MindAlert

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Intervening with Late-Life Cognition: Lessons From the ACTIVE Study by Michael Marsiske

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Introduction

Cognitive intervention programs hold intriguing promise for improving critical skills in reasoning, memory, and speed of processing among older adults. In this booklet, Michael Marsiske, PhD, discusses highlights from the Advanced Cognitive Training in Independent and Vital Elders (ACTIVE) study. He places current findings in the context of prior research and considers new directions for exploration and application to enhance quality of life among elders with normal brain function, as well as those with mild cognitive impairment. In addition, Dr. Marsiske offers a framework for studying brain plasticity and discusses the challenge of transferring skills practiced in formal intervention programs to daily activities.

Dr. Marsiske presented the lecture on which this monograph is based at the 2008 Aging in America Conference in Washington, D.C., as part of the MindAlert program. Sponsored by the American Society on Aging and MetLife Foundation, MindAlert is dedicated to sharing the latest research on maintaining and enhancing cognitive function in later life. Also included in this booklet are profiles of the winners of the 2008 MindAlert Awards, which recognize programs that promote mental fitness in older adults, and an annotated list of past MindAlert monographs.

Intervening With Late-Life Cognition: Lessons From the ACTIVE Study

The Advanced Cognitive Training in Independent and Vital Elders study, known as ACTIVE, is a longitudinal, multisite study of cognitive interventions with diverse elders. Findings from the first phase of the study advance knowledge about the benefits of cognitive training for older adults who live in the community. Somewhat unusual because of its size and scope, ACTIVE has been funded by the National Institute on Aging (NIA) and the National Institute of Nursing Research (NINR) as a cooperative trial. NIA and NINR are valued research partners collaborating with principal investigators at six sites in the United States.[1] To outline the current lessons that ACTIVE offers for researchers and practitioners, I will review general trends in cognitive training research, consider the main findings from the study to date, and explore themes for future research and questions raised as a result of study outcomes.

The Concept of Cognitive Intervention

Cognitive intervention recently has become a popular topic, and it is easy to understand why. Just a few years ago, only one or two big stories per year were written on the subject. In contrast, a Google search today would reveal links to hundreds of articles in the mainstream press related to the theme of intervening in late-life cognition. Three major reasons drive the surge in interest. First, emerging data are suggesting that it is possible to positively affect the cognitive status of older adults. The old saying that you can't teach an old dog new tricks was a prevailing assumption about the aging human brain until the 1970s or so. Now, it is common knowledge that this assumption is false. Some improvement in brain function is possible at virtually any age, especially with targeted skill-building activity. Second, emerging technologies and products are making it easier for individuals to undertake self-training programs. Third, some individuals in the current aging cohort have taken active steps with physical exercise regimens to promote health and prevent disease. The desire to take control of one's late-life physical condition logically extends into wanting to improve mental function, as well.

Findings from the first phase of the study advance knowledge about the benefits of cognitive training for older adults who live in the community.

Cognitive intervention refers to the use of formalized training programs designed to improve specific areas of mental function, such as memory or problem solving.[2] Cognitive intervention programs can be thought of as preventive—that is, designed to enhance or maintain cognitive function in late life. The goal of such interventions is to boost cognitive reserve for people who have not been diagnosed with or do not appear to be at immediate risk for dementia.

The concept of a cognitive continuum helps clarify which segments of the population are candidates for cognitive intervention. Between normal aging of the brain and dementia is an interim stage called mild cognitive impairment.[3] The ACTIVE study focuses on interventions for people with normal cognition and, possibly, for those in the early stages of preclinical (i.e., before the appearance of symptoms) impairment.

The question *How do we know these declines are irreversible if we don't try to reverse them?* gave birth to the cognitive intervention literature.

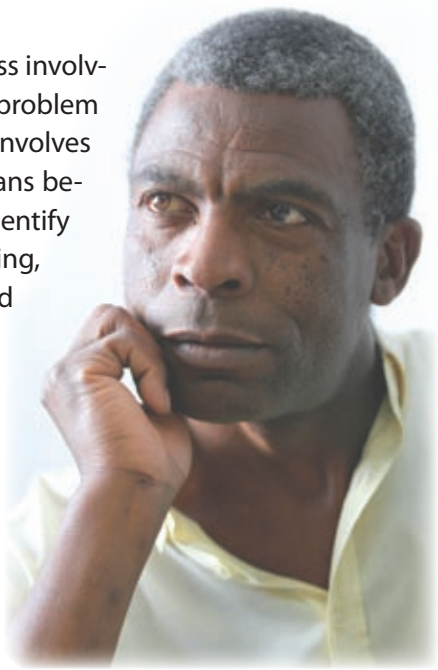
Some people still believe—erroneously—that late life is a time of inevitable decline. However, the reality is far more complex and promising.[4] By the sixth decade of life, some brain functions—such as letter and number sequencing, speed of attention, and working memory task or matrix reasoning (a form of complex problem solving)—seem to decline in significant ways. Other areas of cognition, including vocabulary and the general knowledge acquired over a lifetime, do not seem to decline much and may even improve through at least the sixth decade and then remain fairly stable thereafter. Interventions have focused on those cognitive functions that seem to decline, with the goal of strengthening abilities that are most vulnerable to the aging process.

