

# Neural Activities

THE NEWSLETTER OF THE CENTER FOR VITAL LONGEVITY

## Researchers Explore Why Memory Fades with Age



As we age, it gets harder and harder to remember names, dates, or even where we put down our keys. Although very serious memory problems are possible indications of disease, milder problems are not: dulled recall is a normal, albeit frustrating consequence of growing older.

But what causes normal age-related memory loss? A research team led by Center for Vital Longevity co-director Dr. Michael Rugg is trying to answer this question. Aided by a recent \$1.6 million, five-year research grant from the National Institute on Aging, part of the National Institutes of Health, Dr. Rugg and his team hope to better

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## On Our Minds *A message from the center directors*

### Improving the aging mind through focused research



Denise Park, PhD



Michael Rugg, PhD

People frequently ask us about what kind of work is done at the Center for Vital Longevity and why it is important.

The center is an international research hub focused on improving the quality of human life by understanding how to maintain and improve the function of the aging mind. The work we do is essential to developing effective treatments for Alzheimer's disease. Just as cancer research dollars are primarily spent on scientists working to understand how cells divide and communicate, we are working on understanding how the brain functions and how brain function changes with age and with disease.

When thinking of how we have developed cures and treatments for cancer and heart disease, you no doubt recognize that most of that work was done in laboratories by biologists, immunologists, and pharmacologists.

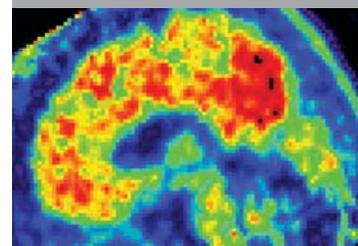
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## RESEARCH UPDATE

Scientists at the Center for Vital Longevity recently completed a research study that may help shed light on the earliest signs of Alzheimer's disease. The study involved measuring the level of amyloid in a large group of healthy adults in the Dallas Lifespan Brain Study. Amyloid is a protein whose buildup in the brain is a hallmark of Alzheimer's disease that until recently could only be measured at autopsy. A remarkable new technique now allows scientists to measure it noninvasively in living adults with a PET scan.

Many scientists now believe that buildup of amyloid protein in Alzheimer's disease can precede symptoms of memory loss and dementia possibly

by as much as a decade or more. Therefore, examining the brains of middle-aged adults may be critically important for diagnosing Alzheimer's in its earliest stages.

In the new study, a team of researchers led by center co-director Dr. Denise Park measured levels of amyloid protein in the brains of 137 healthy people between the ages of 30 and 89. Using a special imaging agent, the team discovered that amyloid level increased with age and that about 20% of adults aged 60 and older had especially high amyloid levels. When the researchers further tested this high-amyloid group, they found that the more amyloid people had in their brains, the worse their memory, processing speed, and ability to reason—three important facets of cognition.

"Even though our initial tests showed that our study participants were in good cognitive health, we saw subtle changes in cognitive performance with increase in amyloid load," said Dr. Karen Rodrigue, a postdoctoral researcher at the center who helped lead the study.

"Imaging the brains of participants when they first show signs of cognitive impairment may help us determine their risk of future disease," said Dr. Rodrigue.

Long-term follow up studies are already underway to help researchers determine whether high amyloid burden in healthy people necessarily predetermines occurrence of Alzheimer's disease later in life.

"Knowing that could lead to the development of treatments to stave off cognitive decline that can be given in middle age, before irreparable damage to the brain is done," Dr. Rodrigue said. ☀️

## SCIENTIST SPOTLIGHT

**Meet the Center for Vital Longevity researchers.**



Dr. Ian McDonough joined the center as a research associate in the laboratory of Dr. Denise Park in June 2011. His research is focused on understanding how we judge the accuracy of our memories and how this process changes as we get older. Dr. McDonough received his master's degree and PhD in cognitive psychology from the University of Chicago. When not busy at work, he enjoys honing his backyard grilling techniques.



