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Psychology 101

AAR #2

Buff Your Brain

Source: Sharon Begley | *Newsweek*/ January 1, 2012

It all sounds great, but there’s something that has long bothered us about the growing number of studies pinpointing ways to buff your brain: they don’t go far enough. Sure, exercises to improve memory are better for your brain than, say, watching reality TV, but the most you’re going to gain is more reliable access to knowledge already scattered around your cerebral cortex.

Yet that’s what we all want—to know more, to understand more deeply, to make greater creative leaps, to retain what we read, to see connections invisible to others—not merely to make the most of what we have between our ears now, but to be, in a word, smarter. By raising our mental game we would be able to pick out the most significant data in a company’s annual report, see immediately when a marketer or advertisement is conning us (“increase the molecular structure” of water to make it healthier for your

Siamese fighting fish, as one bottler promises? Don’t think so.), understand medical studies relevant to what ails us, grasp the significance of the euro meltdown to our retirement savings, and make smarter decisions in work, love, and life. As we dug into the latest research in neurobiology and cognitive science for this second annual installment of the Newsweek/Daily Beast guide to being smarter in the new year, one

discovery from 2011 therefore stood out above all the others: that IQ, long thought to be largely unchangeable after early childhood, can in fact be raised. And not by a niggling point or two. According to a groundbreaking study published this fall in Nature, IQ can rise by a staggering 21 points over four years—or fall by 18.

A higher IQ can get you more than admission to Mensa and bragging rights on online-dating sites. IQ, measured by a battery of tests of working memory, spatial skills, and pattern recognition, among others, captures a wide range of cognitive skills, from spatial to verbal to analytical and beyond. Twenty points is “a huge difference,” says cognitive scientist Cathy Price of University College London, who led the research. “If an individual moved from an IQ of 110 to an IQ of 130 they’d go from being ‘average’ to

‘gifted.’ And if they moved from 104 to 84 they’d go from being high average to below average.” Her study was conducted on people ages 12 to 20, but given recent discoveries about the capacity of the brain to change—a property called neuroplasticity—and to create new neurons well into one’s 60s and 70s, Price believes the results hold for everyone. “My best guess is that performance on IQ tests could change meaningfully in adult years” too, she says. “The same degree of plasticity [as seen in young adults] may be present throughout life.”

In their recently published study, Price and her colleagues documented how IQ changes are linked to structural changes in the brain. In the 39 percent of subjects whose verbal IQ changed significantly, before-and-after brain scans showed a corresponding change in the density and volume of gray matter (the number of neurons) in a region of the left motor cortex that is activated by naming, reading, and speaking. In the 21 percent whose nonverbal IQ (any problem-solving unrelated to language, such as spatial reasoning) rose or fell, so did the density of gray matter in the anterior cerebellum, which is associated with moving the hand. Although most of us think of motor skills and cognitive skills as like oil and water, in fact a number of studies have found that refining your sensory-motor skills can bolster cognitive ones. No one knows exactly why, but it may be that the two brain systems are more interconnected than we realize. So learn to knit, or listen to classical music, or master juggling, and you might be raising your IQ.

Although working on short-term memory—basically, the brain’s scratch pad—has long been considered just one component of overall IQ, recent research shows that it may in fact be the lever that can raise overall intelligence. In one of the biggest surprises in intelligence research, scientists led by Susanne Jaeggi of the University of Michigan found in 2008 that short-term memory may be the foundation of pure intelligence to a greater extent than anyone suspected. They trained adult volunteers on a difficult short-term- memory task: simultaneously hearing a string of letters and seeing a series of computer screens that had a blue square in different places. The volunteers then had to identify when the spoken letter or the square’s position matched that of several screens earlier. The more they practiced and honed their short-term memory, the greater the improvement in the purest form of brain power, fluid intelligence—the ability to reason and solve problems independently of existing knowledge. (The reasoning portion of the test used what are called progressive matrices: seeing three geometric configurations and choosing which of many options continued the pattern.) In June the Michigan team got the same results in school-age kids, finding that memory training boosts pure intelligence, and so may be the surest path to a higher IQ.

“There is some controversy over whether brain training can enhance cognition,” says

neuroscientist Eric Kandel of Columbia University, who shared the 2000 Nobel Prize in Medicine for discoveries about the cellular and molecular basis of memory. “But if you really work on memory by, for instance, memorizing poetry—Shakespearean sonnets work—it probably improves some aspects of cognitive function.”

Neuroimaging offers clues to just how memory drills might improve pure intelligence. During memory training, brain scans show, several regions (the lateral prefrontal cortex, the inferior parietal cortex, the anterior cingulate, and the basal ganglia) become more active—indicating that these regions are involved in memory. What’s interesting is that those same regions also jump into action when the brain reasons and thinks. “I am cautiously optimistic that we’re seeing real effects in these studies,” says

psychologist Jason Chein of Temple University. In his own work, he has found that adults who trained on a complex working-memory task for four weeks saw significant improvements in reading comprehension as well.

The key to these kinds of gains is “intensive training,” says Kandel—not quite the quick brain fix we’re told can come simply from eating blueberries or drinking pomegranate juice. Instead, intelligence comes from having more neurons and synapses (connections between neurons). The creation of new neurons (neurogenesis) and synapses makes learning possible.

