BIOGRAPHICAL SKETCH

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NAME: Kang, Hakmook

POSITION TITLE: Assistant Professor of Biostatistics

eRA COMMONS USER NAME (credential, e.g., agency login): KANGH1

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Minnesota, Minneapolis	B.S.	05/1998	Chemical Engineering
University of Rhode Island	M.S.	08/2005	Applied Pharmaceutical Sciences
University of Rhode Island	M.S.	08/2006	Statistics
Brown University	Ph.D.	05/2011	Biostatistics

A. Personal Statement

The overarching objective of Core E in U54 project is to leverage the considerable statistical and bioinformatics expertise at VU and VUMC to push the current boundaries of design and analyses to facilitate significant and innovative discoveries in IDD. To this end, it is important to understand how to deal with statistical problems ranging from general (bio)statistical problems to problems associated with high-dimensional data analysis. As an imaging statistician, my main research interests include analyzing MRI data by employing spatio-temporal models, developing methods to properly take into account multiple comparisons in high-dimensional data analysis, and developing Bayesian hierarchical models for multi-modal MRI data analysis. My training, experience, and expertise as a doctoral level biostatistician, combined with the tremendous depth and breadth of resources available in the Center for Quantitative Sciences at Vanderbilt University and my home department of biostatistics, aptly supports the proposed research.

1. **Kang H**, Ombao H, Linkletter C, Long N, Badre D. Spatio-spectral mixed effects model for functional magnetic resonance imaging data. J Am Stat Assoc 2012;107(498):568-577. PMCID: PMC4231829
2. Yang X, **Kang H**, Newton AT, Landman BA; Evaluation of statistical inference on empirical resting state fMRI. IEEE Transactions on Biomedical Engineering 2014 Apr; 61(4):1091-9. PMID: 24658234
3. Jeong H, Dewey BE, Hirtle JAT, Lavin P, Sriram S, Pawate S, Gore JC, Anderson AA, **Kang H**, Smith SA; Improved DTI of optic nerve using multishot 2-D navigated acqusitions. Magnetic Resonance in Medicine 2015; 74(4): 953-63. PMCID:PCM4375089
4. **Kang H**, Blume J, Ombao H, Badre D. Simultaneous control of error rates in fMRI data analysis. NeuroImage 2015; 123:102-113. PMID: 26272730

B. Positions and Honors

2011 - Assistant Professor, Department of Biostatistics, Vanderbilt University, Nashville, TN
2012 - Assistant Professor (Affiliated), Institute of Imaging Science, Vanderbilt University, Nashville, TN
2013 - Assistant Professor (Faculty Member), Center for Quantitative Sciences, Vanderbilt University, Nashville, TN
2016 - Core Director of Vanderbilt Kennedy Center, Biostatistics and Bioinformatics Core, Vanderbilt University, Nashville, TN

Other Experience and Professional Memberships

2005 - Member, American Statistical Association
2008 - Member, Institute of Mathematical Statistics
2009 - Member, International Biometric Society ENAR
2009 - Member, Organization for Human Brain Mapping

Honors

2011 John Van Ryzin Award for Best Paper submitted to ENAR Student Paper Competition
2011 Distinguished Student Paper Award, International Biometric Society ENAR
2011 Travel Award for Bayesian Biostatistics Conference

C. Contribution to Science

1. Spatio-Temporal models in biomedical imaging analysis

It is known that biomedical imaging data intrinsically contain underlying correlations, e.g., spatial & temporal correlations. However, due to its complexity and computational burden, the underlying correlation tends to be oversimplified or even ignored in biomedical imaging analysis. In particular, it is not common to fully model the underlying spatial correlation in functional magnetic resonance imaging research. Our spatio-spectral approach was proposed to properly take into account both spatial and temporal correlations while significantly reducing computational burden by transforming time-domain data to frequency-domain data. This approach can be applied for any biomedical imaging data analysis and will be expanded to analyze multi-modal MRI data.

a. **Kang H**, Ombao H, Linkletter C, Long N, Badre D. Spatio-spectral mixed effects model for functional magnetic resonance imaging data. J Am Stat Assoc 2012;107(498):568-577. PMCID: PMC4231829

