

age in action

Journal of the Virginia Center on Aging
Virginia Center on Aging
Virginia Geriatric Education Center
Virginia Department for the Aging

Case Study

Brain Health: Mending the Mind after Age 50

by Susan Hardwicke, Ph.D.

Educational Objectives

1. Increase understanding of brain function and its potential to improve with age.
2. Describe an application of neuroscience, cognitive training, and nutrition for solving a problem associated with aging.
3. Evaluate neural plasticity with aging.

Background

Until the 1990s, neuroscientists believed that the capability of the brain (the biological organ), and therefore the mind (mental skills and consciousness), peaked in early adulthood and declined at an increasing rate until the end of life. In the early 1990s, longitudinal studies provided evidence of a “use it or lose it” principle: a brain that engages in stimulating activity

will decrease in performance more slowly than a less active brain. The brains of millions of inactive TV-viewers seemed doomed.

Then good news arrived when cutting-edge researchers started a revolution in neuroscience with the concept of neural plasticity, the ability of the brain to adapt past its supposed ability peak, offering hope that the effects of inactivity can be reversed by generating new brain cells and new connections among cells in the brain. Laboratory research (Gage, 2003 and Holloway, 2003) strongly suggests that the adult brain can build new structure and capability:

1. Stem cells (the non-embryonic kind) are generated by activity such as exercise.
2. Since the brain is adaptive, repeated external stimulation to the brain increases the likelihood that the stem cells will evolve into neurons or the supporting glial cells.

3. Synapses (the spaces between neurons through which electrical waves and chemicals flow) change so that both new and old cells will be used in new connections to in the brain.

The brain adapts from biological necessity: repeated demands on it will elicit attempts to meet those demands regularly and with greater efficiency. Thus, memory, processing or thinking speed, and other forms of brain ability stand to improve throughout life. However, this “rising to the occasion” may be inhibited or potentially prevented when the receptors on brain cells are blocked or a problem exists with the chemicals needed for the brain cells to communicate. Both cells and brain chemicals, called neurotransmitters, play important roles in developing and revitalizing the mind.

The “use it or lose it” principle and the neural plasticity concept have altered the consciousness of older adults: sales of brain-

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boosting puzzle books are booming, and an adult brain-building Nintendo game was an instant hit (Associated Press, 2006). But public acceptance of an idea does not make it valid, and evidence supporting a newer model of brain functioning does not necessarily provide insight as to its limitations. The newer model raises many questions:

- Can the brain restore previous capability past a particular age?
- What specific techniques and exercises improve the brain?
- How long does it take to measurably improve capability of an adult brain?
- Should an “average person” attempt to improve his/her brain?

The possibilities presented by this newer model of brain functioning compelled me to create a center that offers cognitive enhancement services for persons of all ages. While approximately 90 percent of our clients achieve significant, measurable improvement, the overwhelming majority are younger than 20. Earlier this year, a new client afforded an opportunity to apply the principle of neural plasticity for an older adult. The following case study provides initial support that the same methods used to increase cognitive performance in the young can be applied to restore and improve cognitive performance in older adult brains.

Case Study

Bob, aged 59, thought he was losing his mind, or at least a good part of it. A feature story writer and novelist for many years, he had been unable to generate ideas, let alone works, for at least two years. He reported troubling symptoms which created problems in his relationships and work, and for which he had sought medical help. A physician diagnosed Adult ADD (attention deficit disorder) and prescribed stimulant medications. A compounding pharmacist recommended several herbal, chemical, and food-based supplements. These protocols did little to help his condition.

At the kSero (“I know” in Greek) Center for the Mind, staff followed a five-step process, presented below, that resulted in a customized plan for Bob’s improvement. The plan was based on our proprietary model: customized diet modifications, supplementation, exercise, and cognitive training.

Application of the Five-Step Process. With this process, goals for improvement are established only after assessment and analysis.

1) Understand the client’s

mind. Staff obtained the following information:

- o Symptoms and complaints: inability to perform his work,

high distractibility, difficulty sustaining concentration and attention, mental and physical fatigue, daily outbursts of anger, poor skin tone, “lifeless” quality in eyes.

- o Medical history: no health problems or prescription medications until age 57; moderate to vigorous physical activity through his mid-forties, after which his physical exercise gradually declined.

- o Medications and supplements: Adderall and amphetamines for Adult ADD, valerian and passionflower for sleep, DHEA for improved hormone function, omega-3 fatty acids for improved neurological performance, multi-vitamin.

- o Lifestyle information: two to four hours of television daily, difficulty sleeping, vigorous physical activity less than once a week, low protein intake and few raw vegetables, low to moderate alcohol consumption, poor sleep quality, interests and hobbies centered on work and friends.

- o Cognitive performance: obtained cognitive skill and processing speed data from the Center’s Cognitive Portfolio and BrainTrain®’s Captain’s Log program, obtained basic electroencephalograph information during the BrainTrain® exercises.

