance: Bootstrapping Statistical Inference. Human Brain Mapping Annual Meeting, p.765, 2007
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- 52) **Hernandez-Garcia L**, Rowe D.B.: "Phase Modeling in Arterial Spin Labeling FMRI" , Human Brain Mapping Annual Meeting, p.519, 2008
- 53) **Hernandez-Garcia L**, Peltier SJ, Rezaie M: Granger Causality analysis of the default network, Human Brain Mapping Annual Meeting, p.562, 2008
- 54) Rezaie MG, **Hernandez-Garcia L**: Total variation approach for high temporal resolution event detection in fMRI, Human Brain Mapping Annual Meeting, p.466, 2008

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- 57) Jahanian H., **Hernandez-Garcia L** , Noll DC: Correcting for off-resonance induced degradation of inversion efficiency in pseudo-continuous ASL. Proc. International Society for Magnetic Resonance in Medicine 2009, p.1518.
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- 59) Chowdhry P, Demeter EM, **Hernandez-Garcia L**: Optimizing CompCor in a cognitive ASL-fMRI experiment: A Sustained Attention Task. Organization for Human Brain Mapping Annual Meeting, 2009.
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- 61) Jahanian H, Noll DC, **Hernandez-Garcia L**: Reduced specific absorption rate (SAR) pseudo-continuous arterial spin labeling, Proc.International Society for Magnetic Resonance in Medicine 2010.
- 62) Jahanian H, Noll DC, **Hernandez-Garcia L** : Optimizing the inversion efficiency of pseudo-continuous ASL pulse sequence using B0 field map information. Proc. International Society for Magnetic Resonance in Medicine 2010.
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- 64) Gomez L, **Hernandez L**, Grbic A, Michielssen E: A Simulation of Focal Brain Stimulation using Metamaterial Lenses, International Union of Radio Science (URSI), 2010.
- 65) **Hernandez-Garcia L**, Hall T. "A numerically optimized active shield for improved TMS targeting". Organization for Human Brain Mapping, 2010, abs. 2115
- 66) **Hernandez-Garcia L**, Buschkuhl M, Jaeggi S, Jonides J: Training effects on brain activity during working memory tasks: an ASL study. Organization for Human Brain Mapping Annual Meeting, 2010, abs. 2139.
- 67) **Hernandez-Garcia L** , Jahanian H, Peltier S, Real-Time Functional MRI Using Arterial Spin Labeling, Organization for Human Brain Mapping Annual Meeting, 2010, abs. 3482
- 68) Schmithorst V, **Hernandez-Garcia L**, Vannest J, Holland S: A technique for obtaining simultaneous ASL/BOLD functional MRI contrast in the whole brain, Organization for Human Brain Mapping Annual Meeting, 2010, abs.3467
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- 72) Gomez L, **Hernandez-Garcia L**, Michielssen E, Grbic A: "Focused Multi-Coil Transcranial Magnetic Stimulation," International Union of Radio Science (URSI), 2011.
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- 78) Jahanian H, Peltier S, Noll DC, **Hernandez-Garcia L**: Arterial cerebral blood volume (CBVa) weighted functional MRI using pseudocontinuous arterial spin labeling. Proc. International Society for Magnetic Resonance in Medicine 2012.
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- 80) Li DS, Allen SP, **Hernandez-Garcia L**, Bull JL, Carson PL: Focused ultrasound release of encapsulated drugs and hormones to treat and understand local brain function. Michigan M-Cubed symposium, 2013
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- 85) **Hernandez-Garcia L**: A simple method to image time-varying magnetic fields inside the body using MRI . Proc. International Society for Magnetic Resonance in Medicine 2013. (1844)
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- 91) Schmithorst VJ, Vannest J, Lee GR, **Hernandez-Garcia L**, Plante E, Rajagopal A, Holland SK: What You See Is Not What You Get: BOLD Signal Increases with Age in Children May Be the