2. Quantitative evaluation of MRI technology

As an imaging-biostatistician, I have been actively involved with various cutting-edge biomedical image analyses. In particular, I have been working on validating new MRI acquisition and analysis techniques, which require a deep understanding in imaging acquisition methods and available statistical tools, e.g., test-retest reliability and sophisticated statistical models. It is believed that developing and applying proper validation tools eventually fosters advances in biomedical imaging technique.

a. Jeong H, Dewey BE, Hirtle JAT, Lavin P, Sriram S, Pawate S, Gore JC, Anderson AA, **Kang H**, Smith SA; Improved DTI of optic nerve using multishot 2-D navigated acquisitions. Magnetic Resonance in Medicine 2014. Epub 2014 Sep 26. PMCID:PMC4375089
b. Xu J, Li H, Harkins KD, Jiang X, Xie J, **Kang H**, Does MD, Gore; Mapping mean axon diameter and axonal volume fraction by MRI using temporal diffusion spectroscopy. NeuroImage 2014;S1053-8119(14):00748-4. PMCID: PMC4312203

3. Statistical imaging analysis for Alzheimer and Epilepsy research

I have been actively involved with structural and functional MRI data analysis related to neurodegenerative diseases, such as Alzheimer's and epileptic seizure. The main causes of these diseases are not well understood, and treatment options are very limited, although a large number of people suffer from such diseases. To better understand such neurodegenerative diseases, I have collaborated with scientists at Vanderbilt University Institute of Imaging Science and have provided prognostic/diagnostic tools for early detection of neurodegenerative diseases and for probing structural/functional changes in the brain associated with the diseases. These tools and scientific findings will shed more light on research related to Alzheimer's disease and epilepsy.

a. Shokouhi S, Claassen DO, **Kang H**, Ding Z, Rogers BP, Mishra A, Riddle WR; Alzheimer's Disease Neuroimaging Initiative; Longitudinal progression of cognitive decline correlates with changes in the spatial pattern of brain 18F-FDG PET. Journal of Nuclear Medicine 2013;54(9):1564-9. PMCID: PMC4134885

b. Holmes M, Folley BS, Sonmezturk HH, Gore JC, **Kang H**, Abou-Khalil B, Morgan VL; Resting state functional connectivity of the hippocampus associated with neurocognitive function in left temporal lobe epilepsy. Human Brain Mapping 2014;35(3):735-44. PMCID: PMC3915042
c. Morgan VL, Conrad BN, Abou-Khalil B, Rogers BP, **Kang H**; Increasing structural atrophy and functional isolation of the temporal lobe with duration of disease in temporal lobe epilepsy. Epilepsy Research 2015;110:171-8. PMCID: PMC4306813
d. Shokouhi S, Rogers BP, **Kang H**, Ding Z, Claassen DO, Mckay JW, Riddle WR; Modeling clustered activity increase in amyloid-beta positron emission tomographic images with statistical descriptor. Clinical Interventions in Aging 2015;10:759-70. PMCID: PMC4408970

4. Improvement in prediction of response to neoadjuvant chemotherapy

I have been actively involved with breast cancer imaging data analysis. In breast cancer imaging data analysis, we proposed a voxel-level approach to improve the accuracy of early prediction of failed responses to a particular therapy. Correct early assessment allows the oncologist to choose an effective and less toxic treatment for a particular patient. This modeling approach can be easily extended to various biomedical imaging analyses to make more reliable, precise, and noninvasive predictions of response to a treatment.