2) Analyze symptoms and available data. Staff found the following:

- o Cognitive skill problems:

long-term memory, short-term memory, executive (self-regulation) function, and processing speed problems. We concluded that his cognitive problems were caused, at least in part, by insufficient energy.

- o Diet and lifestyle were causal factors: low protein, enzymes, and choline intake resulted in inadequate amounts of key neurotransmitters related to memory and speed; inadequate physical activity was lessening the probability that he was generating new neurons; energy was being drained by excessive television, and was not replenished by adequate sleep or diet.

- o Inappropriate supplementation: valerian and other herbs for sleep likely contributed to slow processing speed; supplement regimen over-emphasized omega-3 fish oils and did not supply adequate choline, a component of the memory-related neurotransmitter acetylcholine.

- o Side effects of amphetamines: could cause or aggravate Bob's distractibility and outbursts of anger.

3) Design plan. The Center designed a program for Bob that addressed goals of increased processing speed, concentration, and memory, and decreased distractibility. Additional goals included improved sleep and sense of well-being. Bob needed to make the following changes:

- o Diet and nutrition: increased protein; lecithin as

source for choline; ribonucleic acid supplement; daily raw, green, leafy vegetables; changes to supplements recommended by the compounding pharmacy; recommendation that he discuss amphetamines with his doctor.

- o Lifestyle: rebounding on trampoline (for stimulating cells throughout the body); daily activity such as brisk walking or tennis; reduced television exposure.

- o Cognitive training: meditation, customized BrainTrain® at least four hours per week.

4) Implement plan. Bob began cognitive training, started supplementation, stopped taking amphetamines, and made dietary changes. He continued on Adderall until late in the data collection period. He began the BrainTrain® training program. His adherence to the plan, except for diet and supplementation, was uneven. During some weeks, Bob trained for six to nine hours; then he was absent for a week or two. Overall, diet improved by adding more protein, raw green leafy vegetables, and suggested supplements. Bob generally complied with the revised television schedule.

5) Monitor and adjust. Bob quickly made progress in some skill areas and very little on others. Therefore, staff modified individual sessions so that he would obtain concentrated training on a single skill group for an hour or more, until he had

made progress in mastering it. Supplementation was also modified to include more lecithin, which had a positive effect, as reflected in the improvements in memory (see Table 1).

Results. The Center collected copious qualitative and quantitative data. Within three and a half months, Bob performed more than 100 hours of cognitive training on the BrainTrain® system, and staff collected and stored detailed information for each training session.

Quantitative information. The BrainTrain® cognitive training system has three tracks, corresponding to age groups, that present 35 different exercises in an average of 15 different levels of difficulty for each track. The Diamond track (shown as D Table 1) is the target track for adults aged 16 and higher. Bob's BrainTrain® program was customized for his needs, and subsequently modified according to his changing needs over time. Clients typically train on seven to 15 exercises at a time, in order to maximize repetition.

At baseline, Bob was performing below the criterion level appropriate for his education and occupation, with his highest scores obtained for skills related to excessive television-watching (visual tracking, for example). At the end of the reporting period for this publication, Bob

had consistently improved in the majority of skill areas, despite inconsistent attendance. Since Bob's training program changed over time, data comparing baseline and three months after intervention were available for a limited number of the exercises. Table 1 presents a subset of available data from the BrainTrain® system. Of note, Bob stopped taking Adderall just before the end of data collection for this study. Additional information was retrieved from the BrainTrain® user data (See Table 2).

The data obtained on memory show that the speed of retrieval, as well as level of ability, improved substantially in the three-month period. These data provide the most clear-cut support for changes in the brain, since memory involves the hippocampus, a site in the brain

that produces new neurons. The interpretation of changes in categorization, attention, and decision-making are more problematic since speed decreased while skill level increased. For example, practice in the categorization exercise could have helped Bob make the appropriate trade-off between speed and accuracy without a change occurring in his actual skill. On the other hand, the slight (10%) decrease in decision speed seems more than offset by Bob's large increase in the skill level (5 levels or 30% of the track). A similar conclusion can be drawn concerning attention, because Bob advanced 11 of the entire 15 levels in three months of inconsistent attendance. Improved attention is equivalent to decreased distractibility. Bob's average speed increased substantially, as did the average difficulty level.

Qualitative information and observations. Bob's skin tone and general appearance improved remarkably within about three weeks. His sallow and somewhat lifeless coloring became ruddier, apparently from increased circulation. His eyes began to have a brighter appearance. He appeared to have, and reported having, a more positive mood. He walked with more energy while in the Center, and appeared engaged in the process of improving his mind. He began a creative project and reported that he had episodes of inspiration.