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 - 94) Gomez, L.; Abdulkadir, Y.; **Hernandez-Garcia, L.**; Taylor, SF; Michielssen, E : "Sensitivity of TMS-Induced Electric Fields to the Uncertainty in Coil Placement and Brain Anatomy". Antennas and Propagation Society International Symposium (APSURSI), July 2014. (1384)
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 - 97) Hamilton J, Wright KL, Jiang Y, **Hernandez-Garcia L.**, Ma D, Griswold M, Seiberlich N. "Pulse sequence optimization for improved MRF scan efficiency." In Proceedings of the 23rd Annual Meeting of ISMRM, Toronto, Canada, p. 3386. 2015.
 - 98) Luo T, **Hernandez-Garcia L.**: "Inflow velocity density mapping using Fourier Analysis of Velocity Selective ASL images" Proc. International Society for Magnetic Resonance in Medicine 2014 (in review)
 - 99) **Hernandez-Garcia L.**, Ho SS, Abagis T, Maixner DF, Taylor SF: Effects of repetitive transcranial magnetic stimulation on Major Depressive Disorder: an ASL study of working memory. Organization for Human Brain Mapping Annual Meeting 2015
 - 100) **Hernandez-Garcia L.**, Shah Y, Zubietta JK, Greenwald M, Peltier SJ: Dynamic brain activity changes during induced nicotine craving: an ASL study. Organization for Human Brain Mapping Annual Meeting 2015
 - 101) Tessa Abagis, S. Shaun Ho, Daniel F. Maixner, **Luis Hernandez-Garcia**, Stephan F. Taylor (2015). Effect of transcranial magnetic stimulation treatment on resting state connectivity in depression. Poster presented at the 26th Annual Albert J. Silverman Research Conference, Ann Arbor, MI.
 - 102) Taylor SF, Ho SS, Maixner DF, Abagis T, **Hernandez-Garcia L.**: Transcranial magnetic stimulation and resting state connectivity in depression, Society for Biological Psychiatry annual meeting 2015.
 - 103) Allen S, **Hernandez-Garcia L.**, Cain C, Hall T : "Response of MR Contrast Parameters in Tissues and Tissue Mimicking Phantoms to Histotripsy". International Society for Magnetic Resonance in Medicine 2016, n. 2122.
 - 104) **Hernandez-Garcia L.**, Nielssen JF, Noll, DC : Velocity Selective Adiabatic Pulses for Arterial Spin Labeling International Society for Magnetic Resonance in Medicine 2016, n. 1008.
 - 105) Schollenberger JS, C. Alberto Figueroa, **Luis Hernandez-Garcia**: Improved labeling efficiency in Super-Selective Pseudo-Continuous Arterial Spin Labeling. International Society for Magnetic Resonance in Medicine 2017 meeting, #58
 - 106) Wu, Ziqi, **Hernandez-Garcia L.**: MR thermometry of a novel focused ultrasound application in post-mortem skin . International Society for Therapeutic Ultrasound meeting 2017
 - 107) Li Y, **Hernandez-Garcia L.**, Hall T, Cain C : Localized currents generated by simultaneous ultrasound and oscillating magnetic fields. 2nd International Brain Stimulation Conference 2017