a. Li X, **Kang H**, Arlinghaus LR, Abramson RG, Chakravarthy AB, Abramson VG, Farley J, Sanders M, Yankeelov TE; Analyzing spatial heterogeneity in DCE- and DW-MRI parametric maps to optimize the prediction of the response to neoadjuvant chemotherapy in breast cancer. Translational Oncology 2014 Feb 1;7(1):14-22. PMCID: PMC3998687
b. Li X, Abramson RG, Arlinghaus LR, **Kang H**, Chakravarthy AB, Abramson VG, Farley J, Mayer IA, Kelly MC, Meszoely IM, Means-Powell J, Grau AM, Sanders M, Yankeelov TE; Multi-parametric MRI for predicting pathological response after the first cycle of neoadjuvant chemotherapy in breast cancer. Investigative Radiology 2014 Apr;50(4):195-204. PMID: 25360603
c. Whisenant JG, Sorace AG, McIntyre JO, **Kang H**, Sánchez V, Loveless ME, Yankeelov TE; Utility of 18FLT-PET to assess treatment response in trastuzumab-resistant and sensitive HER2-overexpressing human breast cancer xenografts. Molecular Imaging and Biology 2015 Feb;17(1):119-128. PMCID: PMC4311727

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/hakmook.kang.1/bibliography/47174885/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

1U54 HD083211 Dykens (PI) 09/17/15-05/31/20
NIH / NICHD
Eunice Kennedy Shriver Intellectual and Developmental Disabilities Research Center at Vanderbilt University
The Vanderbilt Kennedy Center's IDDRC provides 5 critical Core research services to be used by 46 accomplished investigators, including a U54 Research Project on *Sensory and Multisensory Contributions to Autism* (EKSNICHD Focus Theme#2).Shared Cores reduce study costs and enable researchers to use Cutting-edge approaches that advance basic or clinical discoveries that lead to more effective interventions or treatments for individuals with autism, learning disabilities, genetic IDD syndromes, and acquired IDDs.
Role: Core Director

1R01 MH102246 Taylor (PI) 01/15/15-11/30/19
NIH / NIMH
Neural Connectivity Affecting the Antidepressant Response: Testing a Lesion Model
This project examines the hypothesis that in focal hyperintense lesions have discrete effects on structural and functional measures of neural circuits in older depressed adults. It also examines how focal changes may

influence the antidepressant response and if there are differential effects of focal lesions based on what circuits are impaired and the antidepressant's mechanism of action.
Role: Co-Investigator

1R21NS087465-01 Smith (PI) 04/01/14-03/31/16
NIH/NINDS
In Vivo Macromolecular and Protein-based MRI in the Spinal Cord of MS Patients
The objective of this research is to develop new techniques to assess the spinal cord in multiple sclerosis population. The tools will enable us to understand the relationship between myelin and neurochemical changes in the spinal cord and neurological dysfunction, which in turn can be utilized for diagnosis and prognosis of multiple sclerosis.
Role: Co-Investigator

1R01EY023240-02 Smith (PI) 03/01/14-02/28/18
NIH/NEI
Microstructural Characterization of the Optic Nerve in Optic Neuritis
The objective of the research is to investigate multi-parametric, quantitative MRI data in the human optic nerve of patients with optic neuritis. We wish to further develop statistical and robust prediction models to characterize the relationship between microstructural imaging data in the optic nerve and permanent vision loss with the ultimate goal of offering statistical tools to address the progression from optic neuritis to multiple sclerosis
Role: Co-Investigator

2U01CA142565-06 Yankeelov (PI) 05/01/10-05/31/20
NIH/NCI
Quantitative MRI for Predicting Response of Breast Cancer to Neoadjuvant Therapy
Our goal is to provide the breast cancer community with a rigorous, practical method of predicting the pathological response to neoadjuvant therapy in triple negative breast cancer patients. Early detection/prediction of the outcome using quantitative MRI-derived multi-parameters enables to significantly improve patient care.
Role: Co-Investigator

5R01NS075270-04 Mogan (PI) 03/01/12-02/28/17
NIH/NINDS
MRI Structural and Functional Connectivity Changes in Temporal Lobe Epilepsy
The overall goal of this project is to investigate and quantify the relationship between functional and structural network integrity in seizure propagation and language networks in TLE non- invasively using Magnetic Resonance Imaging (MRI); and to relate these network alterations to disease and cognitive characteristics before and after surgery.
Role: Biostatistician

5R01CA109106-09 Gore (PI) 01/01/12-12/31/16
NIH/NCI
MRI Diffusion in Tumors Using Oscillating Gradients
The research proposed would provide a new MRI technique for noninvasive imaging of tumors which can be used to detect and assess their response to treatment sooner and more accurately than current methods, and which promises to become a useful tool in preclinical research and provide insights into how better to use current imaging methods.
Role: Biostatistician

