

BRAIN FUNCTION

I think, therefore, I am

by Margy Squires

Stop. Close your eyes for a moment; then open them. Look around – what do you see? A green book on the shelf. A sheer curtain blowing in the breeze of an open window. A picture of your son on his first bike. Remember when he fell off for the first time? You were so scared. A bowl of roses, their sweet fragrance reaching your nose. Each look evokes bits of information in your brain that recalls color, scent, memories, space and time.

Your brain connects the incoming pieces of information – called memory traces – you receive through your five senses and matches them to your internal information to come up with a rose, a book, a memory or an action. In fact, the ability to think separates us from many animals, based on whether they have the part of the brain that reasons or not. Birds have small thought centers, hence the slang, “bird brain”. Lizards have none. The ability to think and remember information, in fact, is the very essence of who we are.

It’s All About the Neurons

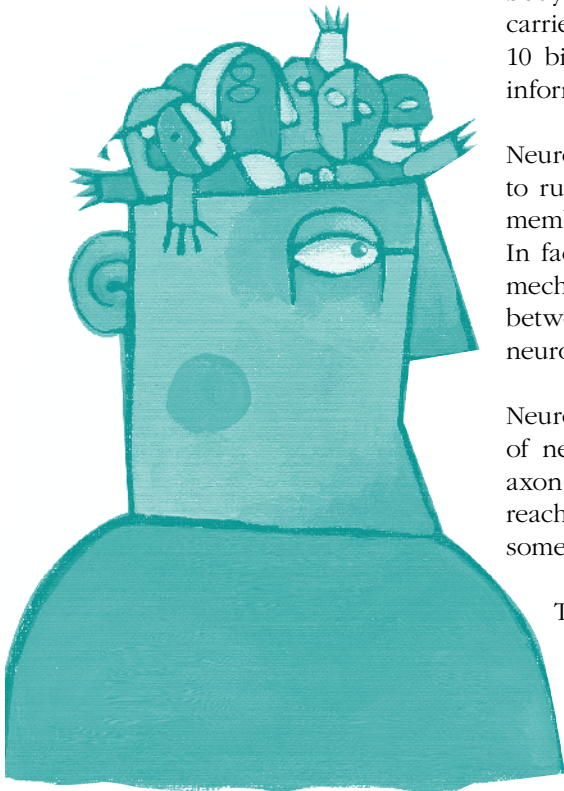
Until 1990, most scientists believed that particular areas of the brain performed specific functions and if you lost that part of the brain, you lost that particular function. Newer research (coupled with the fact that stroke and trauma victims are capable of relearning thought and motor skills) tell us differently. It is true that brain areas are specific, but the activity of the brain, which is more understood now thanks to MRIs and PET scans, operates more on a “network” mapping level. In short, memory traces are scattered throughout a network and collecting those bits into an integrated whole is what thinking (and memory) is all about.

The brain is a high maintenance organ that works 24/7. Although it weighs a mere 2.5 to 3 pounds, the brain uses 20% of your body’s oxygen, 25% of blood pumped from the heart and 34% of its energy stores, which makes it susceptible to damage if it lacks oxygen, glucose or nutrients. It’s also 30% fat but it’s good fat. The brain is basically an electrical unit and the spine an extension cord to the rest of your body. In fact, if you could “plug” the brain in, it would light up a 25-watt bulb! What carries this electric current are small cells called neurons. There are approximately 10 billion of these messengers in your brain and more than 100 trillion bits of information hitting them at any given time.

Neurons are elongated in shape, making it easier for the “messages” or current to run through them (see *How A Neuron Sends Signals* box, next page). The inside membrane protects the nucleus while the fatty (lipid) outside protects the cell itself. In fact, you’ve probably heard about the “brain cell barrier”. It’s a built in safety mechanism that only allows certain substances across the membrane. Sandwiched between the two membranes is the protein filling. On the opposite ends of the neuron are the axon and dendrites, two channels that carry current.