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- 109) Katherine L. Wright, Yun Jiang, Dan Ma, Douglas C. Noll, Mark A. Griswold, Vikas Gulani, **Luis Hernandez-Garcia**, Sensitivity of MR Fingerprinting ASL to Hemodynamic Parameters. in ISMRM Workshop on Magnetic Resonance Fingerprinting (2017).
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- 111) Lahiri, Anish , Fessler, Jeffrey, **Hernandez-Garcia, L** . Optimized Scan Design for ASL Fingerprinting and Multiparametric Estimation using Neural Network Regression, International Society for Magnetic Resonance in Medicine 2018 meeting, p 309.
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- 113) **Hernandez-Garcia, L**, Nielsen, Jon-Fredrik, Noll, Douglas . Velocity Selective Inversion improves the sensitivity and speed of perfusion weighted FMRI, International Society for Magnetic Resonance in Medicine 2018 meeting, n. 5458
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- 115) Lahiri A, Fessler J, **Hernandez-Garcia L**. Optimizing MRF-ASL Scan Design towards Precise Quantification of Hemodynamic Properties in Cerebrovascular Disorders. International Society for Magnetic Resonance in Medicine 2019 meeting
- 116) Schollenberger J, Figueroa CA, **Hernandez-Garcia L**. Quantification of cerebral perfusion fraction map using cardiac-triggered, off-resonance calibrated super-selective arterial spin labeling . International Society for Magnetic Resonance in Medicine 2019 meeting
- 117) Lahiri A, Fessler JA, **Hernandez-Garcia L**. Optimizing MRF-ASL Scan Design for Precise Quantification of Brain Hemodynamics , University of Michigan Workshop on Arterial Spin Labeling, 2019.
- 118) Schollenberger L, Figueroa CA, **Hernandez-Garcia L**. Accurate quantification of vascular territories using super-selective PCASL - Pitfalls and solutions. University of Michigan Workshop on Arterial Spin Labeling, 2019.
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- 127) Tamaddon HA, Hall TA, Choi D, **Hernandez-Garcia L**: Multi-focal ultrasound neuromodulation: a feasibility study. International Brain Stimulation Conference, Dec 6-9, 2021, n. 120
- 128) **Hernandez-Garcia L** : “Recent technical developments in ASL: A Review of the State of the Art”, ISMRM Perfusion Study Group workshop , “Perfusion MRI from Head to Toe”, Los Angeles, CA, USA, March 4-8, 2022
- 129) Frey, DJ, Fessler JA, Noll DC, **Hernandez-Garcia L**: Fast, Isotropic, Whole Head Perfusion Imaging Using A Spin Echo Rotating In-Out Spiral With Velocity Selective Arterial Spin Labeling, Proc. ISMRM 2023, n.2749
- 130) Hong T, Fessler JA, **Hernandez-Garcia L**: Complex Quasi-Newton Proximal Methods For The Image Reconstruction In Compressed Sensing MRI. Proc. ISMRM 2023, n. 4953
- 131) **Hernandez-Garcia L**, Frey DJ, Nielsen JF, Noll DC: Blood Volume Based Functional MRI Using Velocity Selective Pulses And SERIOS Readout , Proc. ISMRM 2023, n.920
- 132) Hong, Tao, **Hernandez-Garcia, L**, Fessler JA, A Fast Double Stochastic Proximal Method for CS-MRI Reconstruction with Multiple Wavelets. Proc. ISMRM 2024, 4999
- 133) Hong,T, Frey D, **Hernandez-Garcia L**, Fessler J. “Optimizing Sampling Trajectories for ASL-MRF: An Unsupervised Way”, 2024 SIAM Conference on Imaging Science.

PATENTS/INVENTION DISCLOSURES

- 1) Schmitthorst, V, Holland S, VanNest J, Hernandez-Garcia, L < Simultaneous ASL/BOLD functional MRI – filed 5/31/2011, Pub. No: 2012/0139537 A1 (25%)
- 2) Hernandez-Garcia L, Michielssen E, Grbic A, Goetz L; Multi-coil Transcranial Magnetic Stimulation - filed 1/13/2014, PCT International Application PCT/14/130,707 (25%)
- 3) Hernandez-Garcia L, Wright K, Griswold M, Gulani V, Ma D: Arterial Spin Labeling with MR Fingerprinting: Simultaneous Quantification of CBF, Transit Time and T1, disclosed on 3/28/2014 at Case Western Reserve University, (17%)
- 4) Allen S, Hall, T, Cain C, Hernandez-Garcia L: Detecting and Localizing Ultrasound Bubble Clouds Using Magnetic Resonance Imaging,(33%) disclosed July 10, 2015 to Tech Transfer Office at UM.

Ph.D. Committees chaired/co-chaired

- 1) Gregory Lee, Spring 2007, “Functional Magnetic Resonance Imaging with Arterial Spin Labeling: A novel pulse sequence and quantitative model”. Co-chair, Current position: Assistant Professor, Radiology, Cincinnati Children’s Hospital Medical Center.
- 2) Hesamoddin Jahanian, Spring 2012, “Functional MRI using pseudo-continuous arterial spin labeling”. Co-chair, Current Position: Research Fellow, Department of Radiology, Stanford University.
- 3) Jonas Schollenberger, Winter 2021, “Characterization of Cerebral Hemodynamics using a Computational Fluid Dynamics and Arterial Spin Labeling MRI Strategy: Applications in Cerebrovascular Occlusive Disease”
- 4) Anish Lahiri, Winter 2021, “Learning-based Algorithms for Inverse Problems in MR Image Reconstruction and Quantitative Perfusion Imaging”

