

# Recovers

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The Newsletter of the COBRE for Stroke Recovery

Medical University of South Carolina



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The Medical University of South Carolina was awarded a major grant from the National Institutes of Health (NIH) to support the development of a Center for Biomedical Research Excellence (COBRE). This award (P20GM109040) is part of the Institutional Development Award (IDeA) program administered by the National Institute of General Medical Sciences. Visit <http://www.nigms.nih.gov/Research/CRCB/IDeA/Pages/default.aspx> to learn more about the IDeA program.

## From the Director



I have very exciting news to share. A team of COBRE investigators has just been awarded a P2C center (entitled National Center of Neuromodulation for Rehabilitation – NC NM4R) in the new NCMRR Rehabilitation Research Infrastructure Network. We have proposed to be a national resource that provides training, collaborations and pilot funding for investigators interested in non-invasive brain stimulation and operant conditioning of brain and spinal networks integrated with rehabilitation principles. Additionally, we will also provide support to NM4R researchers in animal models. The training and collaborations heavily leverage the cores of the COBRE, making their expertise available on a national scale.

I am the Program Director and overall PI. BSTIM Core director Mark George is the Scientific Director. Rick Segal, a co-investigator on a recently approved COBRE pilot project, is the education director. COBRE Executive Committee member and animal model resource mentor DeAnna Adkins serves on the NC NM4R Executive Committee along with COBRE pilot project investigator Aiko Thompson. Additional COBRE investigators as key personnel include Colleen Hanlon, Wayne Feng, Chris Gregory, Mark Bowden, Michelle Woodbury, Donna Roberts, Jeff Borckhardt, Truman Brown and Viswanathan Ramakrishnan.

The total award is for five years and \$5.45 million dollars. While this award is very exciting in its own right, there are several very exciting developments from the perspective of the COBRE. First, the NC NM4R provides support to COBRE cores by funding additional effort of core personnel in order to make the resources available to the national NM4R research community. Since our specific aims for each core included an aim to “make the core a leading resource for MUSC, South Carolina and beyond”, their centrality to the NC NM4R is very strong evidence that we are successfully developing our cores. Second, the NC NM4R will place MUSC at the epicenter of the NM4R research community for the next five years with national and international experts visiting to provide seminars, while many trainees and young investigators will be visiting to participate in our workshops and hands-on training experiences. This is especially exciting because NM4R research has been a central theme of the COBRE research projects. The NC NM4R should provide spectacular mentoring opportunities for our junior investigators.

When the opportunities from the NC NM4R are combined with the opportunities from the WISSDOM AHA center grant in racial disparities in stroke recovery recently obtained by COBRE Co-director Robert Adams (see next page) and the already existing opportunities through the COBRE, the stroke recovery research environment at MUSC is becoming one of the strongest in the nation. I could not be more proud of our accomplishments with our Center existing for little more than one year. Great things are in our future.

**Steve Kautz, PhD**  
**Director, COBRE for Stroke Recovery**

# WISSDOM

## Taking a Closer Look at the Health Disparities Impacting Stroke Recovery



COBRE in Stroke Recovery Co-Director, Dr. Robert Adams, will serve as the Program Director of MUSC's new project, Wide Spectrum Investigation of Stroke Outcome Disparities on Multiple Levels (WISSDOM), examining the disproportionate impact of stroke on African Americans in South Carolina. Supported by the largest grant awarded by the American Heart Association in South Carolina, WISSDOM will receive \$4 million to investigate the increased incidence of cardiovascular disease contributing to the higher risk of stroke and poorer long-term outcomes within race/ethnic minority groups.

In addition to MUSC, this new Strategically Focused Research Network on Disparities in Heart Disease and Stroke includes projects from Morehouse School of Medicine, Northwestern University, and the University of Colorado, Denver. Researchers from each institution will investigate why some Americans are hit harder by heart disease and what can be done to decrease health disparities. AHA will support the network with an investment of \$15 million over four years. As WISSDOM's director, Dr. Adams will serve as the primary contact for MUSC's project within the network over its four year span, and oversee three subprojects led by interdisciplinary principal investigators within MUSC's Colleges of Medicine and Nursing.

