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The Ten-Percent Myth

Someone has taken most of your brain away and you probably didn't even know it. Well, not taken your brain away, exactly, but decided that you don't use it. It's the old myth heard time and again about how people use only ten percent of their brains. While for the people who repeat that myth, it's probably true, the rest of us happily use all of our brains.

Benjamin Radford

The Myth and the Media

That tired Ten-Percent claim pops up all the time. Last year, national magazine ads for U.S. Satellite Broadcasting showed a drawing of a brain. Under it was the caption, "You only use 11 percent of its potential." Well, they're a little closer than the ten-percent figure, but still off by about 89 percent. In July 1998, ABC television ran promotional spots for "The Secret Lives of Men," one of their offerings for the fall season's lineup. The spot featured a full-screen blurb that read, "Men only use ten percent of their brains."

One reason this myth has endured is that it has been adopted by psychics and other paranormal pushers to explain psychic powers. On more than one occasion I've heard psychics tell their audiences, "We only use ten percent of our minds. If scientists don't know what we do with the other ninety percent, it must be used for psychic powers!" In *Reason To Believe: A Practical Guide to Psychic Phenomena*, author Michael Clark mentions a man named Craig Karges. Karges charges a lot of money for his "Intuitive Edge" program, designed to develop natural psychic abilities. Clark quotes Karges as saying: "We normally use only 10 to 20 percent of our minds. Think how different your life would be if you could utilize that other 80 to 90 percent known as the subconscious mind" (Clark 1997, 56).

This was also the reason that Caroline Myss gave for her alleged intuitive powers on a segment of "Eye to Eye with Bryant Gumbel," which aired in July of 1998. Myss, who has written books on unleashing "intuitive powers," said that everyone has intuitive gifts, and lamented that we use so little of the mind's potential. To make matters worse, just the week before, on the very same program, correct information was presented about the myth. In a bumper spot between the program and commercials, a quick quiz flashed onscreen: What percentage of the brain is used? The multiple-choice answers ranged from 10 percent to 100 percent. The correct answer appeared, which I was glad to see. But if the producers knew that what one of their interviewees said is clearly and demonstrably inaccurate, why did they let it air? Does the right brain not know what the left brain is doing? Perhaps the Myss interview was a repeat, in which case the producers presumably checked her facts after it aired and felt some responsibility to correct the error in the following week's broadcast. Or possibly the broadcasts aired in sequence and the producers simply did not care and broadcast Myss and her misinformation anyway.

Even Uri Geller, who has made a career out of trying to convince people he can bend metal with his mind, trots out this little gem. This claim appears in his book *Uri Geller's Mind-Power Book* in the introduction: "Our minds are capable of remarkable, incredible feats, yet we don't use them to their full capacity. In fact, most of us only use about 10 per cent of our brains, if that. The other 90 per cent is full of untapped potential and undiscovered abilities, which means our minds are only operating in a very limited way instead of at full stretch. I believe that we once had full power over our minds. We had to, in order to survive, but as our world has become more sophisticated and complex we have forgotten many of the abilities we once had" (emphasis in original).

Evidence Against the Ten-Percent Myth

The argument that psychic powers come from the unused majority of the brain is based on the logical fallacy of the argument from ignorance. In this fallacy, lack of proof for a position (or simply lack of information) is used to try to support a particular claim. Even if it were true that the vast majority of the human mind is unused (which it clearly is not), that fact in no way implies that any extra capacity could somehow give people paranormal powers. This fallacy pops up all the time in paranormal claims, and is especially prevalent among UFO proponents. For example: Two people see a strange light in the sky. The first, a UFO believer, says, "See there! Can you explain that?" The skeptic replies that no, he can't. The UFO believer is gleeful. "Ha! You don't know what it is, so it must be aliens!" he says, arguing from ignorance.

What follows are two of the reasons that the Ten-Percent story is suspect. (For a much more thorough and detailed analysis of the subject, see Barry Beyerstein's chapter in the new book *Mind Myths: Exploring Everyday Mysteries of the Mind* [1999].)