The other brain element you can train in order to raise your IQ is attention. Neuroscientists have shown over and over that attention is the sine qua non of learning and thus of boosting intelligence. Only if you pay attention to an introduction at a party will you remember that cute guy’s name. Effects on attention may explain why stimulants such as Ritalin and Adderall help some people some of the time with, especially, recall (hence those drugs’ popularity among students cramming for a test). Both stimulants raise the brain levels of dopamine, the neurochemical that produces motivation and a feeling of reward, which make it more likely that the task at hand will rivet your attention. Similarly, action-based games such as Space Fortress and strategy-heavy games such as Rise of Nations have been shown to improve both memory and attention switching. Another way to the same end, says UCL’s Price, is “passion.” If you don’t

care about what you’re reading, seeing, or hearing, it won’t be retained.

While improving your brain takes work, the good news is there are some accessible ways to go about it. Aerobic exercise buffs the brain as well as the quads. Walking 30 minutes a day five times a week stimulates production of BDNF (brain-derived neurotrophic factor), a molecule that nurtures the creation of the new neurons and synapses that underlie learning. In neuroimaging studies, scientists led by Arthur Kramer of the University of Illinois at Urbana-Champaign have shown that exercise increases gray matter in the region of the hippocampus that processes new knowledge and dispatches it to permanent storage in the frontal cortex. That may not raise IQ—pure intelligence—but stuffing your cortex with more information should make you more knowledgeable.

If a half-hour walk leaves you tired, good: a midday nap not only can restore brain power to its fully awake best but can also raise it beyond what it would have been without some shut-eye. In a 2010 study, psychology professor Matthew Walker and colleagues at the University of California, Berkeley, found that a nap may not merely restore brain power but also raise it ….

EEGs, electrodes that record brain activity, suggest how that [might] happen. The number of bursts of electrical activity called sleep spindles—Walker calls them “champagne pops in the brain”—that people experienced during their naps predicted how much their ability to learn would improve once they awoke. Sleep spindles, he suspects, indicate activity in the hippocampus that moves information from that region into the cortex for permanent storage. It’s like moving data from a USB stick onto a hard drive, which “both consolidates into long-term storage the information you offload and leaves you a renewed capacity for absorbing new information—learning,” says Walker. The better we move information from the hippocampus (working memory) into the cortex, the more information we can access when we need it.

Even without the midday nap, the brain has a way of carving out its own downtime, characterized by what’s called the “default-mode network”—basically, brain activity that takes place when you’re daydreaming or keeping your mind blank…. So put away the BlackBerry and let your brain idle.

Too hyper to do that? Then go all in with a jolt of caffeine. It might not make you more creative, but coffee can make your mind sharper, as zillions of java addicts will swear. A 2011 study in Nature Neuroscience backs them up: in lab rodents, caffeine strengthens brain connections. Rats given shots of joe comparable to two cups of coffee had stronger electrical activity between neurons in the part of the hippocampus called CA2 than they did otherwise, found Serena Dudek of the National Institute of Environmental Health Sciences and colleagues. Stronger connectivity means better learning and memory.

For more exalted cognitive functions, the strategy with the strongest evidence behind it is also the toughest: learn a second language. When a brain that is fluent in two languages chooses between, say, English and French, the cortical circuits that hold both languages become active. The prefrontal cortex must then step in to choose the right word—man or homme?—for the circumstances. The prefrontal is also the site of those higher-order functions. The workout it gets in bilingualism carries over, buffing such IQ building skills as problem solving and attention switching, finds cognitive scientist Ellen Bialystok of Canada’s York University. That workout seems to postpone dementia by five years, she and colleagues reported last February.

Brain exercise, not to mention becoming bilingual, takes time, so naturally everyone wants to believe certain foods increase intelligence. After all, eating is easy! But a 2010 analysis of hundreds of studies, done by researchers at the Duke Evidence-Based Practice Center, found that many highly touted recipes for cognitive enhancement are a bust. Supplements containing vitamins B6, B12, or E, or folic acid, did nothing to preserve cognitive function, let alone enhance it. The evidence is hardly better for the fish-, fruit-, vegetable-, and olive-oil-rich Mediterranean diet. Overall, there is not yet rigorous proof that foods high in antioxidants or flavonoids enhance intelligence, but scientists have hopes for a number of exotic foods and ingredients. For instance, some small studies suggest that turmeric, a spice common in Indian cooking, and pomegranate juice may improve memory or other aspects of cognitive function.

But that still leaves you with a brain-buffing trifecta. Memory training fueled by caffeine and interspersed with good sleep and aerobic conditioning, computer-based brain exercises to hone attention, and a regimen of reading, watching, and doing broken up by ample mental downtime: it promises to add up to a smarter you in 2012 and beyond.

**Reading for Meaning**

**Directions:** The purpose of this activity is to hone your ability to gather **textual** evidence to support or refute a statement. For each statement below, circle whether the text agrees or disagrees with it, and, in the space provided, share **quoted**, textual evidence to support agreement or disagreement. Indicate the paragraph number of the evidence.

|  |  |  |
| --- | --- | --- |
| **Agree?** | **Statements** | **Text Evidence (Para. Number)** |
| |  | | --- | | **yes** | | **no** | | 1.IQ does not change throughout the lifetime of a person. |  |
| |  | | --- | | **yes** | | **no** | | 2. Short-term memory practice can lead to increased intelligence. |  |
| |  | | --- | | **yes** | | **no** | | 3. Caffeine intake decreases intelligence. |  |
| |  | | --- | | **yes** | | **no** | | 4. Improving brain function is easily accomplished. |  |