2P30CA068485-19 Pietenpol (PI) 07/01/14-06/30/20
NIH/NCI
Cancer Center Support Grant
The VCC's specific authorities and responsibilities are: 1) to coordinate and integrate the cancer and cancer-related activities of Vanderbilt University; 2) to conduct, support and enhance cancer research and to integrate cancer-related activities throughout the University; 3) to integrate, develop and conduct cancer education programs; and 4) to coordinate and integrate the care of cancer patients at VUMC and VAMC.

Role: Biostatistician

2R01NS049251-08 Miga (PI) 04/01/14-03/31/19
NIH / NINDS
Multimodal Registration of the Brain's Cortical Surface
The objective of this proposal is to implement a new computer-vision based tool to properly take into account brain shift during image-guided surgery. Deformation correction is crucial for success in brain tumor surgery. Moreover, it is paramount to create an efficient computer-vision based workflow and quantitatively validate the new tool against the 'gold standard' intraoperative magnetic resonance imaging approach through both retrospective and prospective validation studies.
Role: Co-Investigator

1R01EB017230-01A1 Landman (PI) 09/21/15-03/31/19
NIH/NIBIB
Controlling Quality and Capturing Uncertainty in Advanced Diffusion Weighted MRI
This translational research proposal squarely addresses the challenges facing quality assurance for advanced DW-MRI methods. Understanding uncertainty of advanced methods is critical for properly interpreting structural connectivity and its implications in neuroscience and medicine, which requires characterizing the empirical noise distribution associated with advanced DW-MRI methods, developing statistical tools for quantification of uncertainty and statistical inference.
Role: Co-Investigator

Completed Research Support

1R21CA169387-01A1 Yankeelov (PI) 03/01/13-02/28/15
NIH/NCI
Integrating Quantitative Imaging and Biophysical Models to Predict Tumor Growth
Our goal is to provide the cancer community with approaches that will broaden the practical application of tumor modeling to clinical cancer care.
Role: Biostatistician

1R21NS081437-01A1 Gore (PI) 04/01/13-03/31/15
NIH/NINDS
Investigation of Resting State Functional Connectivity in the Human Spinal Cord
This project will use magnetic resonance imaging to develop and evaluate methods for detecting and characterizing functional networks in the human cervical spinal cord non-invasively.
Role: Biostatistician

1R21EY024036-02 Landman (PI) 12/01/13-11/30/15
NIH/NEI
Quantitative Image Analysis Techniques for Optic Nerve Disease
The objective of this project is to provide a foundation for robust and multi-modality analysis of the optic nerve which can enable early detection/intervention of disorders of the optic nerve.
Role: Co-Investigator

VUMC362818 Niswender (PI) 04/01/10-12/31/15
Novo Nordisk
Making an Obese Brain (& Body) Lean
This project's goal is to better understand the basic structure-function mechanisms of energy homeostasis; to appreciate current hypotheses and potential mechanisms for the development of obesity and to understand how currently approved and developing drugs, target this system.
Role: Biostatistician

KANG, HAKMOOK
ACTIVE

5R01NS075270-05 (Morgan) 03/01/12 - 02/28/17 0.60 calendar months
NIH/NINDS $218,750
MRI Structural and Functional Connectivity Changes in Temporal Lobe Epilepsy
The overall goal of this project is to investigate and quantify the relationship between functional and structural network integrity in seizure propagation and language networks in TLE non- invasively using Magnetic Resonance Imaging (MRI); and to relate these network alterations to disease and cognitive characteristics before and after surgery.

5R01CA109106-10 (Gore) 01/01/12 - 12/31/16 0.60 calendar months
NIH/NCI $136,953
MRI Diffusion in Tumors Using Oscillating Gradients
The research proposed would provide a new MRI technique for noninvasive imaging of tumors which can be used to detect and assess their response to treatment sooner and more accurately than current methods, and which promises to become a useful tool in preclinical research and provide insights into how better to use current imaging methods.

