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PART FIVE

Brainpower & Mental Health

62. We only use 10% of our brain

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The thought that most of us only use 10% of our brain is appealing because it means we have a whole lot of untapped potential waiting to be harnessed. Unfortunately, that figure is off by about 90%.

This myth has been variously (mis)attributed to William James, Albert Einstein, and even early neuroscience researchers.

While its exact origins are unclear, popular belief in this myth has persisted, and even strengthened, since the 1890s, despite the overwhelming evidence to the contrary.

In his book *Mind Myths: Exploring Popular Assumptions About the Mind and Brain*, neuroscientist Barry Beyerstein discusses seven kinds of evidence that refute the '10% myth'.

The most convincing of these involves the use of brain imaging.

There are numerous brain imaging techniques that allow us to see the activity of the brain. These include Positron Emission Tomography (PET) and functional Magnetic Resonance Imaging (fMRI).

These techniques have revealed that all parts of the brain show some level of activity, except in the case of serious damage.

For example, we recently conducted a PET study which required participants to do nothing, simply rest without ruminating on any one thought. This is known as a resting state study.

Even in this so-called 'resting state' the brain scans revealed widespread areas of metabolic activity — far in excess of 10%.

It's also possible to see the brain activity that occurs when someone is performing a task.

For example, our group used fMRI to look at the pattern of brain activity occurring when people are engaged in a complex problem — solving the task known as the Tower of London.

We saw increased activity in a number of areas: activity over and above what is seen in the brain when participants were not engaged in a task.

This type of imaging clearly shows our whole brains are always active, to some degree. When we are engaged in a task, specific areas of the brain will become more active, depending on the demands of that task.

A variation on the brain capacity myth is that we only use 10% of our brain at any one time, depending on the task we're doing.

Yet even the seemingly simple task of tapping your finger on a desk requires brain power far in excess of 10% of your resting state.

Such a task involves coordinated activity from many areas, including the sensory and motor cortices, the occipital and parietal lobes, the basal ganglia, cerebellum and frontal cortex.

So, how has the 10% myth managed to persist and even thrive?

One reason may be its popularity in books (*Lest We Remember*), film (*Limitless, The Lawnmower Man*), television (*Heroes, Eureka*) and even self-help literature (*How to Win Friends and Influence People*).

The myth is most often presented in popular culture as a hurdle to overcome; by harnessing the rest of our brain power we will be able to achieve amazing feats of intelligence, creativity and (apparently) telekinetic powers.

So, it's not surprising that people continue to believe it's true.

But it's not all bad news. The plasticity of the human brain is able to constantly reorganise itself, allowing us to develop new skills and abilities right throughout our life.

63. You can selectively train your left or right brain

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When it comes to New Year's resolutions, getting your body in shape often tops the list. But what about your brain?

If your left or right brain is feeling a little flabby, there's a wide range of books, teaching programs, and even a Nintendo DS game, purporting to train your left and/or right brain. Indeed, if you Google 'right brain training', you'll score 53,900,000 hits.

These products are based on the belief that the left and right hemispheres are polar opposites. The left brain is often characterised as your intelligent side: rational, logical and analytic. In contrast the right brain is stereotyped as the 'touchy-feely' hemisphere, viewed as artistic, creative, and emotive. Such left and right brain stereotypes have led theorists to suggest that people can be classified according to their 'hemisphericity'. If you're a logical, rational scientist, for

instance, you're left brained. But creative types, from artists to writers, are right brained.

Being 'left brained' or 'right brained' often comes up in popular culture. In the business world, 'left-brainers' are complimented on their logical approach, and right brained is synonymous with being creative/emotive.

But although the notion of 'hemisphericity' has captured the popular imagination, it is not supported by neuroscientific research.

Everyone, from winners of the Nobel Prize in physics to the artists behind the Archibald Prize, uses both sides of the brain when performing any task. In fact, the idea that people can be classified as left or right brained was debunked in scientific literature in the 1980s.