Mark Kindy, PhD, heads the first subproject exploring how the stroke risk factors disproportionately affecting African Americans, including hypertension and diabetes, may influence stroke recovery. The second subproject, directed by Gayenell Magwood, Ph.D., is investigating how a 12-week home-based intervention following rehabilitation will impact stroke recovery. While the third subproject, led by COBRE investigator Dr. Leo Bonilha, MD, PhD, is assessing brain tissue integrity and neuroplasticity through innovative neuroimaging techniques to identify racial differences that may impact recovery processes.

WISSDOM will build on the work of COBRE investigators working to understand and harness brain plasticity, understand the experience dependent nature of post-stroke plasticity, and translate restorative post-stroke therapies inspired by basic science. Visit <http://my.americanheart.org> to learn more about AHA's Strategically Focused Research Networks.



# Publication Highlight

In each issue of *Physiological Reports* the Editor-in-Chief, Susan Wray, from the University of Liverpool, United Kingdom, highlights papers which are of particular interest. The co-authors of a recent issue highlight an inter-disciplinary collaboration of COBRE team members, including Abby Lauer, Viswanathan Ramakrishnan and Na Jin Seo. Congratulations on your paper of distinction!

## Application of vibration to wrist and hand skin affects fingertip tactile sensation.

Lakshminarayanan K<sup>1</sup>, Lauer AW<sup>2</sup>, Ramakrishnan V<sup>2</sup>, Webster JG<sup>3</sup>, Seo NJ<sup>4</sup>.

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### Abstract

A recent study showed that fingertip pads' tactile sensation can improve by applying imperceptible white-noise vibration to the skin at the wrist or dorsum of the hand in stroke patients. This study further examined this behavior by investigating the effect of both imperceptible and perceptible white-noise vibration applied to different locations within the distal upper extremity on the fingertip pads' tactile sensation in healthy adults. In 12 healthy adults, white-noise vibration was applied to one of four locations (dorsum hand by the second knuckle, thenar and hypothenar areas, and volar wrist) at one of four intensities (zero, 60%, 80%, and 120% of the sensory threshold for each vibration location), while the fingertip sensation, the smallest vibratory signal that could be perceived on the thumb and index fingertip pads, was assessed. Vibration intensities significantly affected the fingertip sensation ( $P < 0.01$ ) in a similar manner for all four vibration locations. Specifically, vibration at 60% of the sensory threshold improved the thumb and index fingertip tactile sensation ( $P < 0.01$ ), while vibration at 120% of the sensory threshold degraded the thumb and index fingertip tactile sensation ( $P < 0.01$ ) and the 80% vibration did not significantly change the fingertip sensation ( $P > 0.01$ ), all compared with the zero vibration condition. This effect with vibration intensity conforms to the stochastic resonance behavior. Nonspecificity to the vibration location suggests the white-noise vibration affects higher level neuronal processing for fingertip sensing. Further studies are needed to elucidate the neural pathways for distal upper extremity vibration to impact fingertip pad tactile sensation.

### KEYWORDS:

Finger; hand function; stochastic resonance; tactile sensation; vibration

## COBRE Funded Grants

Investigator	Title
Awgulewitsch, Alexander	Exploring Potential Roles of Hox Genes in Stroke Recovery
Bowden, Mark	Excitatory and Inhibitory rTMS as Mechanistic Contributors to Walking Recovery
Dean, Jesse	Application of Ultrasound Technology to Enhance the Quantitative Measurement of Post-stroke Behavior and Function
Feng, Wayne	Optimizing Transcranial Direct Current Stimulation Current and Electrode Montage for Stroke Patients
Gregory, Chris	Treating Depression and Enhancing Locomotor Recovery Post-Stroke
Hanlon, Colleen	Investigating the Neurobiologic Basis for Loss of Cortical Laterality in Chronic Stroke Patients
Li, Xingbao	Paired Associative Stimulation Modulates Motor Excitability and Plasticity in Chronic Stroke Patients
Roberts, Donna	fMRI BOLD Signal as a Biomarker for Optimal Dosing of rTMS of Rehabilitation in Chronic Stroke Patients
Seo, Na Jin	Sensory Stimulation to Enhance Hand Function Post Stroke
Shih, Andy	Microvascular Function and Neuroplasticity after Stroke
Tomlinson, Stephen	Complement-dependent Inflammation and Experience-dependent Neural Plasticity after Stroke

