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**Are You Sure Your Members are Working Out ALL Their Muscles?**

**by Dr. Elkhonon Goldberg & Alvaro Fernandez**

Sure, they come to the gym every day. They lift more weights, do more pushups, and run further during every workout. They eat right. They watch their weight. They're in good shape. What could your members possibly be missing? Their *mental* muscles.

While living an active life and participating in stimulating activities such as crossword puzzles, music lessons and reading certainly do *use* one's brain, they do not provide a consistent, comprehensive brain workout with measurable results. Brains need novelty, variety and stretching practice in order to get fit!

**What is Brain Fitness?**

The 'mental muscles' we can train include: attention, stress and emotional management, memory, visual/spatial processing, auditory processes and language, motor coordination, and executive functions such as planning and problem-solving. A mentally fit person demonstrates improved attention, memory, thinking and stress management skills.

A mentally fit brain maintains and develops cognitive abilities through neurogenesis, which is the creation of new neurons and dendrites, the hair-like projections of each neuron that reach out to neighboring neurons. The more active a particular brain cell, the more connections it develops through a process called dendritic sprouting. A single neuron can have up to 30,000 such connections, creating a dense web of interconnected activity all over the brain. Each neuron can then be stimulated directly through experience (real or imagined) or indirectly through these connections from its neighbors, and activation means survival for both you and your neurons.

Physical exercise boosts the brain's rate of neurogenesis throughout one's life, while mental exercise increases the rate at which those new brain cells survive and make functional connections into your existing neural networks. Both physical exercise and the challenge from mental exercise increase the secretion of nerve growth factor, which helps your neurons grow and stay healthy. The bottom line is that humans need *both* physical and mental exercise for good brain health.

Four Pillars of Brain Health	What Your Members Can Do Right Now
<p><b>Physical Exercise:</b> Increased blood flow to the brain brings oxygen and a variety of nutrients to active neurons preferentially. Metabolic exchange also removes waste</p>	<p><b>Physical Exercise:</b> Talk to a trainer about setting up a regular physical fitness program that includes cardiovascular work,</p>

metabolic exchange also removes waste products and toxins from the brain tissue.	strength conditioning and stretching.
<b>Mental Exercise:</b> Consistent mental challenge by novel stimuli increases production and interconnectivity of neurons and nerve growth factor and prevents loss of connections and cell death.	<b>Mental Exercise:</b> Stay active – sign up for some new classes, learn a new musical instrument, join a bridge group or try a computer-based brain fitness program.
<b>Diet:</b> A balanced diet gives the body the nutrients it needs to feed brain tissue.	<b>Diet:</b> Talk to a nutritionist to create a balanced diet of a variety of foods in the appropriate quantities for the member's age, gender, body type and activity level.
<b>Stress Reduction:</b> While short-term acute stress can help focus and stimulate the brain, chronic long-term stress not only prevents neurogenesis but also kills existing neurons.	<b>Stress Reduction:</b> Try yoga, meditation or biofeedback as ways to reduce chronic stress. Active social networks also help – try providing social evenings for your members.

### Who Needs Brain Fitness? Everyone!

From birth through our young adult days, we grow brain cells at a rapid rate. If we do nothing to protect them, when we reach age 30 or so, our neurons and neuronal connections start dying off, and this process accelerates around age 60. 'Use it or lose it' in this case points to the specific connections that make up the webs involved in all cognitive functions. Essentially, neurons that don't stay active lose their connections over time. Your body recognizes these disconnected cells as inactive and marks them for cell death since their loss would not heavily impact your functioning. If you don't use it, you're going to lose it!

While all of us may notice age-related cognitive decline as we mature, some people notice or desire changes at specific times in their lives:

- Athletes who want to improve their game skills such as decision-making and reaction times for competition;
- Business executives who want to be more productive;
- Women may notice decline with menopause and pregnancy;
- People who suffer any sort of head injury, such as a stroke, may need rehabilitation through mental exercises that can increase cell production in the damaged areas; and
- Cancer patients undergoing chemotherapy can suffer from memory and concentration problems.

### How Can You Provide a Brain Fitness Program?

Traditional games such as chess, cards, crossword puzzles, sudoku and reading are pleasurable ways of sharpening our wits. A game room or social night can be an easy venue for unstructured mental activity. However, even the best games,

such as chess and bridge, have some very obvious limitations in that moves and bids can become routine or that they use a limited number of mental muscles.

Providing books, lectures or classes that are challenging and cover a variety of topics with new or unfamiliar places, situations and ideas can stimulate members' minds. Learning new dances, routines or sports can also be highly beneficial.

The new frontier in brain fitness involves customizable computer training. No special computer skills are necessary for most software programs, and the interactive nature of the programs allows the creation of personalized training regimens that hone in on improving weaknesses and nurturing strengths. Computer programs are unique in that they can present a wide variety of tasks at many different skill levels to challenge all the mental muscles. Tests may be visual, auditory or linguistic. The software can adjust to a member's performance every time a task is completed and track performance over time.

The key components to any good brain-training program (computerized or not) are: **novelty, variety and stretching practice**. These components are hard to control in traditional activities. If a crossword puzzle is too difficult, we give up. If it is too easy, there is no challenge. The task has to be at an optimal level of challenge to motivate and push us without creating too much stress.