Despite this, left/right-brain training programs appear to be gaining popularity. This is puzzling because there's no evidence indicating that you can train just one side of your brain. Such attempts are doomed because the two hemispheres are heavily interconnected and constantly communicating.

In a normal brain, the left and right sides are connected by a band of some 250 million nerve fibres (known as the the corpus callosum). And information transfer across the corpus callosum is extremely efficient.

If I show a picture to just the right brain (easily done using computer-based techniques), that information is transmitted to the left brain within 20 milliseconds (two hundredths of a second)!

The corpus callosum allows virtually instant communication between the two halves of a normal brain. This means the whole brain is involved in processing, no matter how analytic or artistic the task.

Only patients who've had their corpus callosum surgically severed can process information within just one hemisphere. This rare operation is used to relieve severe epilepsy in people who are not responding to drugs. But in a normal brain, you

cannot restrict information to one hemisphere, no matter how hard you try.

New neuroscience techniques, such as Diffusion Tensor Imaging (DTI), have been specifically designed to show connections between different regions of the brain. Research using such techniques indicates that both sides of your brain are involved in everything you do.

Whether you're working on trigonometry, playing the ukulele, or taking part in 'right-brain' training, both your left and right brain are simultaneously processing and integrating information.

So try as you might, it just isn't possible for someone with a normal brain to selectively use just one hemisphere. And at present there's no independent evidence validating the claims of the programs, educational tools, and books claiming to selectively activate the right (or left) brain.

Until such evidence is available, trying to train just one side of your brain really is simply half-witted.

64. The right side of your brain controls creativity

Annukka Lindell
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Are you suffering a creativity problem? Well, pop psychology claims your 'right brain' holds the key.

Whether you want to drop a few kilos, improve your profits, spice up your sex life, or take over the world, we're encouraged to believe a right-brain approach will solve our problems.

Just look at some of these self-help titles (I wish I were making them up):

- *Not Another Diet Book: A Right-Brain Program for Successful Weight Management*
- *The Right-Brain Business Plan: A Creative, Visual Map for Success*
- *Right Brain Sex: Using Creative Visualization to Enhance Sexual Pleasure*
- *A Whole New Mind: Why Right-Brainers Will Rule the Future.*

The right brain/creativity link first captured the public imagination in 1979 when Betty Edwards published the worldwide bestseller *Drawing on the Right Side of the Brain*.

Edwards argued that by switching from the traditional left-brain mode (logical, verbal, symbolic) to a right-brain mode (creative, non-verbal, non-symbolic), even those who 'can't draw' will uncover their inner artist.

Drawing on the Right Side of the Brain has become the world's most widely used drawing guide, selling millions of copies, because the exercises Edwards describes are genuinely effective. And for the aspiring artist, if the exercises work it really doesn't matter how they work.

But from a scientific perspective, it's a bit of a problem that there's no evidence the exercises in *Drawing on the Right Side of the Brain* selectively involve the right side of the brain.

The idea that the right brain houses the key to creative thinking was born in the 1960s, but the two sides of the brain have been viewed as a Jekyll and Hyde pair for well over a century.

The left brain is regarded as the intelligent, rational, logical half, contrasting with the emotional, irrational, and creative right brain (in the 19th century, the right brain was thought to be the seat of madness, truly the Mr Hyde of the hemispheres!).

The creative process is rarely thought of as rational. The ancient Greeks thought that creativity resulted from the actions of the muses, and so waited for inspiration to strike.

Philosophers from Plato to Popper similarly believed creativity was mystical and therefore irrational. As the right brain was viewed as the 'irrational' hemisphere, it's little wonder it was proposed to control creativity too.

There is no question that the right brain is involved in creative thinking. But the idea that creativity is solely a function of one side of the brain is far too simplistic.

Any creative act, from solving a puzzle to painting a masterpiece, requires the input and integration of information from both sides of your brain. And research is increasingly demonstrating that creativity really is a whole-brain process.