Bob's improved symptoms correspond to the results expected from implementing the diet, supplementation, and lifestyle protocols. The reduction in television-watching combined with increased raw food and nucleic acids and increased exercise should have increased physical energy needed for improved neuronal connectivity and enhanced attention and speed. Increased protein intake can also increase energy, as it supplies the needed components of the key neurotransmitters involved in focused attention. Improved mood would also have been expected from an improved neuro-transmitter profile. Improved memory was predicted from both neurogenesis (the body's generation of new

Table 1. Processing Speed and Difficulty Levels Before Implementing Changes and After at Least Three Months of the Cognitive Improvement Program

Skill	Baseline Processing Speed (seconds)	Baseline Level	After 3 mo. Processing Speed (seconds)	After 3 mo. Level	Change
Memory	29.27	D1	12.65	D4	+57%, +3 levels
Categorization	1.98	D2	2.83	D7	-43%, +5 levels
Attention	.38	D3	.56	D14	-47%, +11 levels
Decision-making	1.1	D2	1.22	D7	-10%, +5 levels

Table 2.

Skill	Baseline Processing Speed (seconds)	Baseline Level	After 3 mo. Processing Speed (seconds)	After 3 mo. Level	Change
Exercise average	7.8	D1	4.03	D6	+48%, +5 levels

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Editorials

From the Director, Virginia Center on Aging

Edward F. Ansello, Ph.D.

Aging and Overweight

This issue's case study on brain health in later life prompts comments on physical health, specifically rates of obesity and diabetes with aging. The good news is that Virginia is no worse than the national averages. The bad news is that the national averages are frightful: 56% of men and women are overweight, 33% are obese, while 18% of 65-74 year olds and 14% ages 75+ have diabetes, usually type 2, the late-onset type. Pointedly, the CDC's National Center for Health Statistics reports that, between 1998 and 2004, the increases in prevalence of diabetes among older age groups were progressive: up 19%, ages 50-64; 28%, ages 65-74; 33%, 75-84; and 35%, ages 85+. Today's older American man of 60-74 years weighs about 33 pounds more than his counterpart of 1960, with the average older woman weighing about 17 pounds more than her counterpart. There is, moreover, an almost direct link between obesity and late-onset diabetes, as well as progressively stronger relationships between excess weight and risks of heart attack, stroke, kidney disease, colon and pancreatic cancer, physical distress, and more.

Recently published research suggests that two simple measures can guide older Virginians in monitoring of their own health: the Body Mass Index (BMI) and the Waist-Hip Ratio (WHR). The BMI offers an indication of the body's work load, how much weight is being carried per inch, as it were. BMI is simply one's weight divided by one's height squared (see simple calculation guidelines on page 6). A BMI of 25 or more indicates overweight, above 30 indicating obesity and greatly heightened risk for the conditions noted. The BMI is a good indicator of risk but it does not distinguish between weight that is muscle and weight that is fat, an important matter when fat-free mass (especially muscle) is lost with aging.

The WHR indicates how much weight is stored around one's mid-section, for one's waist is a dangerous place to store fat. With age the WHR apparently becomes more important a predictor of physical well being than the BMI. While research published last year in the British medical journal *The Lancet* confirmed the greater predictive value of WHR over BMI, research published in the August 8, 2006 issue of the *American Journal of Clinical Nutrition* finds that, for aging adults, where fat or excess weight is stored on the body is more critical than the body's density, which the BMI indicates. Unlike

fat in the arms, legs, or buttocks, fat around the mid-section is likely to get into the bloodstream, carrying potential damage to organs and precipitating harmful blockages and growths there and elsewhere; hence, such a fat distribution is progressively correlated with heart disease, stroke, etc. The bigger the waist, the bigger the risk.

One advantage of the WHR is its simplicity: measure fully around the widest part of your hips and fully around the widest part of your waist. For health reasons, a woman's waist should not exceed 85% of her hip size; because men have narrower hips, a man's safe ratio is 90% or less. So, if hip size is 40 inches, let's say, a woman's waist should not exceed 34 inches and a man's should not exceed 36 inches. As implied above, risks of life-shortening conditions and disability increase as the ratio increases.

What to do after you measure? If your WHR number is suitable, maintain the healthy habits that made it so, and continue to self-monitor. If the ratio is too high, take action. Literally. There's no such thing as spot-dieting to reduce just waist size. Also, electrical and motorized gadgets applied to the waist were debunked years ago. Studies over many years have shown that caloric restriction (cutting calories, especially calories from

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fat) and moderately increasing physical activity (as little as walking 30 minutes six times a month) will not only reduce waist size but will also help improve overall health. If this is too much, start small and work toward doing more. Take advantage of free or nearly-free resources for good health and nutrition information; these include the National Institute on Aging's help line (1-800-222-2225) where one can ask a staffer to send information on many practical topics, and the National Heart, Blood, and Lung Institute's Health Information Center (1-301-592-8573) where one can request "Dietary Approaches to Stop Hypertension (DASH)," a reader-friendly booklet on nutrition, meal planning, and lifestyle conducive to better health. We Virginians need to take action.