Other Ph.D. committee membership

- 1) Alberto Vazquez, 2005, "The dynamics of the blood oxygenation response in functional magnetic resonance imaging", Research Assistant Professor, Neurobiology and Radiology, University of Pittsburgh.
- 2) Timothy Hall, 2007, "Histotripsy: non-invasive ultrasound surgery", Assistant Research Scientist, University of Michigan.
- 3) Michael Franklin, 2008, "The representation and processing of order information in memory"
- 4) Kiran Pandey, 2009, "Mitigation of Motion Artifacts in Functional MRI: A Combined Acquisition, Reconstruction and Post Processing Approach "
- 5) Yoon-Chung Kim, 2011, "Non-Cartesian parallel image reconstruction for functional MRI"
- 6) Elise Demeter, 2011, "Translational research on sustained attention and attentional control in rats, healthy humans and patients with schizophrenia", current position, post doctoral associate, cognitive neuroscience.
- 7) Emre Demiralp, 2012, "Structure and Dynamics of Emotional Experience in Depression"
- 8) Siamak Davarani, 2013, "Parametric Modeling of the Brain Vascular System and its Application in Dynamic Contrast-Enhanced Imaging Studies "
- 9) Luis Gomez, 2014, "Computational electromagnetic tools for transcranial magnetic stimulation"
- 10) Angela Harrivel, 2014, "Monitoring attentional state with functional near infrared spectroscopy",
- 11) Yash Shah, 2015, "Methods and Applications of Multivariate Pattern Analysis in Functional MRI Data Analysis"
- 12) Steven Allen, 2016, "Magnetic Resonance Imaging Guidance for Histotripsy Therapy"
- 13) Matthew Muckley, 2016, "Acceleration Methods for MRI"
- 14) Rachel Surowiec, 2019, "Novel Models to Image and Quantify Bone Drug Efficacy and Disease Progression In Vivo: Addressing the Fragility Phenotype"
- 15) Yige Li, 2019, "Monopolar Acoustic Pulses in Histotripsy and Other Applications"
- 16) Josiah Simeth, 2020, "Quantifying Regional and Global Liver Function Via Gadoteric Acid Uptake"
- 17) Sofia Guterres, 2020, "Brain perfusion imaging using pseudo-continuous arterial spin labelling MRI: impact of coil shimming of the labelling region "(Biomedical Engineering, Universidade de Lisboa, Libon, Portugal)
- 18) Nicholas Luciw, 2022, "Arterial Spin-Labelled MRI Analyses to Advance Adolescent Bipolar Disorder Research and Clinical Applications", (Department of Medical Biophysics, University of Toronto, Toronto, Canada)

GRANT SUPPORT HISTORY

"Modeling the BOLD Response Accounting for Perfusion Effects: Simultaneous BOLD imaging and two-coil Arterial Spin Labeling"

UM Center for Biomedical Engineering Research. (PI: **Hernandez**), 1/1/2000 – 1/1/2001

The BOLD effect is a combination of several phenomena associated with increased brain activity that result in a subtle signal change (~5-10 %). These phenomena include an increase in blood flow to the active region, and a change in the T2* relaxation constant, due to the increase in deoxy-hemoglobin. In this project we propose a model that treats the vascular bed as an expandable compartment, where changes in blood flow affect the volume of the compartment. Blood flow is an essential parameter of our model and a direct measurement would help assess its validity. Here we propose an implementation of the ASL method to measure the blood flow component of the BOLD effect, rapid and continuously that will help us verify our model, and that can be employed for ASL-based functional imaging experiments.

“Forebrain mechanism in chronic non-neuropathic pain” (10%)

(National Institutes of Health 5R01AR46045-02 (P.I.: Casey) 9/30/00-8/31/03

The major goal of this project is to identify mechanisms for pain perception differentiate between pain responses in normal subjects and patients who suffer from chronic neuropathic pain. This project also aims to differentiate the neural substrates of the slow and fast pain responses. My role on the project as co-investigator is to design and conduct the functional MRI experiments described in the project. I am also responsible for the fMRI data processing and analyses.

“Elimination of Head Movement Artifact in fMRI” (20%)

National Institutes of Health, PI: D. Noll 09/30/03-9/28/08

The long-term goal of this project is to develop image acquisition protocols, reconstruction approaches and post-processing methods that will improve on the effectiveness of head movement correction in fMRI.

“Signal Recovery in Susceptibility Based Functional MRI” (20%)

National Institutes of Health R01 DA15410-01 (P.I.:Noll) 7/1/02-6/30/07

This project involves the development of methods for improved imaging in inferior frontal cortex, inferior and medial temporal lobes, and brain stem areas.