Neurons do not touch, but are separated by a space called a synapse. With the help of neurotransmitters (special chemicals), an electrical impulse “jumps” from the axon ends of one cell across the synapse to the dendrites of the next cell until it reaches its final destination. The next cell continues the current in the same fashion, some up to 300 miles per hour.

The more neurons and dendrites you have, the faster the signaling and transmission of messages between cells and the smarter you are. (In Alzheimer’s, dendrites are woefully damaged or destroyed). Keeping numbers up and neurons active means the difference between keeping your mind and losing it.



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The Aging Brain vs. Toxins

Around age 40 or 50, most people have memory glitches of lost keys and forgetting names and faces. As explained, the ability to reason, concentrate and remember is dependent on the brain's electrical signaling and transmission via the neurons and neurotransmitters. Declining hormones (testosterone, estrogen, DHEA, growth hormone) and aging in general affect the chain of command. Oxidative damage occurs through normal aging but toxins accelerate the process.

Here's the fast and dirty list of factors that injure or interfere with your brain "currents". The obvious head the list: alcohol, smoking and drugs (legal or otherwise), but environmental ones in the air, water and food (pesticides, additives) are a day-to-day occurrence. Missing sleep, lack of exercise and poor nutrient intake deprive neurons of building materials, energy and oxygen. Heart and lung disease, diabetes, arterial plaques, stroke, thyroid and other disorders may limit oxygen and blood flow to the brain. Finally, chronic stress (emotional, mental or physical) can elevate cortisol levels, interfering with neurotransmitter chemicals. Well, you say, is there any hope of not "losing my mind?" Yes! But just for fun, stop reading and take the quickie quiz on the next page and see how your brain is doing. How did you score? Now, continue reading!

The Brain Program

You don't have to be a rocket scientist to keep your brain active. Here's five suggestions: (1) increase the number of dendrites by challenging your brain with new activities. Learn a new language, game or do mental word puzzles. (2) Do deep breathing and aerobic exercise to increase oxygen supply and lower the stress component. (3) Detoxify the

body (candida, heavy metals, liver) to reduce the oxidative load. (4) Balance any hormonal problems. (5) Drink distilled or spring water. Eat a healthy diet and add nutrients that support and strengthen neurons and neurochemicals.

Smart Nutrients

The foundation for your brain program will always be a multi-vitamin and mineral formula. Since free radicals damage neurons, pick one that's high in antioxidants and in the B vitamins, which are also neuroprotective. Choline is a building block for the neurotransmitter, acetylcholine, the main chemical in the brain. Look for trace mineral antioxidants zinc, selenium and boron as well.

Beyond a multi-vitamin is the supporting cast, mostly antioxidants. Because of the fatty nature of nerve membranes, they are highly susceptible to oxidative damage. You'll need extra vitamin C; the amount in the brain is 15 times higher for good reason! Vitamin C supports neurotransmitters acetylcholine, dopamine and norephrine. Add 2-4 grams a day. Vitamin E, as a fat soluble vitamin, protects the cell membrane and mitochondria function. CoQ10 increases neuron mitochondria energy and defends dopamine regions of the brain. Alpha lipoic acid chelates heavy metals, especially mercury, and protects the mitochondria. Ginkgo biloba increases oxygen and blood to the brain, glucose transport to neurons and has antioxidant properties. And, of course, essential fatty acids (EFAs) protect the outer lipid membrane of brain neurons. Green tea and grapeseed extracts are also cited as helpful.