To Calculate BMI:

Weigh yourself. Divide your weight in pounds by your height in inches squared. Multiply the result by 705. For example, a woman, 5'5" (65inches) tall, weighing 157 pounds, has a BMI of 26.1: $157 \text{ divided by } 65 \times 65 = 0.037$; $0.037 \times 705 = 26.1$

From the Executive Director, Virginia Geriatric Education Center

J. James Cotter, Ph.D.

Hello, all. Don't give up. The fight continues to save the U.S. Geriatric Education Centers. Funding to reinstate support for Geriatric Education Centers at the federal level is still not assured. Your efforts have put the funding back into the House budget bill, but not the Senate's version. This happened despite the report of the White House Conference on Aging, just released to Congress, in which two of the top 10 recommendations focused on educating the health professions workforce in geriatrics. I still don't get it – more older people, fewer health professionals trained in geriatrics = cut the funding? I know we are used to some lack of sense from Washington, but not this much.

I am urging all of you to contact Senator Warner and Senator Allen and ask to speak with the legislative aide in charge of health. Tell them how this loss of funding for geriatrics has reduced the training of health care professionals in Virginia and how it will mean poorer quality of care for older Virginians. Remind them that the House restored funding for geriatrics at \$31.5 million in

Title VII funding for geriatric education in the Labor HHS appropriation, and encourage the Senate to do the same.

On a brighter note, we are pleased to be working with the Virginia Center on Aging to develop new training programs on geriatrics for health professionals. The Virginia Center on Aging received funds from the 2006 Virginia General Assembly for geriatric education. I want to thank all of you who took the time to contact your members of the General Assembly and inform them about the importance of geriatric education. We will be working with the Center on Aging to design and implement a program to train nursing home administrators, directors of nursing, and nursing assistants at a variety of health care facilities throughout Virginia. In addition, our VGEC Consortium partners, Eastern Virginia Medical School and the University of Virginia, will be able to continue their excellent educational initiatives in geriatrics.

The Virginia Geriatric Education Center (VGEC) of VCU's Department of Gerontology continues to provide geriatric education in Virginia. In the past year, almost 2,000 health professionals have been trained through programs sponsored by the VGEC. Just this month, we cosponsored, with 14 other Geriatric Education Centers in

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the U.S., along with the Employee Education System of the Veterans Affairs health system, a videoconference on “The Elderly Driver.” The speakers were national experts on this important issue. The videoconference will soon be available in DVD format and we expect to make it available as a web-based training program on the Department of Gerontology’s website. Stay tuned or contact us after October 15th at (804) 828-9060 for more information about this training.

The next program that we are excited about is the Annual Conference of the Richmond Chapter of the Alzheimer’s Association to be held on November 7th at the Sheraton West. More information about this conference can be found at www.richmondalzheimers.org or by calling (804) 967-2480.

From the **Commissioner, Virginia Department for the Aging**

Julie Christopher

State Agencies Address the Aging of the Commonwealth’s Population

In the Winter 2006 Issue of *Age in Action* (Vol. 21, #1), the Department for the Aging brought readers up-to-date on the study by the Joint Legislative Audit and Review Commission (JLARC) on the “impact of Virginia’s aging population on the demand for, and cost of, state agency services, policies, and program management issues.” This study was the result of HJR 103 which was passed by the 2004 session of the General Assembly. The idea behind HJR 103 came from the members of the Commonwealth Council on Aging and was a component of their legislative package for the 2004 session. They worked with Delegate Jack Reid who was the bill’s sponsor.

JLARC submitted its study findings to the General Assembly in November of 2005. This study is available in House Document 10 (2006) titled *Impact of an Aging Population on State Agencies*. Briefly put, JLARC found that most state agencies were not prepared to

deal with the impact of the aging “baby boomer” population. As a result of this finding, the Commonwealth Council on Aging once again approached Delegate Jack Reid with proposals for two bills to be submitted during the 2006 session: HB 110 and HB 854. Both bills passed and became effective in July of this year.

HB 110 required each state agency to include in their strategic plan an analysis of the impact that the aging of the population will have on its ability to deliver services as well as a description of how the agency is responding to these changes. The bill also stated, “Based on guidance from the Secretary of Health and Human Resources, each agency shall report by October 1 of each year to the Governor and to the General Assembly its progress for addressing the impact of the aging of the population in at least five specific actions.”

The Secretary of Health and Human Resources issued the following guidance to state agencies this Summer:

- Agencies were asked to report the number of persons who received services from the agency in the past fiscal year who fell into each of the following age ranges: 65-74; 75-84; and 85 and older. If the agency lacked specific information

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about the numbers of senior citizens it serves, but has other evidence indicating that it is serving more or fewer senior citizens than it has in the past, it was asked to describe the basis for that estimation.

- Agencies were asked to identify services that are utilized by citizens 65 and older in significant numbers and to indicate whether the agency has the capacity at present to serve all interested seniors or whether the demand for certain services exceeds the agency's capacity.

- Agencies were asked to identify current programs specifically designed to serve seniors 65 and older that fall into any of the following six categories: healthcare/wellness; education; public safety; recreation; financial security (including housing); and transportation.

- Agencies were asked to identify the extent to which they provide "consumer-oriented" publications and websites online that are designed to be "senior-friendly." If the information currently provided is not readily accessible to seniors, agencies were asked to identify any steps they would take to improve accessibility.