Cognitive Training Prior to the ACTIVE Study

As an organized field of inquiry, research on cognitive intervention with older adults began in the late 1960s and early 1970s as part of the emerging social-change movements of the era. Social scientists who were beginning to question biological irreversibility about nearly everything also challenged the concept that age-related declines were inevitable. The question *How do we know these declines are irreversible if we don't try to reverse them?* gave birth to the cognitive intervention literature. In the 1970s, the focus was not on specific interventions to keep people independent longer or functioning better. Rather, the goal was to demonstrate that there could be plasticity—that improving cognitive performance in the later years was possible, even in areas that had already shown some evidence of decline. Although most of the early cognitive training studies did not have the goal of affecting function, their findings were relatively optimistic with regard to plasticity or improvability. As a result, very little was known about how cognitive training might affect people's function until the mid-1990s at the earliest.

Since the 1970s, a large body of research has investigated the modifiability of three mental abilities in adults ages 65 and older that are thought to be most vulnerable to decline: reasoning, memory, and a broad collection of abilities and skills called

attention and speed of processing. Reasoning is a complex process involving association, categorization, deductions of cause and effect, problem solving, organization, generalization, and judgment of safety. It involves abstract skills, such as figural and inductive reasoning, that humans begin to learn at a young age. In figural reasoning, the goal is to identify a pattern and figure out what is missing. With inductive reasoning, the challenge is to predict what comes next in a series. This kind of thinking is quite abstract and involves both cross-sectional and correlational work. As people reach their 20s and 30s, cross-sectional work shows evidence of a negative age effect. Furthermore, the abstract reasoning required for correlational work is quite predictive of the ability to do everyday tasks—including the instrumental activities of daily living (IADLs).[5]



Memory is the ability to recover information about past events or access knowledge. One common method for assessing memory status is episodic list recall, in which individuals are tested on how well they recall a given list of words over shorter or longer time spans.

Speed-of-processing ability declines precipitously with age. People experience this decline as a restricted field of view, which means that they take in less and less information as they get older. Among the many tests for speed of processing, the ACTIVE study focused particularly on the useful field of view. Despite its name, the useful field of view is not a vision test—although it does have a visual basis. Rather, this test measures how quickly people can see things at a glance. In a classic useful-field-of-view task, an image flashes on a screen very rapidly, for between 16 and 500 milliseconds. The challenge is to do two things at once: Make a judgment about an object in the center of the screen—usually an image of either a car or a truck—and also identify both the location and the identity of a second object on the periphery. Significantly, speed of processing has been shown to be strongly related to such everyday functions as mobility and, especially, driving. The good news is that speed of processing has been found to be quite amenable to improvement and change through training.

Design of Typical Training Studies

A training study typically has four major components. First, participants complete a pretest to assess a level of performance ability on a specific task at baseline. Second, the sample is randomized, with about half of participants scheduled for structured training sessions and the rest in a control group that does not receive intervention. Most commonly, the control group has no contact with any intervention, although some studies set up placebo-contact conditions in which people come in for group discussions or other activities that are not related to the ability targeted by the training program. Third, immediately after the treatment group completes its training, participants undergo a post-test to determine initial levels of change. The fourth step is follow-up over time to see whether participants have sustained any of the improvements measured in the post-test. Delayed post-tests have been conducted over periods from one week to seven years following training sessions. Depending on the ability being studied, effects have been

found to last for up to seven years after training.

In the ACTIVE study, we teach older adults to strengthen and apply a specific skill. For example, we present them with a list of numbers or words in which the challenge is to figure out what would come next in the series. Adults have increasing difficulty with this type of task as they age. An element of the training strategy uses highlighting and marking, a process that is common among college students. We teach people to make patterns in the stimuli stand out so that once they identify a paradigm, they can figure out what comes next. We start with simple examples, provide lots of practice, and then move on to more difficult tasks. We try to deal with tasks that have everyday relevance.

Identifying underlying categories is a step toward learning to categorize or cluster information more generally.

Because memory training involves a complex set of skills, we teach older adult participants that improving memory involves four broad strategies: meaningfulness, organization, visualization, and association. After we introduce the strategy and make it very concrete, we then give individuals exercises to reinforce their skills. We teach older adults that organizing words into categories is a useful strategy and that remembering a few groupings makes recalling the specific components of each one easier. Identifying underlying categories is a step toward learning to categorize or cluster information more generally.

In useful-field-of-view training, the goal is getting individuals to achieve mastery at the level of simple perceptual identification. For example, participants initially are asked to determine whether an object in the center of a picture is a car or a truck. Over time, peripheral objects are introduced to the test and then distractions are added.[6] Tasks not only become more difficult but also require faster responses. In addition, the peripheral objects appear farther and farther away from the center of the visual screen, quite literally helping people build an increased field of view.

All of the cognitive intervention activities are conducted in groups of about four people with one trainer and meet twice a week for 60 to 90 minutes. Research has shown that when older adults work on training games in a small-group environment, they share strategies with one another. Reasoning and memory interventions use paper-and-pencil training booklets; the useful-field-of-view training is conducted with computers.

Training studies typically are evaluated using three criteria. First is magnitude of effect, or the size of the training gain. Second is durability of event, which refers to how long the gain lasts. A training gain that is big but persists for only one day, for example, is not meaningful. A gain that is very specific to the training activity and

does not seem to improve any other ability is less significant than one that may benefit multiple areas of function. Third is breadth of effect, or training transfer. This last category, breadth of training, has bedeviled skills-training research for the last 100 years.

