

# Neural Activities

THE NEWSLETTER OF THE CENTER FOR VITAL LONGEVITY



Denise Park, Ph.D.

## Activities that Challenge the Brain Improve Memory as Baby Boomers Age

Evidence from a new long-term study shows that seniors who step outside of their comfort zones and learn new skills could improve their memories beyond those who stick with what they know.

"As a society, we need to learn how to maintain a healthy mind – we know how to maintain vascular and heart health with diet and exercise, but we know so little about maintaining cognitive health," said Dr. Denise Park, co-founder of the Center for Vital Longevity at The University of Texas at Dallas and Distinguished University Chair at UT Dallas.

A new study conducted by Dr. Park and fellow researchers has shown that learning mentally challenging skills, such as digital photography, helps improve memory in older people. The study was funded by the National Institute on Aging,

Named the Synapse Project, the study explored how participation for several months in one of several learning or social environments might improve aspects of mental function. These findings were published online in *Psychological Science*.

"One of the key differences with our study from other interventions was that we didn't ask people to participate in a specialized brain training program aimed solely at improving their

**DR. PARK'S STUDY** continued on page 5

## On Our Minds *A message from the co-director*



Michael Rugg, Ph.D.

### Peer Review – A key driver of scientific progress

Decisions to award a research grant or publish a research finding are almost always based on 'peer review' – an assessment of scientific worth, usually anonymously, by critical fellow-scientists.

Although it can sometimes be a hard task to satisfy a demanding reviewer, most scientists – including those of us at the University of Texas at Dallas – regard peer review as a key driver of scientific progress.

The importance of peer review cannot be overemphasized. Until a paper has passed peer review, the findings and ideas it describes are considered preliminary at best. And national funding agencies, such as the National Institutes of Health (NIH), rely on the evaluations of independent scientists, rather than government employees or politicians, to select research projects most deserving of support.

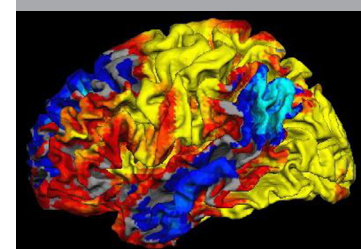
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## RESEARCH UPDATE



### Cartography of the Human Brain

*Gagan Wig, Ph.D.  
Assistant Professor  
Center for Vital Longevity*

**M**aps allow us to navigate our surroundings with relative ease, but maps also reveal important patterns of function and organization, allowing us to make sense of an otherwise seemingly random world.

The brain, too, is organized according to spatial maps. Brain maps define functional and anatomical features of neuronal organization. This organization is a natural byproduct of genetic and developmental processes that continue to sculpt an individual's brain across his or her lifespan.

One goal of neuroscience is to understand what the brain map looks like and how maps vary across individuals. Doing so allows careful investigations towards understanding how the constituent pieces of the map actually work and

how their parts interact to produce the rich and elaborate cognitive processes that define who we are.

Advances in neuroimaging (e.g. functional and anatomical MRI, PET) have provided important tools for the purpose of characterizing brain maps non-invasively in living individuals. In much the same way that social groups in the environment can be defined by maps that range across spatial scales (e.g., communities, cities, states, countries), brain maps too have multiple spatial scales of organization (ranging from maps of single neurons up to maps of large-scale brain systems).

Although neuroimaging is currently incapable of measuring the activity of single neurons, it does have the spatial resolution to measure groups of neurons that are organized into brain areas (i.e., a spatial scale of multiple millimeters). As such, there has been considerable effort towards developing methods to non-invasively parcellate the brain into its areas.

How do we identify distinct brain areas? They can be defined by their function and cellular structure. In addition, they also exhibit distinct patterns of connectivity to other brain areas. One way to distinguish one brain area from another is to look at the other areas a given area communicates.

In two recent papers, Dr. Gagan Wig, assistant professor in UT Dallas' School of Behavioral and Brain Sciences, describes efforts towards using such patterns of 'functional connectivity' measured with fMRI to parcellate the brain into distinct areas. The papers were published by Dr. Wig and his colleagues at UTD's Center for Vital Longevity and researchers at Washington University in St. Louis.

By leveraging the observation that distinct regions of the brain exhibit different patterns of functional connectivity, the authors were able to create maps of area organization in healthy young adults.

The methods were applied to individual subjects allowing subject-specific brain

area parcellation and analysis of individual map variation.

Dr. Wig's research team at the CVL is continuing to develop brain-mapping approaches. They are particularly interested in understanding how brain maps change across the healthy adult lifespan, how they breakdown with disease and how the different parts of a brain interact to produce large-scale systems.