- Finally, agencies were asked to describe any other services or programs that have been implemented (or will be in the future) to address the impact of the aging of Virginia's population.

These questions were intended to provide a baseline of information about what agencies are currently doing. In future reports, agencies will be asked to expand on some of these themes and/or provide additional data.

HB 854 required that the head of each state agency designate an existing employee to be responsible for reviewing policy and program decisions under consideration by the agency in light of the impact of such decisions on senior citizens and adults with disabilities. This designated employee is also charged with advising and alerting the agency head of opportunities to make policies, programs, and regulations senior-friendly and disability-friendly. The Secretary of Health and Human Resources has asked that these designees also be involved in their agency's development of their HB 110 report.

Together, HB 110 and HB 854 may represent the camel's "nose under the tent" for aging baby boomers. These bills force state agencies, especially those agencies not in the Health and Human Resources Secretariat, to begin to acknowledge that they will have to change the way they do business to meet the demands and expectations of the aging baby boomers.

New Grant Project against Elder Abuse

The Virginia Center on Aging (VCoA), on behalf of the Central Virginia Training Alliance to Stop Elder Abuse, Neglect and Exploitation, has been awarded a three-year, \$429,000 grant from the U.S. Department of Justice. This multi-disciplinary training initiative will assist court officers, prosecutors, and law enforcement in recognizing, addressing, investigating, and prosecuting elder abuse, neglect, and exploitation, including domestic violence and sexual assault against older Virginians.

Collaborators signing the project's Memorandum of Understanding are the Ashland Police Department, Chesterfield County Police Department, Hanover County Office of the Commonwealth's Attorney, Hanover County Juvenile and Domestic Relations District Court, Henrico County Office of the Commonwealth's Attorney, Henrico County Division of Police, Richmond Office of the Commonwealth's Attorney, Richmond Police Department, Safe Harbor, Senior Connections: The Capital Area Agency on Aging, VCoA, Virginia Commonwealth University Police Department, and the YWCA of Richmond.

Focus on Contributing Agency Staff Members/Volunteers/Projects

Focus on the Virginia Center on Aging

Lisa Furr



The Virginia Center on Aging (VCoA) is pleased to welcome Lisa Furr, who will

serve as Project Coordinator for the Central Virginia Task Force on Older Battered Women. Lisa brings to this position an array of knowledge and experience with both nonprofits and domestic violence services. For the last four years, Lisa worked at Safe Harbor, a Henrico County domestic violence program that serves the metro Richmond area, first as the associate director of special services in charge of the shelter and education and more recently as Community Educator and Volunteer Coordinator.

An experienced trainer and educator, Lisa has a Master Degree in Christian Education from the Presbyterian School of Christian Education. She has over 15 years experience in nonprofit programming. She has worked as a camp director, educator, program coordinator and, for a few years, as a travel agent.

Lisa serves on the Governing Body (Board) of the Virginia Sexual and Domestic Violence Action Alliance as the Social

Justice Task Force. She is a member of the Alliance's training faculty, and has offered domestic violence training to professionals in the medical, legal, mental health, religious and law enforcements fields. An experienced trainer, Lisa has conducted local and statewide workshops on such topics as community partnerships, the effects of domestic violence on children, domestic violence and the lesbian and gay community, understanding white privilege, and working with criminally charged women. Her work with the Action Alliance has also included helping to develop the first forum for working with Spanish speaking populations; so she is thrilled to be taking a conversational Spanish class at VCU.

Lisa loves the out-of-doors. Most summers find her and Dorothy Fillmore, her partner of 16 years, camping at Virginia's state parks. Lisa feels lucky to live in a region with such a wealth of natural resources. It is her goal to camp at every one of Virginia's parks. Lisa and Dorothy live in Henrico and have two dogs and a cat. They are active in their congregation, where Lisa co-chairs the worship committee and serves on the board. In her free time, Lisa enjoys reading mysteries and science fiction.

Having worked with the Central Virginia Task Force on Older

Battered Women in her previous position, Lisa is excited to be joining the Virginia Center on Aging. She looks forward to training and networking locally and across the Commonwealth in confronting violence against those in later life.

Senior Center Reopens

The faculty, staff, and students of the Department of Gerontology are delighted to be a partner in the Senior Center: A Community Partnership with Senior Connections: The Capital Area Agency on Aging, The Junior League of Richmond, Bon Secours, and William Byrd Community House.

After extensive guidance from Senior Center members, many lively meetings, lots of elbow grease, and generous donations from a supportive community, the grand reopening took place in Richmond on Monday, September 25, 2006.

Our students will be directing the Pathways program and providing general program support. Under the direction of Dr. Kimberly Taylor, Assistant Professor, students from the departments of Gerontology and Exercise Science will plan and implement exercise and wellness programs.

COMMONWEALTH OF VIRGINIA

Alzheimer's and Related Diseases Research Award Fund

2005- 2006 FINAL PROJECT REPORTS

The Alzheimer's and Related Diseases Research Award Fund (ARDRAF) was established by the Virginia General Assembly in 1982 to stimulate innovative investigations into Alzheimer's disease (AD) and related disorders along a variety of avenues, such as the causes, epidemiology, diagnosis, and treatment of the disorder; public policy and the financing of care; and the social and psychological impacts of the disease upon the individual, family, and community.