“Mechanisms in Chronic Multisymptom Illnesses” (10%)

Dept. of Defense DAMD, 17 00 2 0018 (PI: DJ Clauw) 2/01/00 -7/31/05

This multi-phase investigation seeks to identify physiological and psychological factors contributing to the spectrum of illness known as CMI. Part 1 involves cross-sectional investigations of physiological responses to experimentally induced stressors. Part 2 involves pharmaceutical and non-pharmaceutical treatment trials for CMI. This includes web-based and telemedicine implementations of cognitive behavioral therapy (CBT) and exercise protocols. My role is to investigate differences in cerebral perfusion between controls and patients at baseline and during noxious stimulation.

“Fast, Quantitative Perfusion-Based functional MRI” (30%)

National Institutes of Health, 1 R01 EB004346-01 (PI: **Hernandez**) 7/1/05-6/30/08

This project proposes a system to perform rapid event related fMRI experiments using arterial spin labeling techniques with optimum SNR and speed. The new methods will require a new modeling approach for quantification. The project also aims to characterize the perfusion response function to neuronal activity, and to study the noise properties of ASL time series data.

“MRI Parallel Excitation for Neuroimaging Applications” (20%)

National Institutes of Health, RFA : PAR-04-023, (PI: Noll) 4/1/07-3/31/12

A Bioengineering Research Partnership is proposed for the development of parallel excitation technology to improve fMRI studies in orbitofrontal cortex, with a specific emphasis on neuroimaging or loss related processes in patients with OCD. This project is motivated by the large signal voids caused by magnetic susceptibility differences between tissue and air in the nasal sinuses. These artifacts are ubiquitous in fMRI for many inferior brain structures and the frontal pole. This project is further motivated by the upward trend in MRI towards using higher magnetic field systems, which improves sensitivity in many parts of the brain, but also exacerbates the susceptibility artifacts. This project will develop parallel excitation techniques to remove these artifacts at all field strengths. Success in this project will lead to

valuable new methods for probing the whole brain with equal sensitivity, thus aiding the study of brain regions implicated in OCD among other disorders.

“Dosimetry and Improved Targeting for Transcranial Magnetic Stimulation” (15%)

National Institutes of Health, 1R21NS058691 (PI: **Hernandez**) 7/1/08–6/31/10

This project is a step toward a new generation of Transcranial Magnetic Stimulation techniques to stimulate the desired brain regions with greater precision and accuracy, with minimal stimulation of unwanted regions. The project consists of the development of computational and imaging techniques to measure the fields generated by TMS stimulation. Using these techniques, the project will optimize design parameters of TMS devices considering shielding techniques and novel electromagnetic lenses made of meta-materials

“Imaging Feedback to Guide Ultrasonic Tissue Fractionation for Cancer Therapy” (15%)

National Institutes of Health (R01 CA134579) PI: Cain 7/1/08 – 6/31/13

Histotripsy is the controlled use of ultrasound cavitation to mechanically fractionate tissue volumes non-invasively under image guidance. The effects can be easily seen and characterized by histological analysis and chronic animal studies where some clinical “outcome” can be determined. In this project, we will develop methods to predict clinical outcome from image parameters available both during and after treatment. This will provide an answer to the critical question for most noninvasive ablative technologies, i.e., when should the treatment be stopped and what will be the spatial extent of the desired treatment? Development of these image guidance techniques could result in a significant transformation in the effectiveness of ablative therapies in a wide range of clinical applications, e.g., prostate cancer, benign prostatic hyperplasia (BPH), breast cancer, fibroadenomas of the breast, liver cancer and metastases, kidney cancer, uterine fibroids, thrombolysis, cardiac ablations for arrhythmia control, lung and brain cancer (under certain conditions), treatment of infected wounds and abscesses, etc.

“Development and use of rtfMRI for self-control of nicotine craving” (20% Y1-2, 15% Y3-5)

National Institutes of Health (NINDS 1 R21 DA026077) PI: Peltier 09/01/2008-08/31/2013

This proposal aims to study the application of functional magnetic resonance imaging in real time (rtfMRI) as an operant training feedback mechanism for treating substance use disorders. The present application seeks to expand the investigation of these processes and validate their applicability to substance dependent volunteers. In initial studies we will examine the capacity of nicotine dependent volunteers to reduce their craving for cigarettes. This substance was selected for its high retention rates and prevalence and public health burden in the general population, but it is expected that future studies would explore other forms of addiction (e.g. cocaine, opiates). The developmental and experimental elements of this proposal will lead to new avenues for treatment that would be readily generalizable to other forms of drug addiction besides nicotine, and potentially impacting on the outcomes of the substantial numbers of individuals seeking substance abuse treatment.