Prior to his appointment at CVL, Dr. Wig worked with the Human Connectome Project at Washington University School of Medicine. He earned a bachelor's degree from the University of British Columbia, his doctorate at Dartmouth College and completed his postdoctoral fellowship at Harvard University. ☀

## Welcome to our New Post-Doctoral Fellows



Joshua Cohen, Ph.D.  
University of California  
Davis



Danielle King, Ph.D.  
University of California  
Santa Barbara



## Mental Notes

# What's Good for the Heart is Good for the Brain

### Exercise improves cognitive functioning

In the past decade several research studies have converged to show that cardiovascular exercise training in older adults can improve mental performance and slow the effects of cognitive aging.

### How exactly does physical exercise result in improved mental functioning?

Regular exercise is associated with a host of positive effects on the brain that work as mechanisms to facilitate cognitive or mental functioning. Some of these effects work directly to fight age-related changes observed in the brain.

For example, as we grow older there is a natural decrease in blood flow to the brain. Aerobic exercise, which increases heart rate (such as walking, running and cycling, etc.), results in increased blood flow to the brain,



delivering essential nutrients such as oxygen and glucose to brain tissue. Physical exercise also helps to stimulate the growth of blood vessels in the brain, known as angiogenesis.

Just as exercise can help preserve muscle mass in our bodies as we age, exercise also helps preserve brain volume. Shrinkage of brain tissue in some brain regions can begin as early as in our late twenties and thirties.

Research findings suggest that engaging consistently in a walking program can slow brain volume loss in the hippocampus, a brain regional critical for learning and memory.

One intriguing possibility for how this works is through neurogenesis (i.e., the generation of new brain cells). Research also suggests that exercise can stimulate increased production of a substance called brain-derived neurotrophic factor (BDNF), which may strengthen the



*Karen Rodrigue, Ph.D.  
Assistant Professor  
Center for Vital Longevity*

communication across brain cells and contribute to neurogenesis.

There is much more work to be done to fully understand how exercise protects the brain. However, it is clear that regular exercise results in improved vascular health which helps preserve both brain and cognitive health. ☀

## Center for Vital Longevity Announces Spring Lecture



*Bill Booziotis and the late Jean Booziotis*

Thanks to the generosity of a planned gift from Jean and Bill Booziotis, the Center for Vital Longevity (CVL) has instituted an annual public lecture named *The Jean and Bill Booziotis Distinguished Lecture*.

The lecture will be given by a leading scientist in the fields of cognitive neuroscience and aging, with the aim of informing the local community about how research in these fields is advancing our understanding of the aging mind. The inaugural lecture will be held April 23, 2014, at the Communities Foundation of Texas in Dallas. Dr. John Jonides, Department of Psychology, University of Michigan will be the guest lecturer.

Mr. Booziotis has served on the CVL Advisory Council since 2010 and is also chair of the CVL's Director's Research Council. In addition, he serves on the UT Dallas Development Board and UT Dallas Campaign Council. ☀

## Director's Research Circle Supports International Research

### Recent Event Highlights work of Dr. Karen Rodrigue

The Center for Vital Longevity hosted its quarterly Director's Research Circle event on October 1, 2013, at the Center's headquarters in Dallas.

Dr. Karen Rodrigue, assistant professor at the Center for Vital Longevity, spoke on the predictors of the successfully aging brain to a group of advisory council members, donors and faculty.

"Understanding the mechanisms and modifiers of healthy brain aging can help inform us not only about how to maintain good cognitive health, but also about what goes awry in conditions such as Alzheimer's disease and other age related neurological disorders and the best options for treating them," said Dr. Rodrigue, who received her doctorate in psychology from Wayne State University. In 2010, Dr. Rodrigue received the prestigious K99/R00 Pathway to Independence Award from the National Institutes of Health.

Dr. Rodrigue is particularly interested in knowing how health factors such as hypertension and diabetes contribute to brain aging and cognitive decline because both conditions are prevalent in older adults and amenable to prevention and treatment.

Founded in 2011, the Directors' Research Circle is a core group of donors to the Center for Vital Longevity who take great pride in supporting an internationally recognized research and educational center in Dallas that is addressing one of the most pressing problems facing society: preserving the health and vitality of the mind for life.

If you are interested in more information about joining the Director's Research Circle, contact [hmiori@utdallas.edu](mailto:hmiori@utdallas.edu) or at 972.883.3728. ☀



Director's Research Circle members Ken Kay and Mary Susan Barnhill, and Dr. Michael Rugg.



Director Research Circle members Linda Marcus and Peggy Dear.



Director's Research Circle Chair Bill Booziotis, speaker and assistant professor Dr. Karen Rodrigue.

## Support the Center

### PLANNED GIVING

Planned gifts give the Center for Vital Longevity the opportunity to plan for future growth, knowing that these philanthropic commitments will be realized in the years to come.