Prior to 1996—a watershed year because that is when the National Institutes of Health commissioned the ACTIVE study—cognitive training with older adults focused on the enhancement of specific abilities and skills. Effects were found to be of substantial magnitude (0.5–1 standard deviation); very durable (lasting from two to seven years, except for memory); and generalized to multiple markers or tests of the trained ability. Notably, however, the improvement was limited to the ability for which the training intervention was designed. Significantly, there was no evidence that improvements from reasoning training could lead to positive changes in memory or useful-field-of-view abilities.

The ACTIVE Study

ACTIVE was designed to conduct skills training on basic cognitive abilities using training programs that prior research had shown to be effective. The purpose was to explore two broad issues: whether a diverse population of older adults would profit from training and whether training in basic abilities would generalize or transfer to daily functioning.[7]

A participant sample was selected on the basis of three variables. First, the study was to include people ages 65 and older from multiple backgrounds. Second, it was to be conducted with adults living independently in the community rather than in an institutional care setting. Third, to the extent possible, ACTIVE was to focus on adults who were at risk for, but had not yet experienced, loss of independence. Operationally, being at risk was defined as not having a diagnosis of dementia and not experiencing significant decline in the activities of daily living (ADLs).[8] These guidelines led to a study sample of 2,802 adults ages 65 and older at six sites in the United States.[9] The mean age was about 74 years, a population that was on the cusp between *young old* and *old old*.[10] The majority of participants were Caucasian, and approximately 27% were African American. Participants were excluded on the basis of apparent dementia, existing ADL dependence, the presence of certain medical conditions, or anticipation of reduced availability for the duration of the study. As a result, the sample consisted of a relatively high-functioning group of older adults.

We screened 5,000 people for eligibility and selected a total of 2,802. Following baseline measurements, participants were randomly assigned to training in one of three areas—memory, reasoning, or useful field of view/speed of processing—or to a no-contact control group. Each of the intervention groups participated in 10 training sessions of 60–90 minutes each that typically occurred twice a week for five weeks. We post-tested people immediately after training and then again at one, two, three, and five years after training. In addition, we wanted to assess the impact of cumulative intervention—that is, whether more training would be better. A randomly assigned group of about half of

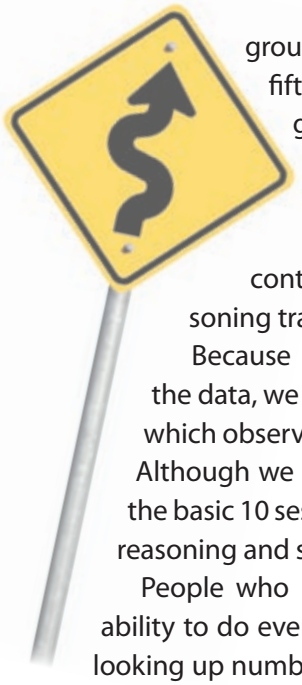
those who participated in the initial intervention received additional booster training one and three years following the first round of training. Thus, people who completed just the basic training had 10 sessions, whereas those who participated in all of the booster sessions received a total of 18 sessions over a three-year period.

The results of ACTIVE training produced a rather consistent finding of durability on cognitive training for memory, reasoning, and useful-field-of-view skills.

The results of ACTIVE training produced a rather consistent finding of durability on cognitive training for memory, reasoning, and useful-field-of-view skills. Furthermore, the moderate to strong effect in all areas is consistent with what previous literature has reported. Three key results emerged from the cognitive training after five years.[11] First, participants who had received memory training outperformed on memory tasks people who had received training for other cognitive skills. To put that into perspective, even five years after spending just 10 hours over five weeks on memory skill training, participants showed a significant advantage in improvement both compared with people who had received no training and compared with those who had completed another kind of cognitive training. The results of reasoning training were similar: After five years, people who had completed reasoning training outperformed on reasoning tasks those who had not received the same training. Likewise, people who had participated in useful-field-of-view training outperformed all others on useful-field-of-view activities five years later.

The impact of booster training—four additional training sessions repeated at one and three years after the original training for about half of those who were initially randomized to training—showed some positive outcomes.[12] Initial memory training produced the weakest effect, and those in the memory training group showed no additional benefit to memory performance from the booster training. In contrast, people who received eight additional sessions of reasoning training showed significant improvement in their reasoning performance. Most striking is the very strong impact of booster training on performance of useful-field-of-view or speed-of-processing skills. Significantly, the benefits of booster training were still detectable two years after the last training session.

What, we wondered, does ACTIVE tell us about the most interesting question: Does training matter? Beyond boosting memory, reasoning, or speed of processing, does training have implications for general functioning or ability to continue living independently? We knew that research over the previous 100 years had found it difficult or even impossible to transfer improvements from training for a specific skill to people's daily activities. Therefore, we focused on difficulty with IADLs to understand the implication of breadth of effect for transferability. Participants seem to have stayed fairly stable in IADLs until about the third year of the study.[13] At that point, people in all four



groups seemed to be reporting at least some degree of decline. At the fifth-year mark, the three training groups were clustered closely together, whereas the no-contact control group was significantly lower in ability. Participants in all of the training groups showed less decline in self-reported IADLs compared with those individuals who had received no training. Notably, the difference from the control group is statistically significant for the group that received reasoning training.