Dr. Kaia Vilberg joined the center as a postdoctoral fellow in July 2011. She is interested in understanding how the brain encodes and retrieves episodic memories, the type of memory that allows us to recall details of past experiences. Dr. Vilberg received her PhD in neurobiology with a focus in cognitive neuroscience from the University of California, Irvine. Away from the lab and office she enjoys painting and cooking.

## Mental Notes

### *Symposium features top expert on Alzheimer's disease*

In January, the Center for Vital Longevity hosted a half-day research symposium titled *Fragile Minds: Understanding the Transition from Neural Health to Alzheimer's Disease*. The symposium brought together researchers from across the state of Texas and featured a keynote address by Dr. Reisa Sperling, an award-winning scientist and one of the world's top experts on Alzheimer's disease.

Dr. Sperling is the director of the Center for Alzheimer Research and Treatment at Brigham and Women's Hospital in Boston and an associate professor of neurology at Harvard Medical School. Her research involves

the use of sophisticated imaging techniques to study changes in the brain that occur during normal aging and early Alzheimer's disease. Her work has been published in numerous scientific journals and widely featured in the national media including *The New York Times*, *The Wall Street Journal* and several television programs.

Dr. Sperling spoke about how age and amyloid protein affect the brain's memory circuits. The buildup of amyloid plays a critical role in the diagnosis of Alzheimer's disease.

"We were honored to have Dr. Sperling speak at our

symposium," said center co-director Dr. Denise Park. "Her work is vitally important to researchers who are trying to understand how the brain changes with age and develop treatments for this devastating neurological disease."

The symposium was co-sponsored by the Alzheimer's Disease Center at UT Southwestern Medical Center and included talks by Dr. Karen Rodrigue, a postdoctoral fellow at the Center for Vital Longevity, and Dr. Hanzhang Lu, associate professor of radiology and psychiatry at UT Southwestern. ☀

## BENCHMARKS

### Scientists reach out to the community to advance their research

Researchers at the Center for Vital Longevity are making great strides in understanding memory, cognitive aging, and Alzheimer's disease and are poised to make many more discoveries that will improve the mental health and vitality of present and future generations—but they need your help! The discoveries center scientists are making about the aging mind would be impossible without the community members who volunteer to participate in the center's important research.

So far, more than 1000 Dallas-Fort Worth residents have participated in center studies including the Dallas Lifespan Brain Study, which aims to identify a "neural footprint" in middle age that can predict who will and will not age well, as well as who may be at risk for Alzheimer's disease long before symptoms appear.

But more volunteers are needed! Center scientists are currently looking for volunteers for studies aimed at understanding:

- Who ages successfully and why
- What causes age-related memory loss
- How computer training can improve memory and attention

If you or someone you know is interested in participating in one of these exciting research studies, we'd love to hear from you! ☀

*To receive further information, please call the center at 972-883-3200 or visit [vitallongevity.utdallas.edu/volunteer/](http://vitallongevity.utdallas.edu/volunteer/)*

## Questions About Cognition

*Do you have a question about the aging mind and how it works? To submit a question, please visit us online at: [vitallongevity.utdallas.edu/newsletter](http://vitallongevity.utdallas.edu/newsletter)*

### Can exercise improve cognition as we age?

It's no secret that exercise has numerous beneficial effects on the body, from building muscle to lowering the risk of heart disease. But there is growing evidence that these positive effects also extend to the brain, influencing several aspects of cognition including spatial memory (where in the parking lot you parked your car, for example). "Even walking at a moderate speed can improve brain health and memory later in life," says Dr. Chandramallika Basak, an assistant professor at the Center for Vital Longevity. The hippocampus, the brain region involved in memory formation, begins to shrink in older adults as a normal part of aging. This can contribute to loss of memory and increased risk of dementia. But a recent study by Dr. Basak and colleagues found that adults aged 55 to 80 who walked for 40 minutes a day, three days a week for a year, increased the volume of their hippocampus and showed improved memory performance over a group that didn't walk. "For those who think that starting an exercise regimen later in life isn't worth the effort," Dr. Basak says, "I hope these findings will provide encouragement." 