1R21NS087465-02 (Smith) 04/01/14-03/31/16 1.20 calendar months
NINDS $150,000
In Vivo Macromolecular and Protein-Based MRI in the Spinal Cord of MS Patients
The overall goal of this proposal is to develop and implement novel, multi-modal, quantitative magnetic resonance imaging (MRI) in the human spinal cord (SC) at clinical field strengths (3T) to quantitatively assess the relationship between SC pathology and neurological deficit in multiple sclerosis (MS).

1R01EY023240-03 (Smith) 03/01/14 - 02/28/18 1.20 calendar months
NIH/NEI $167,730
Microstructural Characterization of the Optic Nerve in Optic Neuritis
Optic neuritis (ON) is often the presenting symptom in patients who develop multiple sclerosis (MS) with nearly 70% of patients with MS having at least one episode of ON in their lifetime. While ophthalmoscopy and conventional MRI can offer evidence to diagnose an event of ON, there is a paradox in that MRI struggles offer a prognosis of the permanence (or recovery) of visual dysfunction or ultimately the risk of developing MS. Recently developed, quantitative MRI approaches offer insight into the microscopic environment of the central nervous system by showing sensitivity to myelin, axonal integrity, inflammation, and neurochemical aberrations, and we hypothesize that a targeted, microstructural-specific set of MRI parameters can address the paradox between radiological presentation and prognosis of visual recovery.

5P30CA68485-19 (Pietenpol) 07/01/14-06/30/20 1.20 calendar months
NCI $4,159,375
Cancer Center Support Grant
The primary goals of this project are: 1) to coordinate and integrate the cancer and cancer-related activities of Vanderbilt University; 2) to conduct, support and enhance cancer research and to integrate cancer-related activities throughout the University; 3) to integrate, develop and conduct cancer education programs; and 4) to coordinate and integrate the care of cancer patients at Vanderbilt University Medical Center and Veteran's Administration Medical Center.

1R01MH102246-02 (Taylor) 01/15/15-11/30/19 0.60 calendar months
NIMH $382,030
Neural Connectivity Affecting the Antidepressant Response: Testing a Lesion Model
This study will examine the relationship between neural circuitry deficits and response to antidepressants in a cohort with late-life depression. This study will enhance our understanding of how differences in neural circuits affect response to antidepressants of differing mechanisms of action. Clinical translation of this work would have great value in personalized therapy approaches for the treatment of depression.

2U01CA142565-06 (Abramson) 09/01/15-05/31/20 1.20 calendar months

NCI $359,832
Quantitative MRI for Predicting Response of Breast Cancer to Neoadjuvant Therapy
The overall goal of this program is to significantly improve patient care by optimizing, validating, and then extending quantitative MRI methods for the early prediction of breast cancer response to neoadjuvant therapy. The knowledge acquired through this study will provide direction on developing personalized treatment strategies for breast cancer patients undergoing neoadjuvant therapy and may motivate a shift in existing paradigms of therapy monitoring and selection in breast cancer. Furthermore, MRI assessment of early response could be broadly applicable to other solid tumors where neoadjuvant therapy is appropriate.

R01NS049251-09 (Miga) 05/01/14-04/30/19 0.60 calendar months
NINDS $543,760
Multimodal Registration of the Brain's Cortical Surface
In summary, if image-guided procedures are to advance surgical therapy, the next evolution of these systems will require methods to account for soft tissue deformation. The tLRS studies proposed herein represent a clinically translatable strategy for documenting brain shift which could be pivotal in developing affordable image-guided platforms capable of compensating for soft tissue deformation.