## COBRE Affiliated – New Grant Applications

Faculty/PI Name	Title	Funding Agency
Dean, Jesse	The role of proprioception in the adaptation toward economical gait patterns	NSF
Feng, Wayne	Development of a skin abrader for direct current stimulation	SCBIO
Shih, Andy	Deciphering the cerebral microinfarct and its role in vascular cognitive impairment	NINDS
Woodbury, Michelle	Trunk control is a critical factor underlying arm motor function after stroke	NIH

## COBRE Affiliated - New Awards

Faculty/PI Name	Title	Funding Agency	Project Dates	Funding
Kautz, Steve	National Center of Neuromodulation for Rehabilitation (NC NM4R)	NIH/NICHHD	10/1/15-6/30/20	\$5,245,792

## COBRE Affiliated - Active Grants

Faculty/ PI Name	Title	Funding Agency	Project Dates	Funding
Adams, Robert	Strategically Focused Disparities in Cardiovascular Disease Research Network	AHA	6/1/15-5/31/19	\$3.7 million
Bonilha, Leo	Brain Connectivity Supporting Language Recovery in Aphasia	NIH/NIDCD	6/10/14-5/31/19	\$350,388
Bowden, Mark	Augmentation of Locomotor Adaptation Post-Stroke	VA/RRD	7/1/13-6/30/18	\$907,000
Brown, Truman	R21 on simultaneous EEG and fMRI	NIH/NIMH	4/17/15-1/31/17	\$361,360
Charalambous, Bobby	The Associations between the Motor Cortical Control and the Task-Specific Biomechanics of the Paretic Soleus after	American Association of Biomechanics	5/1/15-4/30/16	\$2,000
Dean, Jesse	Post-Stroke Contributors to Increased Energetic Cost and Decreased Gait Stability	VA/RRD	October 2012 – September 2016	\$639,100
Feng, Wayne	ASPIRE: Adult Spasticity International Registry on BOTOX Treatment	Allergan, Inc.	9/2014-10/2017	\$77,031
Feng, Wayne	Prediction and Imaging Biomarker for Post-Stroke Motor Recovery	AHA	1/2014-12/2017	\$308,000
Feng, Wayne/ Woodbury, Michelle	The Halo-MUSC Motor Stroke Rehabilitation Clinical Trial	Halo Neurosciences	2/1/15-1/30/16	\$286,770
Finetto, Christian	Biomechanical Assessment of the Relationship between Postural Control and Fine Motor Skills in People with Stroke	MUSC Inter-Professional	1/1/15-12/31/15	\$20,000
George/Bonilha	Trans-Cranial Direct Current Stimulation to Treat Aphasia: Phase II Trial	NIH/NIDCD	4/17/12-4/1/17	\$904,029
Gregory, Chris	Rural Veterans Telerehabilitation Initiative: RVTRI Stroke	Veterans Administration	10/1/14-9/30/15	\$275,050
Gregory, Chris	Skeletal Muscle Plasticity as an Indicator of Functional Performance Post-Stroke	VA/RRD	10/1/13-9/30/17	\$1,100,000
Jensen, Jens	Prediction of Motor Outcome after Acute Stroke using Diffusional Kurtosis Imaging	NIH/NINDS	2/1/2014-1/31/16	\$250,000
Kautz, Steve	Research Career Scientist	Veterans Administration	October 2014 – September 2019	\$530,000
Kautz, Steve	Relationship between Impaired Post-Stroke Coordination and Dynamic Balance and Mobility	Veterans Administration	10/1/15-9/30/18	\$250,500
Seo, Na Jin	Altering Activation Patterns in the Distal Upper Extremity after Stroke (Subaward; Yr 1)	Rehabilitation Institute of Chicago/NIH	2/9/15-5/31/16	\$108,576