1. Brain imaging research techniques such as PET scans (positron emission tomography) and fMRI (functional magnetic resonance imaging) clearly show that the vast majority of the brain does not lie fallow. Indeed, although certain minor

functions may use only a small part of the brain at one time, any sufficiently complex set of activities or thought patterns will indeed use many parts of the brain. Just as people don't use all of their muscle groups at one time, they also don't use all of their brain at once. For any given activity, such as eating, watching television, making love, or reading *Skeptical Inquirer*, you may use a few specific parts of your brain. Over the course of a whole day, however, just about all of the brain is used at one time or another.

2. The myth presupposes an extreme localization of functions in the brain. If the "used" or "necessary" parts of the brain were scattered all around the organ, that would imply that much of the brain is in fact necessary. But the myth implies that the "used" part of the brain is a discrete area, and the "unused" part is like an appendix or tonsil, taking up space but essentially unnecessary. But if all those parts of the brain are unused, removal or damage to the "unused" part of the brain should be minor or unnoticed. Yet people who have suffered head trauma, a stroke, or other brain injury are frequently severely impaired. Have you ever heard a doctor say, ". . . But luckily when that bullet entered his skull, it only damaged the 90 percent of his brain he didn't use"? Of course not.

Variants of the Ten-Percent Myth

The myth is not simply a static, misunderstood factoid. It has several forms, and this adaptability gives it a shelf life longer than lacquered Spam. In the basic form, the myth claims that years ago a scientist discovered that we indeed did use only ten percent of our brains. Another variant is that only ten percent of the brain had been mapped, and this in turn became misunderstood as ten percent used. A third variant was described earlier by Craig Karges. This view is that the brain is somehow divided neatly into two parts: the conscious mind which is used ten to twenty percent of the time (presumably at capacity); and the subconscious mind, where the remaining eighty to ninety percent of the brain is unused. This description betrays a profound misunderstanding of brain function research.

Part of the reason for the long life of the myth is that if one variant can be proven incorrect, the person who held the belief can simply shift the reason for his belief to another basis, while the belief itself stays intact. So, for example, if a person is shown that PET scans depict activity throughout the entire brain, he can still claim that, well, the ninety percent figure really referred to the subconscious mind, and therefore the Ten-Percent figure is still basically correct.

Regardless of the exact version heard, the myth is spread and repeated, by both the well-meaning and the deliberately deceptive. The belief that remains, then, is what Robert J. Samuelson termed a "psycho-fact, [a] belief that, though not supported by hard evidence, is taken as real because its constant repetition changes the way we experience life." People who don't know any better will repeat it over and over, until, like the admonition against swimming right after you eat, the claim is widely believed. ("Triumph of the Psycho-Fact," Newsweek, May 9, 1994.)

The origins of the myth are not at all clear. Beyerstein, of the Brain Behaviour Laboratory at Simon Fraser University in British Columbia, has traced it back to at least the early part of the century. A recent column in New Scientist magazine also suggested various roots, including Albert Einstein and Dale Carnegie (Brain Drain 1999). It likely has a number of sources, principally misunderstood or misinterpreted legitimate scientific findings as well as self-help gurus.

The most powerful lure of the myth is probably the idea that we might develop psychic abilities, or at least gain a leg up on the competition by improving our memory or concentration. All this is available for the asking, the ads say, if we just tapped into our most incredible of organs, the brain.

It is past time to put this myth to rest, although if it has survived at least a century so far, it will surely live on into the new millennium. Perhaps the best way to combat this chestnut is to reply to the speaker, when the myth is mentioned, "Oh? What part don't you use?"

Acknowledgments

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Do we really use only 10 percent of our brains?

Barry L. Beyerstein of the Brain Behavior Laboratory at Simon Fraser University in Vancouver explains.

Whenever I venture out of the Ivory Tower to deliver public lectures about the brain, by far the most likely question I can expect as the talk winds up is, "Do we really only use 10 percent of our brains?" The look of disappointment that usually follows when I say it isn't so strongly suggests that the 10-percent myth is one of those hopeful shibboleths that refuses to die simply because it would be so darn nice if it were true. I'm sure none of us would turn down a mighty hike in brainpower if it were attainable, and a seemingly never-ending stream of crackpot schemes and devices continues to be advanced by hucksters who trade on the myth. Always on the lookout for a "feel-good" story, the media have also played their part in keeping the myth alive. A study of self-improvement products by a panel of the prestigious National Research Council, *Enhancing Human Performance,* surveyed an assortment of the less far-fetched offerings of the "brain booster" genre and came to the conclusion that (alas!) there is no reliable substitute for practice and hard work when it comes to getting ahead in life. This unwelcome news has done little, however, to dissuade millions who are comforted by the prospect that the shortcut to their unfulfilled dreams lies in the fact that they just haven't quite found the secret to tap this vast, allegedly unused cerebral reservoir.