“Improving Fluid Intelligence by Training Working Memory” (5%)

National Science Foundation (0842446) PI: Jonides 10/1/2009-9/30/2011

The goal of this project is to study the brain mechanisms underlying improvement in working memory with training.

“MRI Parallel Excitation for Neuroimaging Applications” (15%)

National Institutes of Health (1R01NS058576) PI: Noll 01/01/2008 – 12/31/2012

A Bioengineering Research Partnership is proposed for the development of parallel excitation technology to improve fMRI studies in orbitofrontal cortex, with a specific emphasis on neuroimaging or loss related processes in patients with OCD. This project is motivated by the large signal voids caused by magnetic susceptibility differences between tissue and air in the nasal sinuses. These artifacts are ubiquitous in fMRI for many inferior brain structures and the frontal pole. This project is further motivated by the upward trend in MRI towards using higher magnetic field systems, which improves sensitivity in many parts of the brain, but also exacerbates the susceptibility artifacts. This project will develop parallel excitation techniques to remove these artifacts at all field strengths. Success in this project will lead to valuable new methods for probing the whole brain with equal sensitivity, thus aiding the study of brain regions implicated in OCD among other disorders.

Role: Co-Investigator

“Imaging Feedback to Guide Ultrasonic Tissue Fractionation for Cancer Therapy” (14%)

National Institutes of Health (R01 CA134579) PI: Cain 08/04/2008 – 05/31/2013

Histotripsy is the controlled use of ultrasound cavitation to mechanically fractionate tissue volumes non-invasively under image guidance. The effects can be easily seen and characterized by histological analysis and chronic animal studies where some clinical “outcome” can be determined. In this project, we will develop methods to predict clinical outcome from image parameters available both during and after treatment. This will provide an answer to the critical question for most noninvasive ablative technologies, i.e., when should the treatment be stopped and what will be the spatial extent of the desired treatment? Development of these image guidance techniques could result in a significant transformation in the effectiveness of ablative therapies in a wide range of clinical applications, e.g., prostate cancer, benign prostatic hyperplasia (BPH), breast cancer, fibroadenomas of the breast, liver cancer and metastases, kidney cancer, uterine fibroids, thrombolysis, cardiac ablations for arrhythmia control, lung and brain cancer (under certain conditions), treatment of infected wounds and abscesses, etc.

Role: Co-Investigator

“Exploring Tobacco Effects on Attention in Schizophrenics and Controls Using fMRI” (2.5%)

National Institutes of Health, (R03 DA029168) PI: Guthrie 07/01/2011 – 06/30/2012

We propose to use functional MRI to measure cerebral perfusion with arterial spin labeling, an indirect measurement of neuronal activity, in two separate sessions (with subjects) with nicotine and without nicotine.

Role: Co-Investigator

“Image-Guided Noninvasive Ultrasonic Liver Tumor Ablation using histotripsy” (0.6 calendar months)

UM P/G N016316, RSG-13-101-01-CCE (PI: Xu) 07/01/2013 – 06/30/2018

American Cancer Society

Histotripsy produces a millimeter-sized cluster of microbubbles that fractionates the target tissue without damaging the overlying tissue, by using ultrasound pulses applied outside the body and focused to the target tissue. Histotripsy can completely fractionate tumors surrounding major vessels while preserving the vessels.

In this grant, a phased array ultrasound transducer for histotripsy therapy will be designed and built based on the anatomy of liver cancer patients. Using this transducer and excised human liver tumors, parameters will be optimized for large tumor ablation through the intact chest and for vessel-sparing ablation. High sensitivity, real-time imaging-feedback will also be developed to monitor the entire histotripsy treatment. Finally, the response to histotripsy tumor treatment will be investigated in an animal liver tumor model. With the successful completion of the proposed work, histotripsy will become a paradigm changing technology for liver cancer ablation and benefit millions of liver cancer patient

worldwide. As a platform technology, histotrispy could be broadened to treat tumors in many other organs, including the breast, prostate, kidney, and brain.

Role: Co-Investigator

“MR-Thermometry of Renaissance Treatment Devices” (15%)

Amway, Access Business Group (PI: **Hernandez-Garcia**) 01/01/2015 – 12/31/2015

The goal of this project is to develop a system of MR thermometry to guide and validate ultrasound therapeutic devices ex vivo and in vivo.