Because self-perception biases engender some challenges to interpreting the data, we also investigated performance-based measures of daily function in which observers in a blind study watched people perform a variety of IADL tasks. Although we found no measurable impact on everyday task performance from the basic 10 sessions of training, the booster training showed different patterns for reasoning and speed-skill training.

People who received speed-of-processing booster training improved in their ability to do everyday speed tasks—such as rapidly reacting to road signs, quickly looking up numbers in the phone book, or swiftly and accurately understanding information on a medication label. Because their improvement in these tasks was greater than the improvement of participants who had received the basic 10 sessions, it seems likely that the extra training was responsible for the difference. We found the same results with reasoning training. Specifically, individuals who received booster reasoning training outperformed all others on a construct called everyday problem-solving, which deals with the ability to understand directions, charts, forms, and similar tasks as part of IADLs. Although not a statistically significant difference, the pattern is the same as with speed-of-processing booster training. The combined results provide a first inkling that more training is better in terms of cognitive performance level and cognitive performance maintenance. Booster training also may help people reach a threshold of improvement with positive functional consequences. Because we conducted only 18 training sessions over three years, we cannot yet answer the intriguing question about the potential for greater impact with more sessions.

One issue of great interest is whether people with cognitive impairment can benefit from training interventions just as the cognitively healthy population does. At baseline, ACTIVE screened out individuals who were strong candidates for dementia, but the sample included a subset of people with some evidence of low mental functioning. Although they had not received a diagnosis of dementia, these participants had what we believed might be mild cognitive impairment. Thus, we were able to compare training outcomes for people with low baseline mental functioning with results for those who were cognitively normal. Mild cognitive impairment status with low memory at baseline appears to have no effect on the ability to benefit from training in either reasoning or speed of processing. Specifically, the outcomes for normal and mildly impaired individuals are similar immediately after training and at one-year and two-year follow-up in both of these skill areas.[14]

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We saw, however, substantial difference in the results of memory training, the area that showed the weakest effect among the cognitively normal population. Memory training, at least the type included in ACTIVE, did not lead to improvement for individuals with low memory at baseline. On the one hand, perhaps their cognitive status was too compromised or the training component was not strong enough. On the other hand, these findings reflect earlier work on brain plasticity suggesting that it is harder to achieve improvement in individuals who have experienced notable memory impairments. Thus, an intervention strategy different from the one included in ACTIVE may be necessary for people with mild cognitive impairment.

A second intriguing issue is the possibility of building cognitive reserves or slowing the rate of cognitive decline. Information on this topic is limited at present because we have not conducted extensive neuropsychological batteries with ACTIVE participants. Furthermore, strong statistical data about the conversion rate to dementia are not yet available because we have been following our sample population for just five years. ACTIVE will continue to follow up with these participants, and we hope to be able to answer this question in the future. We do know, however, that having one of several forms of mild cognitive impairment at baseline puts people at risk for decline in their functional capacity over time.[15] In the ACTIVE study, 93% of the population had no cognitive impairment and so appeared to have no risk for decline over time. Individuals with low ability in nonmemory aspects of cognition (known as nonamnestic and noncognitive impairments) reported that their ADL and IADL function grew worse over the three-year period following cognitive training intervention. In contrast, individuals with no memory impairment at baseline reported that they remained stable on measures of function over the same period.

A second intriguing issue is the possibility of building cognitive reserves or slowing the rate of cognitive decline.

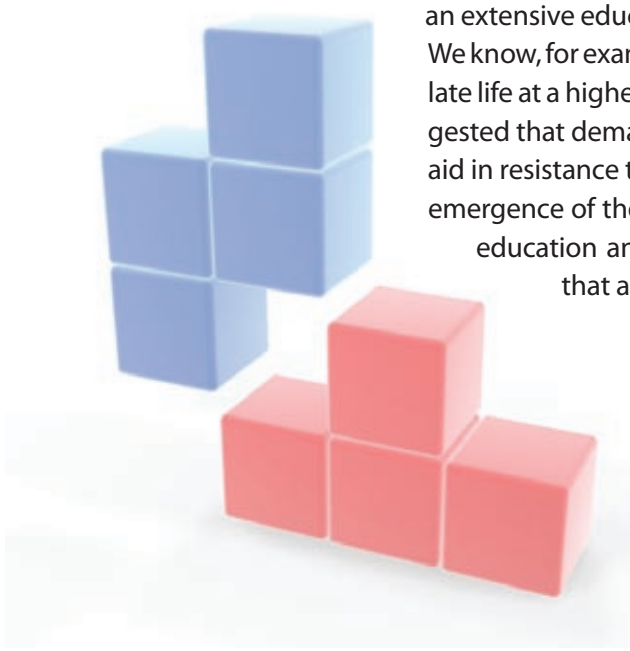
Planning is underway for the next steps in ACTIVE research. Funding has been authorized for a 10-year follow-up study that is scheduled to begin in summer 2008. The plan is to assess the protective effects of cognitive ability on variables such as daily functioning, quality of life, and driving safety. We will study factors that might moderate response to intervention—in other words, what predicts who will and will not respond to training—including the relevance of low cognitive function at baseline. Also, we will do some minor genotyping to see whether people have the ApoE (A4) allele, one risk factor that has been identified for dementia. An additional agenda is dissemination of the training programs used in ACTIVE.