Why would a neuroscientist immediately doubt that 90 percent of the average brain lies perpetually fallow? First of all, it is obvious that the brain, like all our other organs, has been shaped by natural selection. Brain tissue is metabolically expensive both to grow and to run, and it strains credulity to think that evolution would have permitted squandering of resources on a scale necessary to build and maintain such a massively underutilized organ. Moreover, doubts are fueled by ample evidence from clinical neurology. Losing far less than 90 percent of the brain to accident or disease has catastrophic consequences. What is more, observing the effects of head injury reveals that there does not seem to be any area of the brain that can be destroyed by strokes, head trauma, or other manner, without leaving the patient with some kind of functional deficit. Likewise, electrical stimulation of points in the brain during neurosurgery has failed so far to uncover any dormant areas where no percept, emotion or movement is elicited by applying these tiny currents (this can be done with conscious patients under local anesthetic because the brain itself has no pain receptors).

The past hundred years has seen the advent of increasingly sophisticated technologies for listening in on the functional traffic of the brain. The goal of behavioral neuroscience has been to record electrical, chemical and magnetic changes in brain activity and to correlate them with specific mental and behavioral phenomena. With the aid of instruments such as EEGs, magnetoencephalographs, PET scanners and functional MRI machines, researchers have succeeded in localizing a vast number of psychological functions to specific centers and systems in the brain. With nonhuman animals, and occasionally with human patients undergoing neurological treatment, recording probes can even be inserted into the brain itself. Despite this detailed reconnaissance, no quiet areas awaiting new assignments have emerged.

All told, the foregoing suggests that there is no cerebral spare tire waiting to be mounted in service of one's grade point average, job advancement, or the pursuit of a cure for cancer or the Great American Novel. So, if the 10-percent myth is that implausible, how did it arise? My attempts to track down the origins of the 10-percent myth have not discovered any smoking guns, but some tantalizing clues have emerged (more are recounted in the references below). One stream leads back to the pioneering American psychologist, William James, in the late 19th and early 20th centuries. In addition to his voluminous scholarly work, James was a prodigious author of popular articles offering advice to the general public. In these exhortatory works James was fond of stating that the average person rarely achieves but a small portion of his or her potential. I was never able to find an exact percentage mentioned, and James always talked in terms of one's undeveloped potential, apparently never relating this to a specific amount of gray matter engaged. A generation of "positive thinking" gurus that followed were not so careful, however, and gradually "10 percent of our capacity" morphed into "10 percent of our brain." Undoubtedly, the biggest boost for the self-help entrepreneurs came when the famous adventurer and journalist Lowell Thomas attributed the 10-percent-of-the-brain claim to William James. Thomas did so in the preface he wrote, in 1936, to one of the best-selling self-help books of all time, Dale Carnegie's *How to Win Friends and Influence People*. The myth has never lost its steam since.

Other sources for the ubiquity of the 10-percent myth probably come from popular authors' misconstrual of scientific papers by early brain researchers. For example, in calling (for technical reasons) a huge percentage of the cerebral hemispheres the "silent cortex," early investigators may have left the mistaken impression that what is now referred to as the "association cortex" had no function. That was far from the researchers' intention, but that is what seems to have filtered through to the public. Likewise, early researchers' appropriately modest admissions that they didn't know what 90 percent of the brain was doing probably fostered the widespread misconception that the leftovers did nothing.

In my quest for the seminal utterance of the 10-percent myth, I frequently came across the claim that Albert Einstein had once explained his own brilliance by reference to the myth--Einstein's enormous prestige, of course, making it unassailable thenceforth. A careful search by the helpful people at the Albert Einstein archives, however, was unable to provide me with any record of such a statement on his part. So it remains probably just another of those instances where promoters with a point or a buck to make have misappropriated the clout of Einstein's name to further their own endeavors.