If you measure the electrical activity generated by the brain during creative tasks, there is clear evidence of interaction between distant regions in both the left and right brain.

So, as you might expect, if you're highly creative you have more interaction between the left and right brain than less creative folks. Engaging both sides of the brain allows you to generate more creative solutions.

The good news is that even if you don't consider yourself particularly creative, training can increase your creativity by improving communication between the two sides of your brain.

Thus professional musicians have more efficient interaction between the left and right brain than people employed in less creative pursuits, and people with design training show greater interaction than novices. By increasing interaction between the two sides of the brain, you increase creativity.

Creativity is not just a right-brain process.Your right brain is vital to creativity, but so is the left: it is the interaction between the two sides of the brain, and the integration of different concepts and disparate processes, that fosters creative thinking.

When it comes to creativity, two hemispheres really are better than one.

65. Left-handers are more likely to be geniuses

Mike Nicholls
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Left-handers have copped their share of bad publicity in the past.

The term used to describe left-handers in English is 'sinistral', which is derived from the word 'sinister'.

And it's no better in other languages. Italians use 'mancino' (underhand, dishonest), the French use 'gauche' (unpolished, graceless) and the Germans use 'links' (wrong, reverse) — and all words have a similar, negative, connotation.

Even early psychologists had it in for left handers.

Cyril Burt, a famous (or maybe infamous) psychologist, said of left-handers:

> They squint, they stammer, they shuffle and shamble, they flounder around like seals out of water. Awkward in the house and clumsy in their games, they are fumblers and bunglers at whatever they do.

This quote was published in his eloquently titled book, *The Backward Child* (1937).

It's perhaps for these reasons that left-handers look for some light at the end of the tunnel.

Popular culture is replete with lists of famous and talented left-handers. Collections include people ranging from Leonardo da Vinci to Jimmy Hendrix and Alan Border.

Even if you look at the last five American presidents, four-fifths are left-handed (the right-handed exception is George W. Bush).

So does the claim that left-handers are more likely than right-handers to be geniuses hold any water?

Research mapping out a broad range of cognitive abilities has been able to estimate the shape of the bell curve for large

numbers of left- and right-handers. If left-handers were more likely to be high achievers, there should be a bump in the upper tail of the distribution. No such bump was found.

What was found, though, was the entire distribution for left-handers was shifted towards slightly lower scores. So, on average, left-handers perform slightly worse.

Of course, this doesn't mean that a left-hander can't be a genius — just that they are not more likely to be a genius than a right-hander.

It seems that left-handers' special abilities relate to very specific tasks.

It's often said that left-handers use the right side of their brain more, which is specialised for spatial modes of thinking. Such a proposition begs the question of the function of the corpus callosum, which has 200 million axons joining the left and right sides of the brain.

Once again, the evidence for this claim is not strong.

Studies have been shown left-handers are more likely to be architects, artists, gifted mathematicians and musicians. But these studies used small samples and are often contested by other studies.

The only area in which left-handers clearly excel is sport.

Left-handers are over-represented in some sports, such as cricket and tennis, but you are less likely to see them in others, such as golf.

But the advantage in sport is unlikely to reflect any special talent among left-handers. It's more likely to reflect a strategic factor.

Right-handers are less likely to face left-handers (who are only 10% of the population) and this makes them difficult to play against.

Given that left- and-right handers are mirror images of each other in terms of hand preference, perhaps the most surprising thing is how similar they are in the way their brains are organised and operate.

66. Stress can turn hair grey overnight

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The belief that nervous shock can cause you to go grey overnight (medically termed *canities subita*) is one of those tales which could nearly be true. There are certainly cases in medical literature of rapid greying over quite short periods of time. And reported cases go back to antiquity, including such legendary figures as Thomas More and Marie Antoinette.

The biology of the phenomenon suggests that a mixture of hormones and cognitive bias is responsible for the myth.

There is little doubt that plausible biological mechanisms exist to account for emotional stress potentially affecting hair growth. What's fascinating to me, as a pain specialist, is that several of the signalling proteins involved (such as nerve growth factor and substance P) are the very same ones that operate in other nerves to create and regulate pain signals.