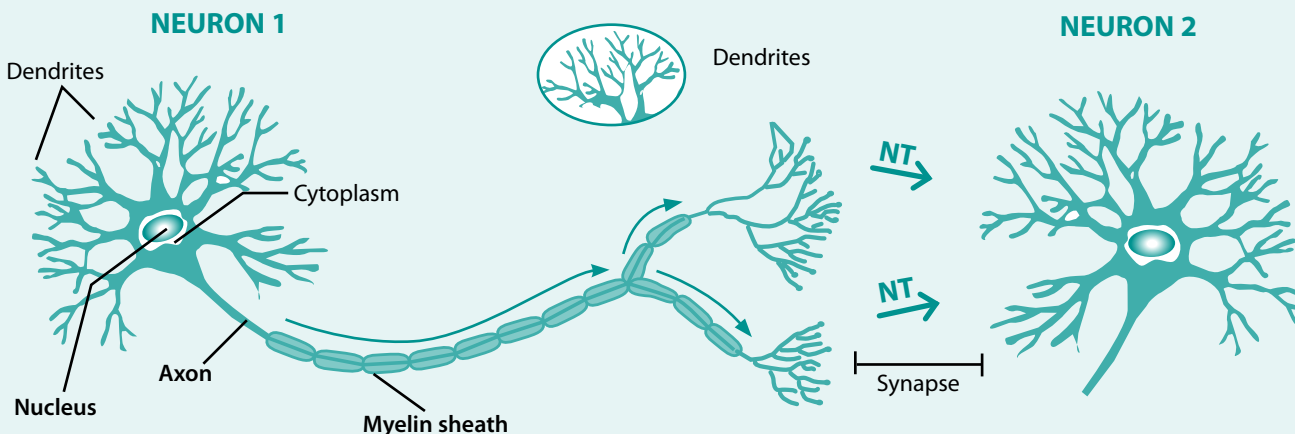
Brain Specific Nutrients

It's possible that you already follow a good brain program and still your brain feels "foggy" and not up to "speed". These specific nutrients reinforce brain and neurochemical activity directly.

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How A Neuron Sends Signals

Neuron 1 receives nerve impulses at its dendrites and sends them through its axon. When the impulse (signal) reaches the axon end, neurotransmitters (NTs) are released. The NTs stimulate the dendrites on Neuron 2 to receive the incoming signal, "jumping" the space (synapse) between the two. 30,000 neurons fit on the head of a pin! {Drawing simplified for illustration}.



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A word about the neurochemicals. There are more than 100 of these neurotransmitters but six are the major brain ones: Acetylcholine (the most abundant), Norephrine, Dopamine, Serotonin, L-glutamate and GABA. Each helps the transmission of specific messages. For instance, acetylcholine helps memory and thought and dopamine movement and the retrieval of memory. Norephrine excites cells to be alert and GABA promotes relaxation and sleep. Serotonin is the feel good one for mood, sleep and reduced pain. L-Glutamate helps lay down new memory plus recall of “old” memory. Of course, this is a simple list but gives you an idea of how missing chemicals means missed “messages”. Amino acids are the building blocks for most neurochemicals.

Phosphatidyl Serine (PS)

PS is the building block for the protective cell membranes that is critical to neuron function. Part fatty acid (lipid), part phosphate., PS supports nerve impulses by regulating the neurotransmitters (accumulation, storage and release) for cell to cell communication. PS regulates transport of substances in and out of the cell and “house cleans” for optimal function. PS down regulates cortisol release. Prolonged stress negatively affects thinking and recall since excess cortisol interferes with acetylcholine’s actions. PS stimulates acetylcholine output, dopamine synthesis and protects and increases dendrite density in the memory center of the brain (the hippocampus). And it has an excellent safety record.

More than 70 human trials and 20 years of research (a third are double-blind studies), show that PS can increase learning and concentration, as well as alleviate and sometimes reverse age related memory decline. PS also improves mood and helps you deal better with stress. The most cited study (Crook et al, 1991) with PS involved 149 subjects, aged 50-75 on PS 100 mg three times a day for 12 weeks. Baseline testing, along with retesting at 3, 6, 9, 12 weeks, plus 4 weeks post study showed statistically significant improvement in brain function. In one measurement (recall), subjects actually reversed brain “age” 12 years! Most noted improvements by week three. Other studies in Europe showed similar results. A six month study (Ceracchi et al, 1993) of 425 subjects showed increased memory and learning in all four variables being tested.

Unfortunately, PS decreases as we age and food supplies are limited. Supplement at the research dose of 100 mg three times per day. Once cognition and thinking improves, a maintenance dose of 100 mg a day is suggested.