The 10-percent myth has undoubtedly motivated many people to strive for greater creativity and productivity in their lives--hardly a bad thing. The comfort, encouragement and hope that it has engendered helps explain its longevity. But, like so many uplifting myths that are too good to be true, the truth of the matter seems to be its least important aspect.

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Do People Only Use 10 Percent Of Their Brains?

What's the matter with only exploiting a portion of our gray matter?

By Robynne Boyd

The human brain is complex. Along with performing millions of mundane acts, it composes concertos, issues manifestos and comes up with elegant solutions to equations. It's the wellspring of all human feelings, behaviors, experiences as well as the repository of memory and self-awareness. So it's no surprise that the brain remains a mystery unto itself.

Adding to that mystery is the contention that humans "only" employ 10 percent of their brain. If only regular folk could tap that other 90 percent, they too could become savants who remember π to the twenty-thousandth decimal place or perhaps even have telekinetic powers.

Though an alluring idea, the "10 percent myth" is so wrong it is almost laughable, says neurologist Barry Gordon at Johns Hopkins School of Medicine in Baltimore. Although there's no definitive culprit to pin the blame on for starting this legend, the notion has been linked to the American psychologist and author William James, who argued in *The Energies of Men* that "We are making use of only a small part of our possible mental and physical resources." It's also been associated with to Albert Einstein, who supposedly used it to explain his cosmic towering intellect.

The myth's durability, Gordon says, stems from people's conceptions about their own brains: they see their own shortcomings as evidence of the existence of untapped gray matter. This is a false assumption. What is correct, however, is that at certain moments in anyone's life, such as when we are simply at rest and thinking, we may be using only 10 percent of our brains.

"It turns out though, that we use virtually every part of the brain, and that [most of] the brain is active almost all the time," Gordon adds. "Let's put it this way: the brain represents three percent of the body's weight and uses 20 percent of the body's energy."

The average human brain weighs about three pounds and comprises the hefty cerebrum, which is the largest portion and performs all higher cognitive functions; the cerebellum, responsible for motor functions, such as the coordination of movement and balance; and the brain stem, dedicated to involuntary functions like breathing. The majority of the energy consumed by the brain powers the rapid firing of millions of neurons communicating with each other. Scientists think it is such neuronal firing and connecting that gives rise to all of the brain's higher functions. The rest of its energy is used for controlling other activities—both unconscious activities, such as heart rate, and conscious ones, such as driving a car.

Although it's true that at any given moment all of the brain's regions are not concurrently firing, brain researchers using imaging technology have shown that, like the body's muscles, most are continually active over a 24-hour period. "Evidence would show over a day you use 100 percent of the brain," says John Henley, a neurologist at the Mayo Clinic in Rochester, Minn. Even in sleep, areas such as the frontal cortex, which controls things like higher level thinking and self-awareness, or the somatosensory areas, which help people sense their surroundings, are active, Henley explains.

Take the simple act of pouring coffee in the morning: In walking toward the coffeepot, reaching for it, pouring the brew into the mug, even leaving extra room for cream, the occipital and parietal lobes, motor sensory and sensory motor cortices, basal ganglia, cerebellum and frontal lobes all activate. A lightning storm of neuronal activity occurs almost across the entire brain in the time span of a few seconds.

"This isn't to say that if the brain were damaged that you wouldn't be able to perform daily duties," Henley continues. "There are people who have injured their brains or had parts of it removed who still live fairly normal lives, but that is because the brain has a way of compensating and making sure that what's left takes over the activity."

Being able to map the brain's various regions and functions is part and parcel of understanding the possible side effects should a given region begin to fail. Experts know that neurons that perform similar functions tend to cluster together. For example, neurons that control the thumb's movement are arranged next to those that control the forefinger. Thus, when undertaking brain surgery, neurosurgeons carefully avoid neural clusters related to vision, hearing and movement, enabling the brain to retain as many of its functions as possible.

What's not understood is how clusters of neurons from the diverse regions of the brain collaborate to form consciousness. So far, there's no evidence that there is one site for consciousness, which leads experts to believe that it is truly a collective neural effort. Another mystery hidden within our crinkled cortices is that out of all the brain's cells, only 10 percent are neurons; the other 90 percent are glial cells, which encapsulate and support neurons, but whose function remains largely unknown. Ultimately, it's not that we use 10 percent of our brains, merely that we only understand about 10 percent of how it functions.