Human hair cycles between a growth phase (*anagen*), a resting phase (*catagen*) and a dormant phase (*telogen*). Pigment is produced by the hair follicle to colour the hair during the anagen phase while it is growing.

The length of the anagen phase varies according to your genes and certain hormonal levels. It can be anything between two years and eight years. When the follicle receives orders to end the anagen phase, it stops producing more hair and begins to prepare for telogen. The telogen phase lasts for between six and eighteen months at a time before heading back into anagen.

After 10 or so of these cycles the follicle runs out of pigment and produces a hair with no colour at all. Despite its white colour, we insist on referring to these as 'grey hairs' for some obscure linguistic reason.

Intense stress can cause large numbers of your follicles to hit telogen at around the same time, producing simultaneous loss of a large percentage of coloured hair. This phenomenon is known as telegen effluvium.

Telogen effluvium is often caused by drugs that affect the hormonal control of the hair cycle, including chemotherapy drugs and anti-Parkinson's drugs.

Interestingly, these hormonal signals have a less potent effect on non-coloured hair, so a person could conceivably lose large amounts of coloured hair, leaving behind mostly white hair. This could also happen at a stressful time, such as the night before your execution. It can also happen due to auto-immunity (Alopecia areata) where the feral antibodies target pigment-producing follicles ahead of non-pigmented ones.

The problem for the myth is that none of this can happen as suddenly as overnight.

There are also plenty of good alternative explanations for these reports. In the case of Marie Antoinette, she was seen little in public in the couple of weeks before her execution, and would also have been deprived of her wigs and servants to dye her hair, if indeed that was one of her guilty secrets.

People such as President Obama, who go visibly greyer during a period of extreme stress over months or years, are usually at an age where many of their unfortunate follicles are on their last pigment cycle.

Confirmation bias means we remember those stressed people who look much greyer, but don't remember those who go through such periods without visible greying.

We also tend to ignore those who grey early and don't seem particularly stressed. That gets put down to genetics rather than stress.

So no matter how stressful your life may become, it might help to know that although you may achieve your pigmentary potential a little ahead of schedule, you can't go grey overnight.

67. Stress causes cancer

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Cancer is a disease of the body's cells that affects around half of all Australians by the age of 85. Normally, cells grow and multiply in a controlled way. But if something causes a mistake to occur in the cells' genetic blueprints, this control can be lost.

There are a number of chemical, physical and biological agents that have been shown to trigger the mistakes in the cell blueprint that cause cancer — but stress isn't one of them.

We all encounter short- and long-term stresses in our lives, such as work challenges, relationship problems and illness, which have varying degrees of psychological impact. Stress can be nature's way to help energise us to deal with these adverse events.

But high levels of stress can lead to anxiety and depression. These are serious, often interconnected, mental health problems that can affect your ability to work, maintain relationships and lead a fulfilled life. But three decades of study have found no direct association between stress and cancer, not even when stress is high enough to cause an anxiety disorder or depression.

If you want to reduce your risk of cancer, the most important thing you can do is avoid or reduce the known risk factors — such as smoking, being overweight, having a poor diet, being physically inactive, exposing yourself to UV radiation and consuming excessive amounts of alcohol. Avoiding these risk factors is known as adopting a 'cancer-smart' lifestyle.

Someone who feels stressed but lives a cancer-smart lifestyle is at no higher risk of cancer than a relaxed person with an equally healthy lifestyle. By the same token, a person

who doesn't feel stressed but smokes or does other things that are known to cause cancer is at higher risk than even the most anxious individual who has a cancer-smart lifestyle.

So, in the absence of evidence, why do so many people think stress causes cancer?

One reason could be that people who are stressed tend to smoke, drink excessively, be inactive and have poor diets. But this does not make stress itself a cancer risk factor. (Ironically, tobacco use, physical inactivity, excessive drinking and consumption of 'comfort foods' can actually increase, rather than alleviate, stress levels.)

