



1. We use only 10% of our brains.

Discussion Questions

What percentage of your brain do you think you are using right now?

What percentage of your students' brains do you think your students are using at any given time?

Think of a scenario in which you would be using 100% of your brain.

How would you go about measuring how much of your brain you really use?

Multiple Choice Question

What percentage of your brain do you think you are using right now?

- A. 25%
- B. 10%
- C. 75%
- D. 100%
- >>E. None of the above

Myth Details

This is one of the most well-known myths about the brain.

Many books and products claim they can help you use the other 90% of your brain.

Brain scans have shown that our brains are always active. Some areas are more active than others at any given time but -- unless we have brain damage -- there is no one part of the brain that never functions. We use our whole brain every day.

The brain is a very efficient device, and pretty much all of it appears to be necessary.

2. Blind people have better hearing.

Discussion Questions

Name some daily tasks that blind individuals may carry out more easily than sighted individuals.

How do you think a blind individual's brain is different from the brain of a sighted individual?

If you think that parts of the brain of a blind individual are simply not used, what do you think happens to these unused parts?

Multiple Choice Question

In general, blind individuals are better than sighted individuals at which of the following?

- >>A. Remembering where objects are located in a room
- B. Threading needles
- C. Hearing faint sounds
- D. Falling asleep
- E. None of the above

Myth Details

When tested, blind people are no better at detecting faint sounds than sighted people are.

What blind people are better at:

- Remembering (they have better language and spatial memory)
- Carrying out language tasks (ex. discerning the meaning of sentences)
- Localizing sounds

Blind people seem to improve these abilities by taking advantage of brain space intended for vision (ex. verbal memory tasks activate the primary visual cortex in blind but not sighted individuals).

3. Listening to Mozart makes you smarter.

Discussion Questions

Other than conventional "book learning," what sorts of activities do you believe make kids smarter?

What kinds of activities other than "book learning" do you think make you smarter?

Why do you think these activities increase an individual's smartness?

What effect do you suppose these activities have on a person's brain? What changes do they initiate?

Multiple Choice Question

Which of the following has been shown to make a person 'smarter'?

- A. Listening to classical music
- >>B. Playing an instrument
- C. Owning a grand piano
- D. Attending the opera
- E. None of the above

Myth Details

In the 1990s, a study at the University of California at Irvine showed that college students performed better on a complex spatial reasoning test after listening to 10 minutes of a Mozart sonata (*the effect lasted for 15 minutes*). This study gave birth to the myth of the "Mozart effect."

DVDs, CDs, and books on the "Mozart effect" have been widely marketed

Scientists have been unable to replicate the results of the original study, and the idea has never been tested on babies

There is evidence that learning to play an instrument improves concentration and spatial reasoning

4. You're born with all of the neurons you will ever have.

Discussion Questions

What are some physical manifestations of neurons degenerating?

Do you think neurons can also generate?

If so, what would be the physical manifestations of this?

Multiple Choice Question

Which of the following senses relies on the continuous production of new neurons?

- A. Sight
- >>B. Smell
- C. Touch
- D. None of the above. We are born with all of the neurons we will ever have.
- E. None of the above

Myth Details

Scientists believed for many decades that the brain doesn't add new cells over its lifetime. New discoveries indicate this is not true.

A few parts of the brain (the olfactory bulb, the hippocampus) have been shown to produce new neurons in adulthood, though this ability declines with age

Learning and exercise encourage these new neurons to survive and become functional parts of the brain's circuitry

5. Your brain is all gray.

Discussion Questions

If you have seen/dissected the preserved brain of a vertebrate, what does it look like? What color(s) is it?

How do you think the appearance of the brain of a living vertebrate is different from the appearance of a preserved brain? Specifically, how do you think the colors are different?

Multiple Choice Question

Which of the following colors can be found within the living brain?

- A. Yellow
- B. Green
- C. Purple
- >>D. Black
- E. None of the above

Myth Details

Preserved brains are a uniform white, gray, or yellowish hue

The living brain is largely gray and white but it is also black and red in certain areas

Gray matter (cell bodies) is gray, white matter (axons) is white due to the myelin sheaths around axons, the substantia nigra (Latin for "black substance") is black due to the neuromelanin (a specialized type of the pigment in skin and hair) that is found here, and blood vessels are red.

6. You get new brain wrinkles when you learn something.

Discussion Questions

What do you think happens (on a macroscopic level and on a microscopic level) to the brain when we learn?

What changes?

What stays the same?