Planned gifts may take the form of a bequest, charitable gift annuity, charitable remainder trust, or life insurance.

### THE LEGACY SOCIETY

The Legacy Society recognizes any individual who has made a planned gift commitment to UT Dallas.

Your membership allows us to thank and honor you for the plans you have made, and we hope it will inspire generosity in others.

Benefits include an annual recognition event, invitations to special events, and information on tax saving measures for you and your family.

### CHARITABLE GIFT ANNUITIES

If you are over 55 and want to support groundbreaking research on the aging mind, consider a charitable gift annuity (CGA).

A CGA is a contract between you and The University of Texas Foundation. You make a gift of at least \$10,000 to the Center for Vital Longevity at UT Dallas and we send you a payment each month, quarter or year for 4 to 8 percent of your contribution, depending on your age.

Depending on your age, a CGA can provide a greater return than a lot of assets in your retirement portfolio. Plus, CGAs give you an immediate tax deduction. Best of all, you're investing in pivotal research that will improve the cognitive health and vitality of present and future generations—an excellent investment!

To learn more about making a planned gift or other opportunities for supporting the center's work, please contact Holly Hull Miori, director of development, at [hmiori@utdallas.edu](mailto:hmiori@utdallas.edu) or 972-883-3728.

## DR. PARK'S STUDY *continued from page 1*

mental abilities," explained Dr. Park, principal investigator of the study.

"Rather, this was a major lifestyle change for our participants," continued Dr. Park. "They each committed to do activities we prescribed for 15 hours a week for three months. The activities were all fun, everyday things, but they varied in how mentally challenging they were."

The researchers compared people who learned complex quilting skills and/or digital photography, to people who only participated in a social club or did passive, easy tasks alone, such as playing games or listening to classical music at home.

Engaging in less demanding activities, such as socializing or playing simple games, did not improve memory in this study.

"Only the quilting and photography groups, who were confronted with continuous and prolonged mental challenge, improved their memory abilities," said Dr. Park.

### **Hands on learning**

Dr. Park and her researcher team rented a storefront named the Synapse Center in Dallas to house the activities. A total of 221 seniors, 60 to 90 years old, participated in one of six groups in the study.

One group learned photography with digital cameras – a task requiring very specific memories for verbal instruction

and complex reasoning as they learned to use the equipment and the software to edit high-quality photos.

A second group learned to quilt with computer-controlled sewing machines, requiring the participants to think abstractly to create patterns and use reasoning skills to sew with the machines. An additional group divided its time between photography and quilting.

Two other groups participated in tasks that were low in cognitive demands.

One was a social group that did things together that were fun but not intellectually demanding, such as playing games, telling stories or going on field trips to museums.

Another group worked at home on low-challenge tasks, like listening to music, watching videos or playing easy word games. A final group did not participate in any of the activities, but took the same before-and-after assessments.

Groups learning the most mentally challenging activities, photography or photography combined with quilting, showed significant gains in memory. Groups participating in social relationships or working on simple tasks at home only did not achieve the same effects.

"It seems it is not enough just to get out and do something – it is important to get out and do something unfamiliar and



mentally challenging," shared Dr. Park. "When you are inside your comfort zone you may be outside of the enhancement zone. What if engaging in fun, but challenging mental activities could slow the rate at which your brain ages?"

Dr. Park added, "Although we don't know now if this is true, we will study our participants for years to see if the cognitive enhancement effects persist. Maybe through our own activities, we can add a year of high-quality life and independence. Further research in this area is becoming increasingly important as people live longer."

Other UT Dallas researchers and authors were Drs. Linda Drew, Sara Haber and Jennifer Lodi-Smith (now at Canisius College). In addition, UT Dallas researchers Andrew Hebrank, Gérard Bischof and Whitley Aamodt also contributed to this study. 🌟

## ON OUR MINDS *continued from page 1*

This demanding review system has undoubtedly contributed to the United States current preeminence in almost all scientific disciplines.

The rigor of peer review means that the quantity of papers published in leading scientific journals, and the number of national research grants awarded, are important measures of the quality of a scientific research program.

We are proud to say that the research conducted at the Center for Vital Longevity (CVL) fares very well by these measuring sticks. In 2013 alone, CVL researchers have already authored more than 25 peer-reviewed publications covering a wide range of topics relevant to understanding the aging mind, while the number of competitively awarded grants held in the Center stands at eleven.

As the Center's newly-minted research groups become established, our accomplishments in these arenas will only increase, adding to our national and international renown for research excellence.

Our goal is for this renown to become as widely known among the community of Dallas as it is among our fellow scientists worldwide. 🌟



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