Myths About the Brain: 10 percent and Counting

by Eric Chudler, Ph.D.

Do we really use only a small portion of our brain? If the answer to this question is yes, then knowing how to access the "unused" part of our brain should unleash untapped mental powers and allow us perform at top efficiency. Let's examine the issue and attempt to get at the truth behind the myth.

"The 'hidden nine-tenths' of your mental strength lies buried... discover, release and use it to gain new success, personal happiness—a fuller, richer life."

"They say you only use 10% of it."

"You only use 11% of its potential."

"It's been said that we use a mere 10% of our brain capacity."

Advertisers believe it. The popular media promote it. Do we use only a small portion of our brains? If the answer to this question is Yes, then knowing how to access the "unused" part of our brain should unleash untapped mental powers and allow us perform at top efficiency. But is it true that we only use 10% of our brains? Let's examine the issue of brain use and attempt to get at the truth behind the myth.

Where Did the 10% Statement Begin?

The origin of the belief that we use only a small part of our brain is unclear. Perhaps the belief is derived from debates during the early 1800s between those who believed that brain function could be localized to particular regions of the brain and those who believed that the brain acted as a whole. These debates centered around Franz Joseph Gall (1757-1828) and Johann Spurzheim (1776-1832) who developed the field of phrenology: the idea that specific human behaviors and characteristics could be deduced by the pattern and size of bumps on the skull. Not everyone agreed with Gall and Spurzheim. Marie-Jean-Pierre Flourens (1794-1867), an outspoken critic of phrenology, believed that although the cerebral cortex, cerebellum and brainstem had separate functions, each of these areas functioned globally as a whole ("equipotential"). Flourens supported his theories with experiments in which he removed areas of the brain (mostly in pigeons) and showed that behavioral deficits increased with size of the ablation. Although the work of Gustav Fritsch (1838-1927), Eduard Hitzig (1838-1907), Paul Broca (1824-1888) and Karl Wernicke (1848-1904) in the late 1800s provided strong data to counter the theory of equipotentiality, some scientists in the early 1900s appeared to once again favor the notion that the brain acted as a whole.

One prominent researcher who promoted the theories of equipotentiality and "mass action" was Karl Spencer Lashley (1890-1958). Lashley believed that memory was not dependent on any specific portion of the cerebral cortex and that the loss of memory was proportional to the amount of cerebral cortex that was removed. His experiments showed that the ability of rats to solve simple tasks, such as mazes and visual discrimination tests, were unaffected by large cerebral cortical lesions. As long as a certain amount of cortex remained, the rats appeared normal on the tests he administered. For example, in 1939 Lashley reported that rats could perform visual discriminations with only 2% of the visual thalamocortical pathway intact. He even estimated that this behavior required only 700 neurons. In another experiment in 1935, Lashley found that removal of up to 58% of the cerebral cortex did not affect certain types of learning. It is possible that overinterpretation and exaggeration of these data led to the belief that only a small portion of the brain is used. For example, although Lashley's rats may have been able to perform the simple tasks, they were not tested on other more complicated paradigms. In other words, the brain tissue that was removed may have been used for tasks that Lashley did not test. Moreover, Lashley was interested primarily in the cerebral cortex, not in other areas of the brain. Therefore, these data should not be extrapolated to other parts of the brain.

Several public figures have made reference to the 10% brain use statement. American psychologist William James wrote in 1908: "We are making use of only a small part of our possible mental and physical resources". Some famous people without training in neuroscience, such as physicist Albert Einstein and anthropologist Margaret Mead, are also attributed with statements regarding human use of only a small portion of the brain.

Regardless of its origin, the statement that we use only 10% of our brains has been promoted by the popular media for many years. Indeed, many advertisers have jumped on the statement to sell their products. According to these advertisements, if we buy their products, devices, or programs, we will be able to tap into the brain's unused powers and enrich our lives.