Other Current Research on Cognitive Training

Although ACTIVE is important because of the size of the study and because it has addressed many of the design issues present in prior research, other training studies also add to an understanding about cognitive function in later life. One current topic is whether there is a need for formal training sessions in groups led by trainers. We know, for example, that people can accomplish a great deal on their own when they follow plans for home-based practice of cognitive tasks. Even among people who have mild cognitive impairment, brain plasticity is substantial enough to allow for maintaining or

even improving performance on specific tasks without formal training.

What we are learning now leads us to ask whether all forms of mental stimulation are beneficial and whether it matters at what age one begins. Considerable controversy has surrounded questions about whether having an intellectually rich life, an extensive education, and a complex job delays cognitive decline.[16] We know, for example, that people with more education seem to enter late life at a higher level of cognitive function. Some studies have suggested that demanding work and challenging leisure activities could aid in resistance to cognitive decline.[17] These findings have led to the emergence of the cognitive reserve hypothesis, which suggests that education and complex life activity enhance the neural circuits that are most protective against age-related decline.[18]



Might late-life engagement with novel settings, ill-defined problems, and nonroutine activities produce broad intellectual gains?[19] Because it is beneficial to have a good job and a lifetime of challenging leisure pursuits—such as playing chess or going to museums—would it be better for brain health to begin those activities late in life or at an early age? This question has not yet been answered, although studies are underway that may shed light on this area.

One activity that may be beneficial for some aspects of cognitive function is playing video games. College-age video game novices who played first-person shooting games were found to improve on selective visual attention, which is a skill similar to the useful field of view measured in ACTIVE.[20] In these games, players are challenged to keep figures in the center of their vision and shoot while they are moving through space and, at the same time, scan the periphery for others who are trying to shoot them. The game involves high arousal, a center of fixation, and monitoring of peripheral vision. All of these elements are key for useful field of view, and we think that they are involved in functional activities such as driving. Logically, then, playing these games might boost useful-field-of-view capacity. In contrast, in games such as Tetris, the player watches blocks drop, sometimes quickly and sometimes slowly, but cannot change the pattern of action.

One activity that may be beneficial for some aspects of cognitive function is playing video games.

A study with a sample of people ages 65 and older found that those who played the shooting game *Medal of Honor* improved both their selective visual attention and their useful field of view. This study also provided evidence that *Tetris* produced similar results with an older population. One possible explanation for this outcome is that because video games generally are a new experience for older adults, even *Tetris* offered enough cognitive challenge to positively affect visual attention for elders (even though it might not improve the skills of younger adults). We compared benefits of the two video games to the standard ACTIVE useful-field-of-view training. Although the standard program was most effective, the games were helpful—and both games were more beneficial than the control-group experience of only intermittent field-of-view practice.[21] Thus, video games

hold some promise for improving late-life cognition, and more research is needed.

Games designed specifically for individuals who wish to improve their mental functioning in later life are being marketed widely.[22] Although only some have been validated empirically, the results of practice studies and some of the evidence from ACTIVE make it reasonable to infer that people are likely to improve on the skills that they practice in these games. One promising example comes from the PositScience Group, which has designed a computer program of mental exercises based on known neuroscience principles and is striving to conduct a clinical trial similar to ACTIVE. Results from a preliminary study document substantial cognitive improvement, at least immediately after training, for people who spend 40 to 50 hours with the program.[23] Nonetheless, the really important question of whether the improvement generalizes to everyday function has yet to be answered.

Concluding Observations

Five themes summarize current progress in today's understanding of cognitive intervention. First, recent studies have demonstrated brain plasticity or the potential for improvement in older adults who are at risk for mild cognitive impairment.

Second, it appears that more is better in order to succeed in transferring skills from training to daily function. People who participated in the ACTIVE study booster sessions showed some generalization of training skills to everyday function. This outcome suggests that people may need to spend more time in training than initially anticipated to achieve improvement, such as the 50 hours required by the PositScience program rather than just 10 hours as in the ACTIVE study. In the case of physical exercise, individuals would not be advised to stop training, even after 50 hours of activity, but would be encouraged to make exercise a lifelong commitment. Although we do not yet have supporting data, I suspect that the recommendation for mental exercise will be similar.

Third, thus far only modest evidence shows transfer of training to real-world function. Although this outcome is consistent with 100 years of skills-training research, it also reflects how difficult positively affecting functional skills will be. It is important to acknowledge that IADLs combine cognitive components with physical, motivational, and social components. Thus, even if all the cognitive elements involved in IADL performance could be fixed with training, many other factors also predict elders' ability to live independently.

Fourth, exciting findings in physical exercise studies, in which people participated in complex leisure pursuits, have suggested that a broad tool kit may be available within the next five to 10 years that will benefit older adults in both cognitive prevention and rehabilitation. Finally, the next critical step in research is to address cognitive interventions for those who already have impairments and identify rehabilitative strategies.

Q: How were participants recruited for the ACTIVE study?

A: We did community-based recruitment, using strategies that varied a bit from setting to setting. In Detroit, we identified key stakeholders in the downtown area and did snowball sampling through them. We also worked with all the community service and social service agencies. The Pennsylvania group recruited through PACE, the Pharmaceutical Assistance Contract for the Elderly, which offers prescription drug assistance to low-income elders. In Massachusetts, some participants were recruited from a continuing care retirement community, yielding a sample that was about 10 years older than participants at the rest of our sites. Some sites worked exclusively with established participant-recruiting registries. Overall, the sample was extremely heterogeneous.