N/A (Powers) 08/01/15-07/30/20 0.60 calendar months
Juvenile Diabetes Research Foundation $178,241
Quantitative MRI of the Pancreas in Type 1 Diabetes
This project uses magnetic resonance imaging (MRI) to image the pancreas immediately after diagnosis with type 1 diabetes mellitus and longitudinally over the first year of disease. New MRI techniques may be able to image changes in the pancreas that accompany diabetes. These imaging techniques may yield new insight into type 1 diabetes, help monitor disease progression, and help diagnose type 1 diabetes earlier than currently possible

1R01EB017230-01A1 (Landman) 09/21/15-05/31/16 0.72 calendar months
NIBIB $435,108
Controlling Quality and Capturing Uncertainty in Advanced Diffusion Weighted MRI
Advanced diffusion-weighted magnetic resonance imaging (DW-MRI) techniques offer the potential to resolve complex structures with micron-level organization at millimeter resolution. While there is general consensus in the research community that advanced DW-MRI methods contribute meaningful biological information, specifically which technique is optimal or advantageous given practical considerations remains an open problem. This research will improve understanding of how practical imaging concerns impact advanced DW-MRI and provide a quantitative basis for interpreting biomarkers.

1U54HD083211-01A1 (Dykens) 09/01/15-08/31/20 1.20 calendar months
NICHHD $828,026
Eunice Kennedy Shriver Intellectual and Developmental Research Center at Vanderbilt University
The Vanderbilt Kennedy Center's IDDRC provides 5 critical Core research services to be used by 46 accomplished investigators, including a U54 Research Project on *Sensory and Multisensory Contributions to Autism (EKS* NICHD Focus Theme #2). Shared Cores reduce study costs and enable researchers to use cutting-edge approaches that advance basic or clinical discoveries that lead to more effective interventions or treatments for individuals with autism, learning disabilities, genetic IDD syndromes, and acquired IDDs.

PENDING
1R01NS092819-01A1 (Morgan) 04/01/16-03/31/21 0.60 calendar months
NIH/UNKWN $327,567
Multimodal MRI Characterization of Repetitive Subconcussive Head Injury
The goal of this study is to measure the structural and functional changes in the brain that occur as a result of repeated subconcussive head impacts in college football players. We will relate these brain changes to the number and severity of the impacts sustained to determine the level at which they can cause brain injury. This information is essential for assessing potential brain injury on the field, and identifying at-risk individuals in real-time.

1R01 MH06723-11 (Mirnics) 04/01/16-03/31/21 1.20 calendar months

NIMH $349,059
Effects of Environmental Challenges on Genetically Modified Interneuronal Subpopulations
We study how different inhibitory brain cell types control various behaviors, focusing on those that show alteration in schizophrenia. Furthermore, we are trying to understand how this process is influenced by two distinct environmental insults: cannabinoid exposure in adolescence and prenatal maternal immune activation during fetal life. We are taking advantage of a novel transgenic mouse technology developed in the previous grant cycle.

1R01CA204064-01A1 (Xu) 09/01/16-08/31/21 0.96 calendar months
NCI $254,812
Quantitative temporal diffusion spectroscopy imaging in cancer
This multidisciplinary proposal seeks to develop, validate and evaluate the quantitative temporal diffusion spectroscopy imaging method as a virtual biopsy technique to noninvasively quantify tumor microstructures, and determine its feasibility and accuracy as a surrogate imaging biomarker to detect treatment-induced apoptosis non-invasively in order to assess treatment efficacy at an early stage of therapy.

1R01NS096716-01A1 (Gore) 09/01/16-08/31/20 1.20 calendar months
NINDS $257,871
Resting State Connectivity as a Biomarker of Functional Integrity in Spinal Cord
Functional MRI methods have been developed that can detect neural circuits within the spinal cord non-invasively, and in animal studies these have been shown to change as a result of injury and recovery in a manner that correlates with functional measures. This proposal will further develop and evaluate these findings in human subjects with either of two common spinal pathologies to verify they are useful predictive biomarkers of outcome and the effects of treatments.

1R01NS097783-01 (Claassen) 07/01/16-06/30/21 1.20 calendar months
NINDS $292,374
Biological Determinants of Impulsivity in Parkinson’s Disease
Impulsive and Compulsive Behaviors (ICB) in Parkinson’s disease (PD) are characterized by maladaptive, reward-driven behaviors that occur in a subset of patients as a consequence of dopamine therapy. The work assesses the biophysical, physiological and molecular relationships determining susceptibility to medicationinduced behavioral changes in PD. Completion of this study will provide the basis for a novel cognitive and imaging approach that will ultimately improve the quality and care of PD patients.