GMU Jane Flinn, Ph.D. (Dept. of Psychology) “The Effect of Enhanced Levels of Zinc and Iron in Drinking Water on Memory, Amyloid Configuration, and Plaque Development in Transgenic Mice”

Alzheimer's disease is characterized by the presence in the brain of intracellular tangles and extracellular plaques containing the amyloid protein. Attention has recently focused on the role of metals in plaque formation, as amyloid binds to zinc, copper, and iron. Transgenic mouse models of AD have been developed, and brain concentrations of metals can be increased by raising animals with enhanced levels of metal in the drinking water. This study examined how elevated zinc and iron affected memory, amyloid conformation, and plaque formation in a transgenic mouse model of Alzheimer's disease. Transgenic mice raised on enhanced zinc or iron showed deficits in spatial memory, when tested in the Morris water maze, compared to those raised on lab water. Spatial memory is dependent on the hippocampus, where both zinc and iron are found. The mice were also tested on a task designed to investigate their ability to consolidate memories (the Novel Object Recognition task), measuring whether they could remember that they had previously seen an object. Transgenic mice raised on excess zinc showed no preference for the novel object (which normal mice do), performing at chance level. In contrast, mice raised on iron were not impaired on this task, compared to those raised on lab water. Initial analyses of metal content showed that high levels of both iron and zinc were seen in plaques. The beta pleated sheet form of amyloid, the type of amyloid found in the end stage of the disease, co-localized better with the iron than with the zinc. Since zinc has been recommended as a treatment for age related macular degeneration, and ingestion of zinc can deplete copper in the body, the investigator raised some mice with a small amount of copper added to the zinc-enhanced water. This reduced the spatial memory deficits, but did not affect memory for objects. These studies indicate that metals in drinking water can affect memory in a mouse model of Alzheimer's disease. *(Dr. Flinn can be reached at 703/993-4107)*

**College of Christine J. Jensen, Ph.D. and colleagues (Center for Public Policy Research)
William and Mary “Promoting an Effective Partnership between Families Coping with Alzheimer's
Mary Disease and Their Healthcare Providers”**

The primary objective of this project was to identify the needs of family caregivers and healthcare providers who care for persons with memory loss. A total of 128 caregivers completed a telephone or online survey, and 27 healthcare providers participated in a focus group and completed a survey. The hypothesis that primary care physicians would be more likely to provide a diagnosis of Alzheimer's disease than a specialist was not supported. Caregivers reported their primary source of information about the disease was the doctor; however, the majority reported that the doctor provided more information about medications than about the course of the disease or available resources. Physicians and nurses reported that time to spend with patients and families and awareness of community services were their biggest challenges. These findings suggest a number of policy-related recommendations: 1) Increase awareness about the local Alzheimer's Association among medical professionals and family caregivers; 2) Promote the provision of training programs for family caregivers and healthcare providers to address the identified health literacy issues and to strengthen the healthcare partnership; 3) Raise awareness of the Certificate for Added Qualifications in Geriatric Medicine (available for physicians board certified in Family Medicine and Internal Medicine) and encourage support for the Geriatric Loan Forgiveness bill; 4) Encourage greater utilization of technology among healthcare providers to track the needs of persons with dementia; and 5) Expand clinical standards to include support for the healthcare triad in dementia care. *(Dr. Jensen can be reached at 757/221-1971)*

GMU Pamela M. Greenwood, Ph.D. (Department of Psychology) & Karl Fryxell, Ph.D. (Department of Molecular and Microbiology) “Use of Allelic Association to Study the Genetics of Cognitive Aging”

Although the risk of Alzheimer’s disease is thought to be influenced by several genetic factors, only one gene, APOE, has been conclusively linked to the disease. However, the APOE gene, which is neither necessary nor sufficient for Alzheimer’s disease, also has a broad role in the health and repair of neurons in the brain. The investigators hypothesize that genes which affect neuronal health and efficiency of neuronal communication (neurotransmission) may also affect cognitive aging. However, little work has been done to investigate the role of such genes in cognitive aging. Consequently, this research team carried out four experiments on over 400 young and old healthy people to investigate how normal variation in eight genes modulates aspects of attention, memory, and visual search. The genes were selected based on previous work, including their own previous investigations of APOE and neurotransmission genes. Analyses indicate that one neuroprotection gene (BDNF) may modulate attentional function in aging. This indicates that normal variation in neuronal plasticity may play a role in the course of cognitive aging. If confirmed, this finding will provide evidence supporting research into the role of neuronal protection genes as an important avenue for investigating risk factors related to cognitive decline in aging. *(Dr. Greenwood can be reached at 703/993-4268; Dr. Fryxell can be reached at 703/993-1069)*

UVA Michelle King, Ph.D. (Dept. of Biology) “Direct Interactions between A β and Tau in Cultured Cells”