Acetyl L-Carnitine (ALC)

ALC increases attention and concentration, as well as slows down mental decline, by supporting the synthesis and release of acetylcholine. ALC has a positive effect on dopamine as well. ALC is neuroprotective. ALC assists neuron mitochondria by its transport of fatty acids in to the cells.

Research shows that ALC’s benefits increase cumulatively over time. In studies by Ames et al (2002), when acetyl L-carnitine was paired with alpha lipoic acid, the two worked synergistically together to enhance mitochondria energy and protect against oxidative damage.

Huperzine A (HupA)

Huperzine A is an alkaloid derived from Chinese Club Moss. It inhibits acetylcholinesterase, an enzyme that breaks down acetylcholine. (Decreased acetylcholine is found in primary brain disorders). In three different studies, Tang et al (2001-2003) suggest HupA reduces memory loss and protects brain tissue from damage both from ischemia (low blood supply) and by clearing out interfering agents that cause neuron death. The PDR for Nutritional Supplements also states that HupA has “neuroprotective” properties. In Chinese studies, HupA was also given to students with “significant” results in learning and recall (Sun et al 1999).

Are You Losing Your Mind?

A quickie memory test

Check all that apply...

- I frequently go into a room only to forget why I’m there.
- I sometimes find it difficult to focus during conversations.
- I can read the same thing several times and it does not “sink” in.
- I tend to forget something as soon as I read it or hear it.
- I misplace items frequently.
- I start a sentence only to forget what else I was going to say.
- I often ask people to repeat things (over and over) without remembering doing so.
- I have trouble with number sequencing and often transpose numbers.
- I find it difficult to learn new things.
- I sometimes use caffeine or sugar to “wake up” my brain.

If you checked...

- 8-10 You need brain food! I’m surprised you finished the test!
- 5-7 Almost there. Better start your nutrients today!
- 1-4 Pretty good. You’re either young or taking care of your brain already!

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Gotu Kola

Gotu Kola is a native of India and used in Ayurveda medicine for nerve and brain cells and as a tonic for the adrenal glands. Gotu Kola increases learning and memory and enhances cognition, even for Alzheimer's, according to one study (Kumar et al, 2002). Gotu Kola has the ability to calm the nervous system while maintaining the brain's ability to focus, which may be beneficial for ADD. Gotu Kola enhances blood flow, which is also good for the brain.

Summary

Can your brain stay young and active despite your chronological age? Science says yes. Brain nutrients can make the difference between being brain active or brain challenged in fibromyalgia and ME/chronic fatigue specifically, blood flow to the brain on SPECT scans is decreased and deficiencies in neurochemicals have been noted. Since both syndromes have symptoms of "brain fog", brain nutrients offer hope. Although you cannot turn back the hands of time, you can slow down the effect, especially when it comes to brain cells. Live long. Think longer.

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Caution: Women who are pregnant, nursing or planning a pregnancy should consult with their physicians before using any supplements.

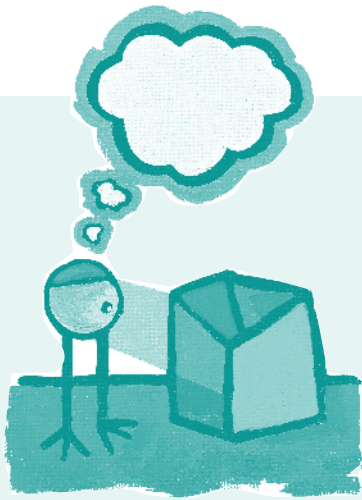
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Resources:

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3. Khalsa, D. *Brain Longevity*, Warner Books, 1997.
4. Kidd, P. *Phosphatidylserine*. Keats Publishing, 1998.
5. *Longevity, Alternative Medicine Definitive Guide*, 2001.
6. *PDR for Supplements*. Medical Economics Press, 2001

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**“Prevention.
It’s easier to stop a small hole
than fill a big one.”**

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