1R01NS097821-01 (Dortch) 07/01/6-06/30/21 1.20 calendar months
NINDS $250,000
Quantitative Assessment of Peripheral Nerve Injury and Repair via Multi-Parametric MRI
Clinical care following peripheral nerve injuries is currently limited to a “wait and watch” approach based on patient history and/or physical exam, increasing the likelihood of losing motor and sensory function following these injuries. To address this limitation, we propose a program of innovative, technical developments that will provide a set of quantitative magnetic resonance imaging parameters for characterizing peripheral nerves following injury and after surgery. If successful, these new strategies could identify injuries that require surgery and predict surgical failures much earlier than current techniques, improving outcomes for patients with peripheral nerve injuries.

1R01MH111877-01 (Caskey) 09/01/16-08/31/20 1.20 calendar months
NIH/Unk $225,000
Establishing a dose response for ultrasound neuromodulation
The mechanisms of ultrasound neuromodulation will be investigated at the cellular through network level with the goal of establishing dose response metrics for this new neuromodulation technology. We will use patch clamp methods in brain slice preparations to generate comparable experimental data for a recently proposed mathematical model for the interactions of ultrasound with neurons. We will characterize these effects at the network level in rodents and monkeys using neurophysiological measurements and functional MRI and concurrently use MRI for image guidance and to characterize the ultrasound beam during transcranial insonation.

1R01AG054618-01 (Shokouhi) 09/01/16-08/31/21 1.20 calendar months
NIA $250,000
Quantifying the progression of Alzheimer's pathophysiology in cognately normal adults using novel PET analyses
Pre-symptomatic (preclinical) prevention trials in Alzheimer's disease are now being launched, in which brain imaging will play a central role. Our research is focused on measuring abnormal brain changes in presymptomatic elderly adults by bringing new ideas in brain image analysis to measure subtle changes in brain prior to the diagnosis of dementia. Our proposed studies are significant for assessing drugs that can stop/delay the onset of clinical symptoms, which would reduce the cost of care as well improve the quality of life for patients, their families and caregivers.

1R01NS099365-01 (Smith) 09/01/16-08/31/21 1.20 calendar months
NINDA $250,000
Quantitative MRI of Thoracolumbar and Cervical Spinal Cord: Application to MS
Multiple sclerosis (MS) is one of the most prevalent and debilitating neurological diseases that affects patients in early adulthood. Importantly, the spinal cord is often thought as the site of involvement that may ultimately drive the neurological deficits experienced by patients, however, magnetic resonance imaging (MRI) and in particular, quantitative MRI are poorly suited to study the spinal cord outside (and even within) the cervical spinal cord primarily because of its size and motility. Recently we have developed quantitative MRI approaches for the cervical spinal cord that can offer insight into the microscopic environment of the spinal cord by showing sensitivity to structure, myelin, axonal integrity, inflammation and function, but the same techniques have never been properly studied in the thoracolumbar bulge; we hypothesize that there is a need to develop advanced MRI methods for the thoracic and lumbar spinal cord and a combined microstructural-specific set of MRI indices applied at the cervical and thoracolumbar bulge can offer advanced insight into the magnitude of damage to the spinal cord and address the paradox between radiological presentation and neurological dysfunction in MS.

1R01CA196833-01A1(Abramson) 12/01/16-11/30/19 0.60 calendar months
NCI $175,294
Quantitative MRI to Optimize Neoadjuvant Therapy in Triple Negative Breast Cancer
The overall goal of this proposal is to improve care for breast cancer patients by advancing the use of quantitative magnetic resonance imaging (MRI) to optimize neoadjuvant therapy on a patient specific basis. The knowledge acquired through this study will provide direction on developing personalized treatment strategies for breast cancer patients undergoing neoadjuvant therapy and may motivate a shift in existing paradigms of therapy monitoring and selection in breast cancer. Furthermore, MRI assessment of early response could be broadly applicable to other solid tumors where neoadjuvant therapy is appropriate.

Overlap:

Institutional policy prevents any effort to exceed 12 calendar months. As such, any potential overlap for the "pending" projects with earlier start dates will be addressed/adjusted in compliance with Institutional policy and NIH policy.