### **What are the benefits?**

In the short term, members can expect to see improved performance (attention, memory and stress management), as with any other muscle. In the long term, they will notice the prevention and delay of deficits due to aging or disease.

In the last few years, a growing amount of research has shown that staying cognitively active reduces mental decline and may even delay the development of Alzheimer's disease. There is a lot of new basic research in neuroplasticity, cognitive reserve, cognitive rehabilitation, cognitive training, cognitive simulations and biofeedback.

By using neuroimaging techniques -- described by Dr. Elkhonon Goldberg, Clinical Professor of Neurology at New York University School of Medicine to be 'as important for neuroscience as telescopes were for astronomy' -- neuroscientists are showing that brain exercise influences the generation of new neurons and their connections.

### **Value of Mental Stimulation as Prevention**

The Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) nationwide clinical trial is the nation's largest study of cognitive training. Researchers found that improvements in cognitive ability roughly counteract the degree of long-term cognitive decline typical among older people without dementia. The results, published in the *Journal of the American Medical Association* in 2002, showed significant percentages of the 2,802 participants age 65 and older who trained for five weeks for about 2 1/2 hours per week improved their memory, reasoning and information-processing speed.

One study, using an activity score range from 1 to 5, found that people could reduce their risk of Alzheimer's by 64% simply by raising their activity score by 1 point. A second study, using an activity score range from 0 to 42, found that a 1-point increase corresponded to a reduction of dementia risk by 7%. That means

that people could lower their dementia risk by 7% simply by adding one activity per week (such as doing a crossword puzzle or playing a board game) to their schedule. According to the findings of that same study, subjects who did crossword puzzles four days a week had a 47% lower risk of dementia than subjects who did a crossword puzzle just once a week.

### **Value of Stress/Emotional Management**

Stanford's Robert Sapolsky has proven that chronic stress not only inhibits new connections in the brain but also leads to cell death of the existing neurons. University of Massachusetts Medical School's Jon Kabat-Zinn and University of Wisconsin-Madison's Richard Davidson are investigating the ability of trained meditators to develop and sustain attention and visualizations and to work positively with powerful emotional states and stress through the directed mental processes of meditation practices.

Biofeedback systems use electronic sensors to measure physical symptoms of stress and then feed the results of this measurement back to the person for a real-time assessment of the member's stress level and relaxation skills. Biofeedback methods convert vague feelings into observable information and help people, including athletes, to fine-tune the use of stress management techniques. Heart Rate Variability sensors are some of the best types of sensors to provide.

### **Value of Specific Programs for Improved Performance**

Furthermore, the effects of mental training seem to transfer or generalize beyond the specifics of a particular exercise. This means that people don't just get better at the specific task they're doing, but the skills actually transfer to general cognitive abilities and mental faculties, as measured independently from the task itself. Just by training at something, people get better at that specific task. The key is to transfer that specific improvement into a general improvement that can be used in a different situation. Reliable, accurate, independent assessments are essential to verifying this generalization, whatever the chosen brain-training program.

Research shows that children with working memory deficits (common in ADD/ADHD) who undergo working memory training improve their ability to concentrate and control their impulsive behavior. Over 1,700 children have been trained with a software program called RoboMemo with an 80% success rate. Improvement is seen primarily in increased concentration, sustained attention and learning ability. After five months, 82% of participants think the improvements have either remained or have increased.

Another program, The Basketball IntelliGym<sup>®</sup>, is a training tool that enables basketball players to dramatically improve their game-intelligence skills. The trainer directly stimulates the brain functions that are responsible for basketball's cognitive skills. By doing so, the IntelliGym trainer enables quick development of proficiencies that, until now, were considered impossible to teach.

### **How Does This Impact Your Club?**

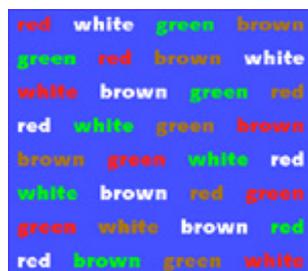
Today with a minimal investment of time or resources, you can provide brainteasers and puzzles in your club's newsletter. Try posting some mental activities people can do while using the treadmill, stationary bike or even driving. To find appropriate challenges with some explanation on the neuroscience and

neuroanatomy involved, log on to [www.sharpbrains.com/solutions/fitness-centers](http://www.sharpbrains.com/solutions/fitness-centers). Stress reduction is essential to brain health, so be sure to offer some classes in yoga or meditation, or include a 10-minute guided meditation at the end of a group fitness class.

Today and tomorrow, with some investment, expect to see computer labs in many gyms. Most of the software is Windows-based and run on typical PC or Macintosh machines allowing the labs to provide scientifically validated computerized brain fitness assessments and tests that allow for uniquely tailored workouts and performance tracking over time. Websites such as [www.sharpbrains.com](http://www.sharpbrains.com) provide complete solutions for multiple users.

Tomorrow, expect to see downloadable memory exercises clients can use on their iPods or fitness equipment with interactive monitors to simultaneously exercise the brain and body.

### Sample Brain Teaser



The Stroop Test is a psychological test of our mental vitality, flexibility and ability to inhibit automatic responses. Most people are so proficient at reading words that they cannot easily ignore them. The Stroop Test challenges the ability to inhibit the automatic tendency read a word. It is much harder than it sounds! Directions: Say the color you see and disregard the word you read as quickly and accurately as you can.

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