COBRE Affiliated - Active Grants Cont'd				
Faculty/ PI Name	Title	Funding Agency	Project Dates	Funding
Seo, Na Jin	Delays in Muscle Relaxation: A Novel Approach to Neuromechanism-based Stroke Rehabilitation (Transfer)	AHA	5/1/15-6/30/16	\$138,022
Shih, Andy	In Vivo Optogenetic Control of Vascular Contractile Cells	AHA	7/1/14-6/30/16	\$70,000
Spampinato, Maria	Diffusional Kurtosis Imaging of the Corticospinal Tract and Motor Outcome Prediction in Acute Ischemic Stroke	SCTR	7/27/15-7/26/16	\$25,000
Tomlinson, Stephen	Novel Therapies to Improve Functional Recovery after Stroke	VAMC	4/1/14-3/31/18	\$243,700
Woodbury, Michelle	Patient-Targeted Upper Extremity Rehabilitation After Stroke	VA/RRD	4/1/13-3/31/17	\$1,100,00
Woodbury, Michelle	Telerehabilitation in the Home Versus Therapy In-Clinic for Patients with Stroke	NIH	9/8/15-2/7/17	\$33,539

## Professional News

**Dr. Mark Bowden** gave a talk entitled “Paretic LE Force Production: Quantification and Clinical Translation” at the University of Delaware as a part of their PhD program’s research seminar.

**Dr. Wayne Feng** presented “Translational Research in Stroke Lessons and Opportunities for Researchers and Investors” August 8, 2015, at the first conference of the Society of Chinese American Physician Entrepreneurs (SCAPE) at Stanford University, and “Diabetes and Stroke” September 18, 2015, at the 21<sup>st</sup> Annual Diabetes Fall Symposium for Primary Care Professionals in North Charleston.

**Dr. Steve Kautz** gave a talk entitled “The Crucial Role of Measuring Coordination and Biomechanics for Improving Walking after Stroke” in seminars at the University of Nebraska-Omaha and the University of Alabama-Birmingham in September.

## Welcome to the Team!

Leo Bonilha, MD, PhD



The COBRE team is happy to welcome its newest member, Dr. Leonardo Bonilha. Dr. Bonilha came to MUSC in 2007, serving as the Chief Resident of Neurology from 2010-2011 and stepping into his position as Neurology Faculty in 2012. Dr. Bonilha is a clinical neurophysiologist, epilepsy and language specialist. His hospital appointments include MUSC since 2012 and the South Carolina REACH (Remote Evaluation of Acute ischemic Stroke) Hospital network since 2014.

Dr. Bonilha's lab investigates the relationship between brain networks, language, stroke and epilepsy, with a specific focus on seizure control and why stroke can affect the ability to understand and produce speech. The main tools used in the Bonilha Lab are magnetic resonance imaging (MRI) and EEG, with a focus on brain connectivity. He collaborates with the Center for Biomedical Imaging at MUSC to explore new forms of analyzing the structure and connections of the brain as it relates to epilepsy, stroke and language.

Dr. Bonilha brings his imaging and EEG expertise to the COBRE to assist in the development of standardized practices for defining stroke specific to mapping lesion and volume. Additionally, he will serve as the resource mentor for the new satellite lab of the Neuroimaging core within the CHP research building to house a high-definition EEG system (currently under construction).

### From the National Stroke Association:

We're proud to share with you, the stroke community, a new color and symbol to support stroke recovery. The movement is strongly centered on the return symbol that signifies the drive of survivors to return to their former self, for a new normal. Intentionally left open, the symbol reflects reality that the road to recovery looks different for everyone—but there **is** a road and there **is** a recovery—and it is emotional, physical and spiritual.