Role: Principal Investigator

“Training in Functional Magnetic Resonance Imaging” (1.0 calendar months)

UM 15-PAF00298, R25 (PI: Jonides) 09/01/2015 – 08/31/2020

National Institutes of Health

This project is to continue to offer an annual two-week short course on functional Magnetic Resonance Imaging at the University of Michigan in August of each year. The curriculum covers the physics of MRI and fMRI, coverage of data acquisition, a detailed presentation of issues having to do with experimental design, and substantial coverage of data analysis and interpretation. Students will get the opportunity to design an experiment, and analyze data that have been gathered previously. The proposed short course will be open to graduate students, post-doctoral fellows, faculty, medical students, and medical residents.

Role: Co-Investigator

“Direct, non-invasive brain stimulation using ultrasound and magnetic field pulses”, (10% effort)

University of Michigan, MI-BRAIN initiative, (PI: Hernandez-Garcia, Cain), 9/1/2015 – 9/1/2016

University of Michigan, Recent work shows that one can open ion channels in neural tissue using mechanical vibration in order to produce action potentials. There is a small but exciting body of literature on this area, but the potential of this technology is tremendous. The goal of this project is develop that technology, but more importantly, to construct a biophysical model of the biophysics underlying the phenomenon.

Role: co-principal investigator.

“Quantitative blood flow imaging using Spin Labeled MR Fingerprinting” 3/1/2016 to 2/18/2018

National Institutes of Health (R21EB021562), (PI Hernandez-Garcia)

This proposal seeks to develop a new strategy for Arterial Spin Labeling Perfusion imaging based on newly developed MR fingerprinting techniques. These techniques will allow the estimation of multiple hemodynamic parameters linked to brain function. Success in this proposal will translate into a new robust perfusion imaging technique that can be made readily available in most clinical and research MRI scanners. The new technique will permit physicians and scientists to obtain quantitative images of multiple vascular parameters, such as blood flow and blood volume. These quantitative images will provide fundamental data to diagnose and characterize multiple neurodegenerative disorders early in the process, as well as to determine treatment efficacy.

“Enhancing Cognitive Training with Transcranial Direct Current Stimulation” (5% effort)

National Science Foundation 1658268 (PI: Jonides)

4/1/2017 – 6/31/2020

Enhancing cognitive performance via cognitive training has become a promising yet quite controversial field of inquiry. Some have proposed that non-invasive brain stimulation may be used as an adjuvant tool to enhance the effects of cognitive training. This has been met with some initial success (Richmond et al., 2014; Park et al., 2014; Martin et al., 2013; Jones et al., 2015), though these early studies are not yet conclusive. Our own preliminary research has documented a robust enhancement effect of one non-invasive stimulation technique, transcranial direct current stimulation (tDCS) during seven days of training on a WM task (Au et al., 2016). Furthermore, this same research has shown that this enhancement effect is maintained approximately a year after training, without any intervening training or stimulation.

Role: Co-Investigator

“Novel Ultrasonic Technique for the Treatment of Hemorrhagic Stroke”

(5% effort)

NIH R01 NS108042 (PI: Pandey)

09/30/2018 – 07/31/2023

The rupture of blood vessels in the brain can lead to bleeding and clotting (hematoma) inside the brain, termed as hemorrhagic stroke or intracerebral hemorrhage (ICH). ICH accounts for 10-15% of all strokes and is particularly devastating, leading to a 30-day survival rate of 30-50%. The goal of this proposal is to develop a new, minimally invasive, ultrasonic technique that can allow of liquefaction of the ICH thus allowing it to be removed via a ventriculostomy catheter placement thus reducing brain compression from the ICH as well as minimizing secondary effects of blood products within the brain.

Role: Co-Investigator

“Theta burst transcranial magnetic stimulation of fronto-parietal networks: Modulation by mental state”
(5% effort)

NIMH R01 (PI: Taylor)

07/01/2019 – 06/30/2021

0.48 CM (Yrs 1-2)

This proposal will use functional magnetic resonance imaging to examine the effects of transcranial magnetic stimulation (TMS) on specific brain networks relevant for neuropsychiatric conditions. We will test the broad hypothesis that when TMS is applied to a brain in a controlled mental state, network changes induced by TMS will be facilitated, compared to stimulation when mental state is uncontrolled. Results from this study will be used to optimize TMS therapy for depression by controlling mental state to improve the efficacy of TMS treatment.