Q: During the process of recruiting participants for ACTIVE, did you use neutral terms to ask whether people were interested in a study about memory and cognition or was the questioning more interactive so that you were more likely to attract individuals who thought they needed some help?

A: Because our recruitment materials made it clear that this was a training study, the issue is how that might have connected with personal motivation and pre-existing interests. People knew ACTIVE was about cognition and training, so there would have been some self-selection. We made a conscious choice to be explicit. As you know, 27% of our sample is African American. We conducted many focus groups at the beginning, and the memory of the Tuskegee experiment was extremely strong in some of the communities.[24] Thus, any sort of deception or concealment about the purpose of our study would have been toxic. We wanted to be completely up-front about the project. The result of our recruitment strategy was that people who had no interest in cognition and training did not show up on our rosters.

Q: In connection with the memory-testing component of ACTIVE, can you infer the location in the brain where the training effect occurs?

A: Neurologically, we know that the hippocampus is important and that the frontal lobes are involved in activities such as strategy and organization. ACTIVE's cognitive training, which concentrated on these areas and especially on the memory component, mainly involved frontal lobe executive function to help people get better organized for memory tasks. The fact that the frontal lobes are an area of primary cognitive aging might explain why memory training was a more challenging intervention. In the future, neuroimaging data may help pinpoint the specific locus of those effects.

With so much to explore in working with impaired people and with combinatorial treatment in next-generation studies, I think imaging will be included regularly.

Q: Will you be working on measures of brain activity such as PET scans?

A: That is not likely to occur in the context of ACTIVE. You can imagine that with a sample of about 2,800 people, such measures would be prohibitively expensive. However, with so much to explore in working with impaired people and with combinatorial treatment in next-generation studies, I think imaging will be included regularly. Two of the commercially available mental training products include neuroimaging data, and both suggest that those programs foster more frontal activation and more brain activation in general.

Endnotes

1. The principal investigators for ACTIVE are Karlene Ball, PhD, University of Alabama—Birmingham; John Morris, PhD, Hebrew SeniorLife program, Boston, Mass.; Fred Unverzagt, PhD, Indiana University, Bloomington; George Rebok, PhD, Johns Hopkins University, Baltimore, Md.; Kathy Mann Koepke, PhD, National Institute of Nursing Research, Bethesda, Md.; Jon King, PhD, National Institute on Aging, Bethesda, Md.; Sherry Willis, PhD, Pennsylvania State University, University Park; Michael Marsiske, PhD, University of Florida, Gainesville; and Sharon Tennstedt, PhD, New England Research Institutes (coordinating center), Watertown, Mass.
2. Other terms related to cognitive intervention are more generic. For example, *cognitive stimulation* and *cognitive engagement* suggest maintaining or improving mental function in late life via activities such as bowling or going to a museum. The term *cognitive rehabilitation* encompasses intensive therapeutic work with individuals following a major event such as a stroke or a traumatic brain injury.
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23. For information about the IMPACT study, see *www.positscience.com/science/pdfs/PSC_IMPACT_design.pdf*.
24. See *www.cdc.gov/tuskegee/timeline.htm*.

Michael Marsiske, PhD, is an associate professor and associate chair for research in the Department of Clinical and Health Psychology, College of Health Professions, University of Florida, Gainesville. He holds a joint appointment in the Department of Psychology, College of Liberal Arts and Sciences. Dr. Marsiske also is coordinator of the University of Florida Network for Biobehavioral and Social Aging. From 2000 to 2003, he served as associate director for research at the University of Florida Institute on Aging.

He is a fellow of the Gerontological Society of America and a past recipient of the Springer Award for Early Career Achievement in Research and Adult Development and Aging from Division 20 of the American Psychological Association. Dr. Marsiske is a past chair of the NIA-S (Behavioral and Social Sciences) Initial Review Group for the National Institute on Aging and currently serves on the editorial boards of the *Journals of Gerontology: Psychological Sciences and of Aging, Neuropsychology and Cognition*.

Dr. Marsiske serves as a principal investigator on the National Institutes of Health–funded study ACTIVE, which examines long-term cognitive training effects on elders' everyday functioning, and he collaborates on several other federally funded studies and centers at the University of Florida. In addition, he is the training director of Physical, Cognitive and Mental Health in Social Context, a predoctoral training program funded by the National Institute on Aging.

Dr. Marsiske's research has four major foci:

- Modifiability of older adults' cognitive performance with training interventions and practice
- Understanding short-term variability and fluctuation in elders' cognition, as well as its relationship to cognitive status and other time-varying predictors
- Older adults' everyday problem-solving abilities and the relationship of these abilities to basic cognitive and intellectual performance
- Understanding the interrelationship of sensorimotor and cognitive function in later life, with a particular focus on balance and locomotion

Detailed information about Dr. Marsiske's research, instructional resources, and peer-reviewed publications are available at *www.marsiskelab.phhp.ufl.edu*.

2008 MindAlert Awards

The ASA-MetLife Foundation MindAlert Awards were established to recognize innovations in mental fitness programming for older adults. Inspired by research showing that cognitive decline is not inevitable in aging, these awards recognize programs, products, or tools that promote cognitive fitness in later life. The programs are judged for their innovation, their basis in research, demonstration of effectiveness, potential for replication, and the extent to which the programs are accessible to diverse populations of elders. The Awards are given in three categories:

- Programs that enhance mental fitness for older adults in general
- Programs that enhance mental fitness for older adults with early-stage cognitive impairment
- Lifelong learning/third age educational programs

The winners of each year's awards are recognized at the annual ASA-NCOA Aging in America Conference.