## Upcoming Events

**November 11-13, 2015**  
**Southeastern IDeA Regional Meeting**

**November 16, 2015**  
**Strategic Planning Meeting**

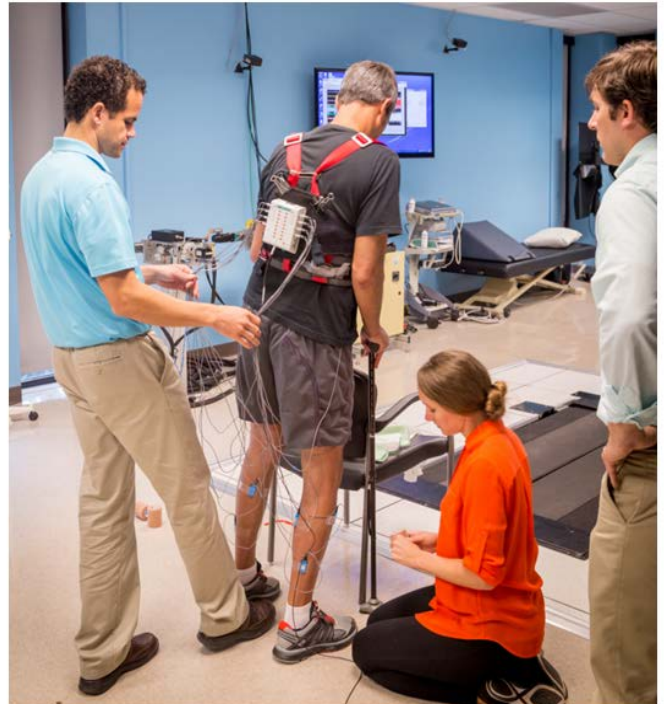
**December 10, 2015**  
**Executive Committee Meeting**

**January 20-21, 2016**  
**COBRE Annual Meeting**



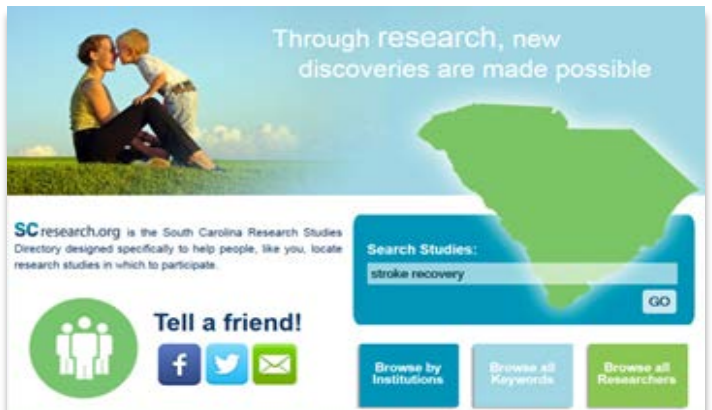
The COBRE for Stroke Recovery participated in SCTR's Research EXPO Tuesday, October 6<sup>th</sup> to increase awareness for the center, current stroke recovery research projects, and opportunities available for study participation.

**Move Forward.™**  
*Physical Therapy Brings Motion to Life*



**October is national Physical Therapy Month!**

Visit [www.moveforwardpt.com](http://www.moveforwardpt.com) to learn more about the role physical therapy plays in recovery from stroke.



Visit [www.SCResearch.org](http://www.SCResearch.org) or call (843)792-1589 to learn more about current stroke recovery research studies.



# COBRE for STROKE RECOVERY

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## Get moving! jumble

Unscramble the words below to see what regular exercise can do for your body (hint: for help for some answers, and for more information about exercise and your brain, see the “Staying Sharp” booklet *Successful Aging and Your Brain*, [www.dana.org](http://www.dana.org)). Once you figure out the answers, unscramble the highlighted letters to answer the riddle (two letters have been filled in for you):

“What happened to the mollusk that went to the gym?”

“It \_\_\_\_\_ !”

Regular exercise can...

Prevent... **BIOTYSE**

Promote... **SOENIEGESNUR**

Boost... **DOMO**

Slow... **NEBO SOLS**

Decrease risk  
of some... **SIAEDSES**

Increase... **REGNYE**

Combat high  
blood... **PERURESS**

Improve overall... **HHTELA**

**U**           **L**  **!**

Puzzle by the Dana Alliance for Brain Initiatives