Role: Co-Investigator

“Multi-modal assessment of GABA function in psychosis”

(5% effort)

P30 AG072931 (PI: Taylor)

07/01/2019 – 06/30/2024

NIH/NIMH

Although post-mortem work and functional studies have consistently implicated GABAergic dysfunction in the psychosis spectrum (schizophrenia, schizoaffective disorder and bipolar disorder), the nature and extent of these disruptions remains unclear. Using converging MRI measures of GABA function (pharmacologic challenge with functional magnetic resonance imaging and magnetic resonance spectroscopy), this project will undertake the first in vivo study of GABAergic systems across the psychosis spectrum. Pursuing preliminary data linking alterations in GABA function with persistent negative affects in psychosis patients, the study will establish critical foundation work for the development of pharmacologic and clinical targets to ameliorate the serious disturbances caused by psychosis syndromes.

Role: Co- Investigator

“Quantitative MR Imaging of Vascular Factors in Parkinson’s Disease”

(20%)

(PI: **Hernandez-Garcia**)

09/30/2020 - 06/30/2025

National Institutes of Health

R01NS112233

Role: Principal Investigator

Vascular health has been shown to be an important factor in the development of neurodegenerative diseases like Alzheimer’s and Parkinson’s diseases. Hence, the ability to measure reliably and quantitatively early hemodynamic changes in the aging brain can be a powerful tool for diagnosing, studying, and developing treatments. Arterial Spin Labeling (ASL) magnetic resonance imaging can yield quantitative perfusion images without the use of contrast agents. We propose that combining new ASL techniques, such as Velocity Selective Inversion (VSI) labeling pulses and magnetic resonance fingerprinting (MRF) with deep learning regression methods will allow quantification of multiple hemodynamic parameters beyond perfusion, thus providing a much more nuanced picture of the state of the vasculature. We also expect that the new technique will offer dramatic improvements in SNR, specificity and sensitivity of ASL, and that the proposed techniques will have many other applications in research and in the clinic. We propose to use these techniques to fill the knowledge gap regarding the relationship between vascular changes and Parkinson’s disease and its symptoms, particularly fatigue, whose pathogenesis is not well understood. If we are successful in this application, future work will use the hemodynamic parameters of interest as biomarkers to assess risk of neurodegeneration, determine therapeutic targets, and guide in the development of new therapies.

“Michigan Alzheimer’s Disease Research Center”

(2.5%)

(PI: Paulson, Henry)

9/2021 – 5/2026

National Institutes of Health : P30 AG072931

Role: co-investigator

Major Goals: Alzheimer’s disease and related dementias (ADRD) represent one of the greatest health problems in the United States and the state of Michigan. Building on longstanding strengths in dementia research, outreach and training at three universities working as a consortium, the Michigan ADRC will lead a regional effort to identify, understand and modulate the many factors beyond β -amyloid that contribute to brain dysfunction and degeneration in ADRD.

Title: Development of Layer Specific fMRI for clinical scanners

(10%)

PI: **Luis Hernandez-Garcia**

Role : Principal Investigator

9/2023-2/2025

National Institutes of Health: R21EB032514

Layer Specific fMRI is a new and exciting tool to probe mesoscale brain networks non-invasively, without the need for invasive surgical procedures, such as electrode implantation, or confocal microscopy. Recent work has demonstrated the Layer Specific fMRI can identify both the columnar, as well as layer specific structure of a network. While the field of Layer Specific fMRI is dominated by “ultra-high” field MRI scanners (7T and above), it is still extremely challenging to achieve those results in 3T scanners because of their reduced signal:noise ratio (SNR). The need for ultra-high field scanners stems from the requirement of extremely small voxels for layer specific fMRI, which translates into a dramatic loss of SNR.

This need for ultra high field scanners means that much of it has to be carried out on small animals, and human work in this area is limited to a few select institutions. The goal of this proposal is to develop the technology needed to make layer specific fMRI feasible at 3T scanners, common in most research institutions. Our proposed strategy is to improve SNR efficiency and reduce scan time by using a reduced

field of view, 3D read-out in tandem with a new positive vascular contrast imaging method based on Velocity Selective pulses to collect arterial blood volume weighted images much faster. At the same time, we will also aim to reduce the noise of the measurement by an efficient echo correction technique.