The primary objective of this study was to characterize the relationship between pre-fibrillar β -amyloid and intracellular tau expression, as modeled in a cell culture system. The principal observation used initially was time-lapse photography of tau and tubulin localization following β -amyloid treatment. First, the investigator was able to quantify the microscopy findings by counting cells in populations treated with β -amyloid, and these data provided statistical significance in the initial observation. Second, the findings were confirmed by using an independent biochemical assay for tubulin. And finally, all of the findings were confirmed by microscopy and biochemistry of primary neurons treated with β -amyloid. A significant question regarding the signaling pathway connecting β -amyloid and tau still remains. While the original objectives proposed have been attempted, the research has yet to yield a potential candidate pathway. New experiments are ongoing, as this information is crucial to our understanding of the relationship between tau and β -amyloid and has great potential as a means for designing molecules for therapeutic intervention. *(Dr. King can be reached at 434/243-7764)*

UVA Isaac G. Onyango, D.V.M., Ph.D. (Department of Neuroscience and Neurology) “Molecular Mechanisms of Neurodegeneration in Alzheimer’s Disease”

Two cellular models of Alzheimer’s disease (AD), the transmittochondrial cellular hybrid (cybrid) cell model of sporadic AD (sAD) and the SH-SY5Y cells bearing familial AD (FAD) presenilin1 mutations, over produce amyloid-beta peptide (A β) similar to patients. A β requires functional mitochondria to induce cell toxicity, and the survival of neurons in AD is likely regulated by the integration of a complex network of intracellular and extracellular signals. The mitogen-activated protein kinase (MAPK) superfamily comprises the c-Jun NH2-terminal kinase (JNK), p38 MAPK, and the classical MAPK, extracellular signal-regulated kinase (ERK). This study characterized intracellular responses to oxidative stress, beginning with how oxidative stress alters activities of the apoptosis signal-regulating Kinase 1 (ASK-1) or MAPK kinase 4 (MEKK4), and how these upstream “sensors” regulate downstream, pro-apoptotic effector kinases (p 38 MAPK, JNK). Cybrids representing sAD were compared to SH-SY5Y cells expressing PS1M146L mutations as a model of FAD and A β (1-42) treated control (CTL) cybrids. The investigator found that in all three cell models of AD, A β mediated depletion of glutathione (GSH) enhances oxidative stress and seemingly drives the activation of p38MAPK and JNK, in the face of a weak and ineffective ERK and phosphatidylinositol 3-kinase stimulated Akt (PI-3K/Akt) activation, resulting in reduced viability. The upstream regulators are distinct with the FAD utilizing ASK-1 as the primary regulator of the cell death, whereas in the cell models of sAD, both ASK-1 and MEKK4 seem to be key regulators of neuronal vulnerability. Activation of the PI3K/Akt signal transduction system by both N-acetylcysteine (NAC) and nerve growth factor (NGF) enhances viability and protects against oxidant injury. Insight gained from these investigations into the signal transduction cascades activated in these cell models provide specific mechanistic insights that will lead to improved approaches to manage the oxidative stress burden in AD brain. *(Dr. Onyango can be reached at 434/243-9268)*

Case Study, continued from page 4

neurons) as well as the lecithin supplementation: lecithin supplies choline, which the body uses to make acetylcholine, a neurotransmitter involved in memory.

Bob reported highly positive results from the program. Currently, he has at least one project underway. He reported higher energy and greater interest in living, greatly improved mood, ability to focus, resistance to distractions, and sleep. It is clear to Center staff that Bob enjoys life, and has a higher quality of life than before starting the program.

Conclusions

This case study supports the Center's model for improvement and provides at least limited evidence for neural plasticity in later life. Bob had previously higher skill levels, which decreased over a period of years, and then increased in a period of months during the study. Because the measures of Bob's performance were obtained on an objective system, performance improvements were most likely due to the Center's protocols and not to placebo or experimenter expectations.

Considering that Bob had cognitive skill deficits and a diagnosis of Adult ADD, the

achievement of substantially higher levels of performance in approximately four months is remarkable. Data showed that a combination of diet modifications, supplementation, cognitive training, and lifestyle changes can improve speed and capability, and, further, that these can improve the quality of life. Comparisons of subjects of different ages and with different symptoms would provide valuable insight into the factors that contribute and hinder cognitive skill improvements.

Study Questions

1. What is the diet-neurotransmitter-brain function relationship?
2. Why is a multi-dimensional approach needed for cognitive improvement?
3. Which evidence best supports the concept of neural plasticity?

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About the Author



Susan Hardwicke, Ph.D., earned her doctorate in psychology at George Washington University. A cognitive psychologist, she has been the Founder and CEO of Edutest, Inc., the first online educational testing company; kSero Corporation Inc., and kSero Centers for the Mind, which developed an after-school program that builds foundational cognitive skills; and Virginia Bionutrients LLC, a nutraceutical company that develops products designed to improve cognitive functioning.