## Support the Center

Founded in 2011, the Directors' Research Circle comprises donors to the Center for Vital Longevity who take great pride in supporting a nationally prominent research and educational center in Dallas that is producing the highest caliber science and addressing an issue of tremendous medical and societal importance. Circle donors are invited to attend quarterly events that provide intimate and timely access to information about the aging brain, delivered by world-class experts in an entertaining and accessible manner.

In 2011, Directors' Research Circle events featured two exceptional award-winning scientists. Dr. Laura Carstensen, founding director of the Stanford Center on Longevity at Stanford University and a leading authority on longevity and aging, talked with Circle donors about her latest book, *A Long Bright Future*, which examines the myths and misconceptions about aging and how they stop us from preparing for long, healthy, financially stable and fulfilling lives.

At another event, memory and cognition expert Dr. John Jonides, professor of psychology and neuroscience and co-director of the functional MRI Center at the University of Michigan at Ann Arbor, spoke to Circle donors about his groundbreaking work on improving intellectual ability through training.

In addition to having opportunities to meet prominent researchers in an intimate setting, Circle donors can schedule a lunch at the center with scientists annually. Circle donors also receive regular briefings about the latest center discoveries and progress other labs are making in understanding memory and the aging mind and finding treatments for Alzheimer's disease. 

To find out more about the Directors' Research Circle and other opportunities for supporting the Center for Vital Longevity, please contact the center at **972-883-3200**.

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understand how the brain changes with age and how these changes affect memory. Their findings could one day lead to new interventions to help bolster the brain's memory functions.

Researchers have known for years that people in their 60s and 70s show different patterns of brain activity than people in their 20s when they form memories. For example, young people engage a brain region known as the left prefrontal cortex when forming a memory, whereas older people engage both the left and right prefrontal cortex. Whether this extra brain activity helps older brains remember better, or instead, interferes with normal memory processes, is unclear. Results from a recent study by Dr. Rugg and his team have provided some exciting new clues.

In the study, healthy study participants were asked to perform a specific memory task, which involved viewing pairs of words denoting common objects like “wolf” or “piano” and then remembering which words were shown and in what pairwise arrangement. Subjects’ brain activity was monitored as they performed this task using an imaging technique called functional magnetic resonance imaging, or fMRI. The researchers found that older people showing the most activity in the right prefrontal cortex had the worst memory on a later test of memory for the word pairs.

“There are two possible explanations for these results,” says Dr. Rugg. “Either the extra brain activity we see in older people is harmful to normal memory, or the activity is compensating for slow or inefficient processing in the left side of the brain—and without the right side helping out, memory would be even worse.”

Dr. Rugg’s new grant will support several experiments to help determine which of these scenarios is correct, including a large-scale study of young, middle-aged, and older adults over several years.

“The goal is to understand how patterns of brain activity correlate with memory performance during different periods of healthy adulthood, and over time,” explains Dr. Rugg. “We hope these insights will help us identify the processes involved in normal age-related memory decline, and ultimately, the steps that can be taken to slow or ameliorate this decline.” 🌞



Dr. Rugg discusses research results with members of his team. From left: Sarah Yu, Dr. Michael Rugg, Hannah Stanton, Jenny Wong, Dr. Marianne de Chastelaine, Dr. Ünal Sakoğlu, and Tracy Wang.

## ON OUR MINDS *continued from page 1*

These scientists did not treat patients—they worked to advance understanding of how cells divide and how the cardiovascular system works so that effective treatments could be developed.

The scientists in our center are dedicated to understanding how the human mind works, how brain circuits develop and change with age, how memories are formed, and how the accumulation of amyloid plaques and other disease processes operate to create cognitive dysfunction.

Until very recently, scientists could not see into the living brain and thus had only a crude understanding of how it worked. But thanks to the work of physicists and engineers, cognitive neuroscientists now have remarkable tools that allow us to see the structure and function of the living brain; how it changes with age and disease, and how it responds to interventions.

Using these tools, our center is playing an internationally visible role in addressing the unprecedented challenge represented by Alzheimer’s disease and other causes of cognitive decline that occur with age. We are truly proud of our center and its achievements, and look forward with excitement to future discoveries. 🌞

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