What does it mean to "use only 10% of your brain?" Does this statement imply that only 10% of the brain's neurons is active at any one time? If so, how could this be measured? Does the statement assume that only 10% of the brain is firing action potentials at one time? Even if this was true, the discharge of action potentials is not the only function of neurons. Neurons receive a constant barrage of signals from other neurons that result in postsynaptic potentials. Postsynaptic potentials do not always result in the generation of action potentials. Nevertheless, these neurons, even in the absence of generating action potentials, are active.

Keeping the Brain Quiet

If all neurons of the brain were generating action potentials at the same time, it is highly likely to result in dysfunction. In fact, some neurotransmitters, such as GABA, act to inhibit the activity of neurons and reduce the probability that an action potential will be produced. Massive excitation of neurons in the cerebral cortex may result in seizures such as those that occur during epilepsy. Inhibition of neuronal activity is a normal and important function of the brain. In other words, some areas of the brain keep other areas quiet.

It is also important to keep in mind that neurons are not the only type of brain cell. Although there are an estimated 100 billion neurons in the human brain, there are another ten to fifty times that number of glial cells in the brain. Glial cells do not generate action potentials. Glial cells function to:

- support the brain structurally
- insulate axons
- clean up cellular debris around neurons
- regulate the chemical composition of the extracellular space

Would we behave normally without 90 billion neurons and billions of glial cells? Would we be just fine if 90% of our brains was removed? If the average human brain weighs 1,400 grams (about 3 lb) and 90% of it was removed, that would leave 140 grams (about 0.3 lb) of brain tissue. That's about the size of a sheep's brain. Clinical evidence indicates that damage to even a small area of the brain, such as that caused by a stroke, may have devastating effects. Some neurological disorders (e.g., Parkinson's disease) also affect only specific areas of the brain. Disabilities may arise after damage to far less 90% of any particular brain area. Because removal of small essential brain areas may have severe functional consequences, neurosurgeons must map the brain carefully before removing brain tissue during operations for epilepsy or brain tumors.

Imaging the Active Brain

In addition to clinical evidence, brain imaging methods appear to refute the 10% brain use statement. For example, positron emission tomography (PET) scans show that much of the brain is active during many different tasks. Often when brain scans are published, they have been manipulated to show relative amounts of brain activity rather than absolute activity. This graphical presentation of the data shows differences in brain activity. Therefore, it may appear that some areas of the brain are inactive when, in fact, they were active, but at a lower level compared to other sites. Brain scans only show activity for the carefully designed isolated tasks being tested, such as memory or visual processing. They do not show activity related to other untested abilities. Imagine the brain is a restaurant kitchen. If you looked in on the kitchen at one time, you may see the chef preparing salad. However, you may not know that the main course is cooking in the oven. Similarly, if you image the brain during a visual task, you will not see the other patterns of activity associated with performing different (simultaneous) tasks.

Evolution and Development Weigh In

From an evolutionary perspective, it is unlikely that a brain that is 90% useless would develop. The brain is an expensive organ to maintain and utilizes a large supply of the body's energy resources. Certainly there are redundant pathways that serve similar functions. This redundancy may be a type of "safety mechanism" should one pathway for a specific function fail. Still, functional brain imaging studies show that all parts of the brain function. Even during sleep, the brain is active. The brain is still being "used"; it is just in a different active state.

From a developmental perspective, the 10% of the brain statement also fails. The adage "use it or lose it" seems to apply to the developing nervous system. During development, many new synapses in the brain are formed. After birth, many synapses are eliminated later on in development. This period of synaptic development and elimination goes on to "fine tune" the wiring of the nervous system. It appears that correct input is required to maintain a synapse. If input to a particular neural system is eliminated, then neurons in this system may not function properly. Nobel prize winners David H. Hubel and Torsten N. Wiesel demonstrated this in the visual system. They showed that complete loss of vision would occur when visual information was eliminated during early development. It seems reasonable to suggest that if 90% of the brain was not used, then many neural pathways would likely degenerate.

Brains are quite adaptable and do have the ability to recover after damage. When a brain is damaged, remaining neural tissue can sometimes take over and compensate for the loss. The ability of the brain to recover lost functions does not indicate that the damaged tissue had no function. Rather, this ability illustrates the brain's capacity to reorganize and rewire itself.

It appears that there is no hidden storehouse of untapped brain power. We use all of our brain.

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