For more information about the MindAlert program, including how to submit an application for the MindAlert awards, visit *www.asaging.org/mindalert*.

Award Program for General Mental Fitness

Borchardt Cyber Café

St. Barnabas Senior Center of Los Angeles, Los Angeles, California

Borchardt Cyber Café, a program of St. Barnabas Senior Center has been serving Angelenos in the heart of Los Angeles since 1908. Founded by the Episcopal Diocese in downtown Los Angeles, St. Barnabas Senior Services (SBSS) is today an independent, nonsectarian, nonprofit public benefit corporation, and the oldest senior service agency in Los Angeles. The

mission of SBSS is to provide and advocate for a continuum of innovative services that empower a diverse community of elders to live well, feel well, and age well—to do what all of us wish to do as we age: remain in our own homes and live independently.

The Borchardt Cyber Café was developed by an interdisciplinary research team that included University of Southern California Annenberg faculty to help senior citizens become comfortable using the Internet. The Café helps low-income and non-English-speaking elders "cross the digital divide." Considering the multiethnic population St. Barnabas serves, and the implications for helping them cross the digital divide, St. Barnabas took a broad sociological approach to the challenge, rather than a narrow technological approach. The Café offers one-on-one computer instruction, based on each senior's preferences and abilities, using staff and volunteers to teach in English, Spanish, Korean, Mandarin, and Cantonese.

Computer labs by design isolate, strictly focusing a student's attention on what can be a daunting singular end goal: mastery of the computer. By contrast, the Cyber Café is designed to engage students in a more multivariate way. Seeking to engage seniors in a lifestyle of learning, the Cyber Café, rather than focusing on learning computers as an end goal, instead offers computer use as a means to broader goals related to Healthy Living and Healthy Aging. This has been achieved by the following guidelines:

- Creating a supportive social environment, where learning is an experiential cycle, in which context and community are as important as content to success.
- Respecting adult learning style by teaching the students what the students wish to learn, then encouraging them to explore all the creative possibilities at will.
- Making the experience of technology dynamic, by making technology available in its infinite variety, e.g., e-mail, webcams, games, shopping, downloading music, information seeking, scanning, Web building, blogging, digital photography and editing, film making and editing.

One of the spin-off projects of the Cyber Café is a Film Making Initiative, which uses volunteer film industry professionals to teach seniors to shoot their own films, edit and digitize them on the computer, and record them on DVDs.

Contact: St. Barnabas Senior Services
675 S Carondelet St.
Los Angeles, CA 90057-3309
mspinks@saintb-la.org
(213) 388-4444

Award Program for Elders With Early-Stage Cognitive Impairment

The Dancing Heart: Vital Elders Moving in Community
Kairos Dance Theatre, Minneapolis, Minnesota

The Dancing Heart: Vital Elders Moving in Community, was developed by Maria DuBois Genné for Kairos Dance Theatre. The Dancing Heart is an intergenerational dance company based in Minneapolis, Minn. Kairos' mission is to share the joy of dance and nurture intergenerational connections by offering performances and opportunities for creative collaboration that celebrate people of all ages, abilities, and experiences.

The Dancing Heart is one of the few evidence-based arts programs and is a best practice for working with frail elders. Kairos Dance uses this program of dance and storytelling to create a sense of community and well-being in participants of all ages, and from all walks of life. This program helps to improve flexibility, energy, balance, memory, and socialization of older, frail adults. Kairos is the only intergenerational modern dance company in Minnesota, and one of only a handful in the United States.

Kairos is a part of the emerging national field of creative aging, working alongside professionals in the arts, healthcare, social service, and community development to raise awareness about the importance of creative involvement across the lifespan. Our culture is witnessing a paradigm shift in attitudes related to aging. We are moving away from a model that assumes the inevitability of declining health and isolation toward a strengths-based approach that focuses on potential, vital engagement, health maintenance and prevention, and continued connections to community.

Contact: Maria DuBois Genné, Artistic Director
Kairos Dance Theatre
4524 Beard Ave. S
Minneapolis, MN 55410-1450
mariagenne@yahoo.com
(612) 927-7864

Award Lifelong Learning/Third Age Educational Program

Senior Center Without Walls
Oakland, California

Senior Center Without Walls, a program of Senior Resources in Oakland, Calif., offers activities, friendly conversation, and an assortment of classes and support groups to homebound elders and those who find it difficult to go to a community senior center.

Senior Center Without Walls is available to seniors in Northern California who have difficulty getting out to community activities. Difficulties may include disability, illness, transportation challenges, caregiving responsibilities, and other hindrances. All of the activities take place on the telephone with participants calling in from their own homes. The program also has volunteers who make friendly reminder calls to participants who want to be called on the days they have activities scheduled to further accommodate participants.