Another reason for the myth might be the relationship between stress and the body's immune system. There is some evidence that stress can lower immunity — the body's natural defence against disease. Reduced immunity makes us more susceptible to some virus-related cancers, such as certain forms of lymphoma and Kaposi's sarcoma. However, evidence of causation is limited and, again, complicated by the direct impact of behavioural risk factors on the immune system.

Studies also show that people who are emotionally distressed are more likely to think they are sick. The flip side is that dealing with serious illnesses like cancer can be stressful. But again, neither equates to stress being a cause of cancer.

The idea that a positive outlook will affect your chances of remission from cancer or your survival is another myth, based on stories we hear about people who 'beat' their cancer through their 'fighting spirit' or 'determination'. There is no conclusive evidence that people who are distressed by their cancer experience have poorer clinical outcomes than those who feel 'positive' — provided they follow evidence-based advice on treatment and care.

The perception that some patients did not survive because they were not as positive as others is unfounded and unfair. Dealing with a cancer diagnosis is tough enough; being

pressured into thinking that the only way through it is to remain positive and thus minimise your stress can add to a patient's individual burden.

Stress is, nonetheless, a significant health issue. If it's a problem for you, you can learn calming techniques to help deal with it. Speak to your doctor or contact referral services such as Beyond Blue or Lifeline, which provide information and support to people with depression and anxiety. Improving your health and fitness by being more active and avoiding substances like alcohol and tobacco can also assist. And a healthier lifestyle will reduce your risk of cancer.

Fortunately, there's no evidence that stress causes cancer — so it's one less thing we need to worry about.

68. Emo music makes you depressed

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Like death metal and grunge before it, emo music has copped more than its fair share of criticism since it rose to prominence a decade ago. Rather than being seen as an outlet for young people to express their emotions, emo music is often blamed as a catalyst for adolescents' low moods.

There's no doubt that emo music — a style of emotionally charged punk rock — is expressive and bleak. Themes of pain, loneliness and death feature prominently. But there's no evidence that listening to this style of music, or any other, will cause you to feel depressed.

Perhaps the most well-cited research in this area is a 1998 study published in the *Journal of Adolescence*. To investigate the

effects of music on young people's mood states and their associations with chronic depression, the researchers asked 14 adolescent girls to listen to a 23-minute session of rock music.

The girls were compared with a control sample of chronically depressed females, who, for the same time period, were simply asked to sit and relax. The researchers found no differences or changes in the two groups' observed or reported mood state. But, interestingly, the girls' cortisol levels (a hormone associated with anxiety) decreased during and after their exposure to the music.

The researchers concluded that music had positive effects on physiological and biochemical functioning, even though an individual's mood did not seem to change. These conclusions have since been widely accepted by music researchers.

A more recent study, published last year in the *Archives of Pediatrics and Adolescent Medicine*, views music as more of a symptom than a cause of depression. Lead author Brian Primack claimed it's more likely that depressed teenagers turn to music for emotional support.

His study measured 106 teenagers' use of media via specialised mobile phones. The researchers phoned the teens as many as 60 times over an eight-week period to ask whether they were watching movies or TV, listening to music, surfing the internet, or reading.

Around half of the teens had been diagnosed with clinical depression. These teenagers listened to music an average of 9% of the time. Crucially, those who listened to lots of music were eight times more likely to be depressed than those who didn't listen very much. By contrast, teenagers who read were far less likely to be diagnosed with depression.

This study implies that rather than contributing to depression, the music-listening preferences of teenagers are indicative of their depressive mood states.

This raises an interesting research question: if a teenager's music listening habits are an indicator of emotional mood,

could they be used, in combination with other tools, in the diagnosis of depression? As a music researcher, I'll be watching this space.

In the meantime, let's stop blaming emo music for corrupting and depressing a generation of teens. From devil worship to promiscuity, popular music has been accused of all sorts of things throughout human history. We don't need to add depression to that list.