Responding to Elder Abuse and Domestic Violence in Later Life: Safety, Accountability, Services, and Collaboration

An August regional conference drew 150 law enforcement, social work, victim services, and other professionals to the Richmond Airport Doubletree. The Richmond Police Department, the Virginia Center on Aging, the Virginia Coalition for the Prevention of Elder Abuse, and the Central Virginia Task Force on Older Battered Women sponsored this two-day conference to address the issues surrounding domestic violence and older adults. Attorney General Bob McDonnell offered opening remarks.



Top Left: Dr. Peter Boling, a geriatrician at VCUHS, addresses the audience.

Top Right: Wendy Swallow (Virginia Beach Dept of Social Services) discusses financial exploitation and undue influence with conference attendees.

Middle Left: VCoA staff members Paula Kupstas, Ed Ansello, Aly Cooper, Tara Livengood, and Catherine Dodson.

Middle Right: Det. William Lightfoot (Richmond Police), Dr. Paula Kupstas (VCoA), and Assistant Police Chief Ray Tarasovic (Richmond Police), following Chief Tarasovic's luncheon address.

Bottom Left: Candace Heisler, a District Attorney in San Francisco for 25 years, shares promising practices from around the country with conference participants.

Calendar of Events

October 25-27, 2006

Fifth Annual North Carolina Conference on Aging. Sheraton Imperial Hotel & Convention Center, Research Triangle Park, NC. For more information, visit www.aging.unc.edu/nccoai/index.html.

October 30, 2006

Greater Hampton Roads Coalition on Aging 10th Annual Legislative Event. 8:00 a.m. - 10:00 a.m. Hilton Garden Inn at Constance Wharf, 100 East Constance Road, Suffolk. For more information, call Mandy Jordan at (757) 846-5541.

October 30-31, 2006

Virginia Conference on Mobility Needs. Sponsored by AARP Virginia, the Secretariat of Transportation, and the Virginia Commissioner for Aging. Sheraton Richmond West Hotel, 6624 W. Broad Street, Richmond. For more information, call (866) 542-8164 or visit www.aarp.org/states/va/va-news.

November 2, 2006

2006 Community Conversations on Aging with Julie Christopher, Virginia's New Commissioner for Aging. Noon - 2:00 p.m. Norfolk Senior Center, 7300 Newport Avenue, Norfolk. For more information, contact John Skirven, Senior Services of Southeastern Virginia, at (757) 461-9481.

November 2, 2006

2006 Community Conversations on Aging with Julie Christopher. 4:00 p.m. - 6:00 p.m. The Immaculate Conception Catholic Church, 2150 Cunningham Drive, Hampton. For more information, contact Bill Massey, Peninsula Agency on Aging, (757) 873-0541.

November 6-7, 2006

Reflecting on 100 Years of Alzheimer's: The Global Impact on Quality of Lives. Presented by Case Western Reserve University's University Center on Aging and Health. Crowne Plaza City Centre Hotel, Cleveland, OH. For more information, contact Sandra Hanson at (216) 368-4945 or visit fpb.case.edu/cfa/announce.shtm.

November 7, 2006

Estes Express Caregiver Conference. Presented by the Alzheimer's Association. 8:30 a.m. - 4:30 p.m. Sheraton West, 6624 W. Broad Street, Richmond. For more information, call (804) 967-2580.

November 16, 2006

2006 Community Conversations on Aging with Julie Christopher. 2:00 p.m. - 4:00 p.m. The Cascades Senior Center, 21060 Whitfield Avenue, Sterling. For more information, contact Lynn Reid or Debra Williams, Loudoun County Area Agency on Aging, (703) 777-0209.

November 16-20, 2006

Education and the Gerontological Imagination. The 59th Annual Scientific Meeting of the Gerontological Society of America to be held at the Adam's Mark Hotel-Dallas, Dallas, TX. For more information, call (202) 842-1275 or visit www.geron.org.

January 24, 2007

Virginia Center on Aging's Annual Legislative Breakfast. St. Paul's Episcopal Church, Richmond. For more information, call (804) 828-1525 or eansello@hsc.vcu.edu.

Age in Action

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Fall 2006

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Age in Action is published quarterly. Submissions, responses to case studies, and comments are invited and may be published in a future issue. Mail to: Editor, *Age in Action*, P.O. Box 980229, Richmond, VA 23298-0229, fax to (804) 828-7905, or e-mail to spruill_kimberly@yahoo.com.

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Long-Term Living: Preparing and Caring

Virginia Coalition for the Aging Fall Meeting and Elder Rights Coalition Legislative Forum

Thursday, October 26, 2006
Holiday Inn Select Koger Center, Richmond
8:30 a.m. - 4:45 p.m.

Co-sponsored by the Virginia Health Quality Center

Agenda Highlights:

Anticipating our long-term living needs - what should we be planning for?
Balancing work and eldercare responsibilities - pilot programs
VHQC initiatives for quality in long-term care
Model programs in long-term care

For more information, contact Carter Harrison, VCA President,
at (804) 967-2594 or carter.harrison@alz.org.

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