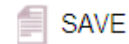


Growing Grey Matter

Our brain is plastic—and adaptable
by Charlotte Francis



If you've noticed that your memory, thinking, and focus are not as sharp as they once were, take heart. Recent developments in neuroscience have shown that we can continue to learn new skills and improve our memories and cognitive abilities well into old age.

From the 16th century until recent times, it was widely held that the brain was an immutable machine made up of parts that each had a specific function and location.

Research now shows that our brain and nervous system are not fixed but plastic; that is they are capable of changing, adapting, and re-wiring themselves through activities such as sensing, thinking, seeing, acting, imagining, and perceiving.

The science of neuroplasticity

"Brain plasticity is a major change in our understanding of the brain and challenges the neurological nihilism of the last 400 years," says Norman Doidge, author of [The Brain That Changes Itself](#) (Penguin, 2007).

The prevailing belief used to be that our brain was fixed in form and function, and from childhood onward only changed through deterioration with age.

The discovery that the brain can change and reorganize itself is revolutionizing the treatment of stroke patients as well as those with brain injury, chronic pain, and other debilitating neurological conditions.

Brain plasticity—or neuroplasticity—also has wide-ranging applications for enhancing learning and performance, improving IQ scores, warding off age-related cognitive decline, and helping to address emotional and psychological problems such as obsessive compulsive disorder.

Innovations in brain plasticity

Scientist Paul Bach-y-Rita (1934 to 2006) was one of the first pioneers in the practical application of neuroplasticity. His findings overturned the belief that the brain operates on a one function, one location basis.

Inspired by helping his father recover mobility after a massive stroke, Bach-y-Rita's work showed how closely our sensory systems work, and that when one area is damaged, another can take over.

He created a special chair programmed with vibrating wires at the back and connected to a large camera that enabled blind people to see. The experiment showed that the skin can function as a retina with vision being processed through the sense of touch.

Adult brains can grow

Our brain's plasticity is at its peak in childhood when we are constantly learning new skills and abilities. As we age and start to practise already mastered skills, we rarely employ the same intense mental focus.

However, as research carried out by California-based neuroscientist Michael Merzenich has demonstrated, the adult brain can continue to grow and develop.

Merzenich believes that exercising and retraining the brain in the right way can lead to healthier cognitive function. He maintains that practising a new skill can change the physical structure of our brain by forming hundreds of new connections between neurons (nerve cells) in our brain maps.

Posit Science, Merzenich's company, carried out a controlled double-blind study in 2006 on a group of adults aged from 60 to 87 who had participated in an auditory brain-training program for eight to 10 weeks.

The results, published in *Proceedings of the National Academy of Sciences*, showed the training was successful in reversing aged-related decline: many of the subjects turned back their memory clock by 10 or more years, with some seeing a 25-year reversal.

If you want to boost your brain power, there's a wealth of online brain-training exercises now available. Designed not only to improve our memory but also our ability to quickly and accurately process what our brain hears and sees, the exercises and games are fun, challenging, and stimulating. And most programs enable you to keep track of your scores so you can monitor your development.

Mental muscle training

The key to retaining—or even regaining—mental agility is to treat the brain as a muscle; as with the body, the use it or lose it rule applies. One of the best things we can do as adults is to learn a foreign language or perhaps a new dance routine.

Learning any new skill requires intense and steady focus and involves repeating particular actions over and over again. It's not a process that can be rushed; going slowly, focusing on one thing at a time, and paying close attention is essential for sustained learning.

"While multi-tasking is often hailed as an efficient and useful habit, it's ultimately inefficient, as the likelihood is that neither task will be done well," says Martina Sheehan of brain-training organization Mind Gardener.

"And it's a bad habit to get into, as it trains our brain to constantly search for information and stimulation."

Doidge advises, "You need to rest between exercising your faculties, because sleep and naps consolidate plastic change. People who are always 'switched on' are usually stressed out, and if this is a chronic problem, it releases brain chemicals that actually shrink parts of the brain."

Avoiding the plastic paradox

The changeability of our brains can work for better or worse: “Neuroplastic properties that allow us to change our brains and produce more flexible behaviours also allow us to produce some rigid ones,” writes Doidge, explaining that we can get stuck in a rut.

He calls this the plastic paradox. Each time we repeat a bad habit, whether physical, mental, or emotional, it strengthens a brain circuit and prevents the use of that space for a good habit. Unlearning and weakening connections between neurons can be just as important as forging new ones by learning or doing something new.

This is also how psychotherapy works, says Doidge, explaining that brain scans have demonstrated that the brain can reorganize itself after treatment with psychoanalytic, interpersonal, and cognitive behavioural therapies.

Talking through problems can help people to learn new ways of relating by wiring new neurons together, at the same time releasing or unlearning old memories or ways of responding and thinking.

Using our imagination

Equally powerful is the power of our imagination. A study carried out by neuroscientist Alvaro Pascual-Leone at the Harvard Medical School on two groups of piano players—one actually playing and the other doing mental practice—showed that imagining something and doing it activate the same parts of the brain.

Other studies have demonstrated that we can even increase our muscle strength by performing an exercise sequence in our imagination.

This is not to undermine the importance of engaging in physical exercise and keeping fit and mobile. Cardiovascular exercise helps to strengthen the heart and blood vessels that supply the brain as does a healthy diet. Even walking at a good pace can strengthen the growth of new neurons.

“Everything we think, do, and learn changes our brain. This opens up a wonderful world where we can continually improve and develop what we think and who we are,” says Sheehan.

“Paying attention to where you are directing your mind is all important,” she adds. “Mindfulness is one of the most important skills you can develop if you want a clear and calm mind.”

Tips for maintaining mental focus and clarity

- Tame your busy mind by focusing on what you are doing and letting the internal chatter go.
 - Do brain warm ups by visualizing your day progressing smoothly.
 - Be clear and focused, balancing the energy you give to each task.
 - Switch smoothly between tasks, consciously setting one aside and clearing your mind before embarking on a new one.
 - Acknowledge distractions as they arise and then refocus on the task in hand.
 - Use downtime to clear your mind rather than dwell on a problem.
 - Spend time in nature.
 - Develop mindfulness by stilling the chatter of your mind and consciously paying attention.
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Anatomy of the brain through the ages

16th to 17th centuries

The discoveries of Galileo (1564 to 1642) fostered a belief that all nature, including mankind, functioned like a vast mechanism. In a similar vein, French philosopher René Descartes (1596 to 1650) described the brain as a complex machine with separate areas performing specific functions.

19th century

American William James, author of the [*Principle of Psychology*](#) (1890) is widely credited as the first person to suggest that the brain is changeable and capable of reorganizing itself.

20th century

In the 1940s Canadian psychologist Donald Hebb illustrated that the brain could forge new pathways, a belief summed up by the phrase: “neurons that fire together, wire together.”

From the 1970s and 1980s onward neuroplasticity began to gain currency through the work of neuroscientists such as Paul Bach-y-Rita, Edward Taub, and Michael Merzenich.

In 2009 Norman Doidge, Canadian psychoanalyst and psychiatrist, wrote [*The Brain That Changes Itself*](#) (Penguin, 2007), introducing readers around the world to the concept of neuroplasticity through the stories of leading scientists and the people whose lives they are transforming.

About the Author

Charlotte Francis is a freelance writer who is passionate about exploring ways of staying physically, spiritually, and emotionally balanced in our busy world.