Contact: Terry Englehart, Director
Senior Center Without Walls
114 Montecito Ave.
Oakland, CA 94610-4556
srresources@yahoo.com
(510) 444-0243

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MindAlert Awards Review Committee

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Dean Blevins (Chair), North Little Rock, AR; **Jo Arnold**, Portage, MI; **Barbara Ginsberg**, Brooklyn, NY; **James E. Birren**, Pacific Palisades, CA; **Ruth Flexman**, Wilmington, DE; **James Frasier**, Petersburg, FL; **Pamela Huff**, Portland, OR; **Darby Morhardt**, Chicago, IL; **Cheryl Svensson**, Corona del Mar, CA; **Sharon Sokoloff**, Waltham, MA; **Robyn Yale**, San Francisco, CA

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Past MindAlert Special Lectures

The annual MindAlert monographs from 2001 to the present are available on the America Society on Aging website at *www.asaging.org/mindalert* as free, easily downloadable PDF files. Past monographs:

Good News About the Aging Brain!

Nationally known brain researchers Marian Diamond and Arnold Scheibel describe their groundbreaking studies of brain function and the optimistic implications for successful aging. (2001)

Brain Health From 1 to 100

Paul Nussbaum, a leading clinical neuropsychologist, describes what he refers to as a health promotion opportunity of unprecedented stature: the ability to foster our own brain wellness for healthy, functional aging. (2002)

Centenarians: Lessons on Living Long and Living Well

Head of the renowned New England Centenarian Study, Thomas Perls shares the findings of his research and talks about how we all can make our later years healthy, vital ones. (2003)

Uniting the Heart and Mind: Human Development in the Second Half of Life

Gene D. Cohen, a pioneer in the field of creative aging, explains the implications of his four developmental stages of late life and how these phases represent a richly creative period, full of personal growth and societal engagement. (2004)

Intellectual Functioning in Adulthood: Growth, Maintenance, Decline, and Modifiability

Husband-and-wife research team K. Warner Shaie and Sherry L. Willis gathered data from thousands of people over 40 years as part of the Seattle Longitudinal Study. From their study, they shed light on the differences between elders who maintain their intellectual functioning into late life and those whose cognitive abilities decline. (2005)

Benefits of Memory Priming: Effects of Guided Autobiography and Reminiscence

James E. Birren, a longtime researcher and expert in guided autobiography, enumerates its many benefits to elders and the organizations they frequent and outlines research issues provoked by the quantitative analysis of autobiographical data. (2006)

Art and Dementia

Bruce L. Miller, MD, describes the impact of dementia on creative process and challenges our society to recognize and nurture the individual strengths of people with neurodegenerative diseases. (2007)

About the MindAlert Program

The MindAlert Program seeks to disseminate information on research and innovative practices that assist older adults in taking steps to maintain and enhance cognitive and mental function. The program, established by the American Society on Aging (ASA) in 2001 and supported with funding from MetLife Foundation, has the following components:

MindAlert Awards Program

The ASA-MetLife Foundation MindAlert Awards program recognizes nonprofit organizations that have developed innovative and effective mental fitness programs for older adults, accessible to diverse communities and based on research. Each program shows potential for replication in other communities by ease of application and financial feasibility. Winners are chosen in three categories:

1. Lifelong Learning/Third Age Educational programs.
2. Programs specifically focused on enhancing mental fitness for the general population of older adults.
3. Programs designed to enhance mental fitness specifically for early-stage cognitively impaired older adults.

MindAlert Speakers Bureau

The MindAlert Speakers Bureau provides $1,200 grants for organizations to host daylong workshops on innovative approaches to brain health. Organizations choose from a directory of trainers who have received the MindAlert Award (see description above).

MindAlert Lecture Series and Publication

The MindAlert Lecture features a presentation on the latest research findings for maintaining and enhancing cognitive function in late life. Each lecture is accompanied by a publication based on the lecture. Past lecturers include:

James E. Birren—*Benefits of Memory Priming: Effects of Guided Autobiography and Reminiscence*

Gene D. Cohen—*Uniting the Heart and Mind: Human Development in the Second Half of Life*

Paul Nussbaum—*Brain Health From 1 to 100*

For more information about the MindAlert Program, visit *www.asaging.org/mindalert*, or contact the American Society on Aging at *mindalert@asaging.org*.

The American Society on Aging

The American Society on Aging is the largest association of professionals in the field of aging in the United States. Founded in 1954, ASA seeks to promote the well-being of older adults and their families by enhancing the abilities and commitment of those who work with them. To that end, ASA sponsors a wide variety of conferences, networking opportunities, and Web-based training. The organization also publishes a quarterly journal, a bimonthly newspaper, seven quarterly newsletters, and an e-mail newsletter for its members.

To obtain more information on ASA or to join,
call (800) 537-9728 or visit *www.asaging.org*.

MindAlert Program Sponsor:

MetLife Foundation

MetLife Foundation, established in 1976 by the Metropolitan Life Insurance Company, has been involved in a variety of aging-related initiatives. Since 1986, the foundation has supported research on Alzheimer's disease through the MetLife Foundation Awards for Medical Research and has contributed more than $11.5 million to efforts to find a cure. In addition, the foundation has provided support for a traveling exhibit on memory; a public-education video for use by caregivers and families of people with Alzheimer's disease; and support for healthy-aging projects addressing issues of caregiving, intergenerational activities, health and wellness programs, and volunteer opportunities. MetLife Foundation supports health, education, civic, and cultural programs throughout the United States. For more information about the foundation, visit *www.metlife.org*.

American Society on Aging

833 Market Street, Suite 511, San Francisco, CA 94103-1824

Phone: (415) 974-9600 • Fax: (415) 974-0300

E-mail: info@asaging.org • Website: www.asaging.org