Multiple Choice Question

Which of the following does not happen in our brains when we learn?

- A. New connections between neurons are established
- B. Blood flow to certain areas of the brain increases
- C. Existing connections between neurons are modified
- >>D. New bumps (gyri) and dips (sulci) develop on the brain's surface
- E. None of the above

Myth Details

The brain of a newborn baby is just as wrinkled as that of an adult

Our brains do change when we learn, but they do not develop new bumps (gyri) or dips (sulci)

Rather, when we learn, our synapses and the blood vessels that support them are modified and increase in number

7. The human brain is the biggest brain.

Discussion Questions

Do you believe that humans are capable of more complex thinking than other vertebrates?

If you do, what about the human brain makes it capable of more complex thinking?

In general, how does the size, shape, and makeup of the human brain compare to the size, shape, and makeup of other vertebrate brains?

Multiple Choice Question

Humans are capable of more complex reasoning than other vertebrates. What about the human brain is evidence of this 'higher' functioning?

- A. The human brain is the largest vertebrate brain
- B. The human brain has more specialized parts than any other vertebrate brain
- >>C. Humans have the highest brain weight to body weight ratio of all vertebrates
- D. The human brain requires more energy to function than any other vertebrate brain
- E. None of the above

Myth Details

We often think of humans as the most intelligent of species. In our "bigger is better" society, this leads to the misconception that the human brain is the biggest brain.

The average adult human brain weighs 3 pounds. The sperm whale's brain weighs 17 pounds.

The ratio of brain weight to body weight or the size of individual brain components- like the cerebral cortex or cerebellum- provide better insight into intelligence than overall brain size.

The brain weight/body weight ratio is actually $\log \text{ brain weight} / \log \text{ body weight}$. Since animal weights are not normally distributed, this transformation helps to linearize the values in the numerator and denominator.

8. You can get holes in your brain through drug use.

Discussion Questions

We have discussed what the healthy brain looks like. How do you think a "brain on drugs" looks different (macroscopically and microscopically)?

What aspect of drugs/drug use causes these changes?

What behaviors do you think are associated with these changes?

Multiple Choice Question

Drug use can cause which of the following changes in the brain?

- A. It can cause the brain to develop additional lobes
- >>B. It can change the quantities of neurotransmitters in the brain
- C. It can leave small, almost imperceptible holes in certain areas of the brain
- D. It can stop blood flow to whole areas of the brain
- E. None of the above

Myth Details

Some people believe that drugs such as cocaine and ecstasy leave holes in your brain

The only thing that can actually leave a hole in your brain is physical trauma

Even though they don't bore holes, drugs do cause short and long term changes in the brain (lower the impact of neurotransmitters, change levels of neurotransmitters, etc.)

9. Alcohol kills brain cells.

Discussion Questions

It is common knowledge that alcohol affects the brain. By what mechanism do you think it does this?

What effects are longlasting? Shortlasting?

What determines whether or not an effect will be longlasting or shortlasting? What determines if an effect is reversible?

Multiple Choice Question

Which of the following changes occurs in the brain with persistent alcohol use?

- >>A. Dendrites are damaged, impairing neuronal communication
- B. Neurons die, ending some neuronal communication
- C. Neurons extend additional axons, complicating and confusing neuronal communication
- D. Neurons burst, flooding nearby synapses with neurotransmitter
- E. None of the above

Myth Details

Alcohol use does not result in the death of brain cells. It does damage dendrites. This results in impaired communication between neurons.

The good news is this damage is mostly reversible.

Alcoholics can develop of neurological disorder called Wernicke-Korsakoff syndrome. This disorder can involve neuron loss in some areas of the brain, but it is the result of a *deficiency of thiamine* rather than alcohol consumption itself. Severe alcoholics are often malnourished, and alcohol consumption itself can interfere with the body's ability to absorb thiamine.

10. Brain damage is always permanent.

Discussion Questions

Name some forms of brain damage. What are some minor forms? Severe forms?

What exposure (to family members, celebrities, etc.) have you had to brain damage?

What is your overall impression of brain damage? How does it effect the life of an individual?

Multiple Choice Question

When the brain is damaged, which of the following can happen?

- A. Neurons lost in the damage grow back
- B. Neurons far from the damage go into shock and stop functioning
- >>C. Undamaged areas of the brain start carrying out the functions of damaged areas
- D. The brain begins producing new types of neurotransmitters
- E. None of the above

Myth Details

There are many different types of brain damage, and exactly how it will affect someone depends largely on its location and how severe it is

Not all brain damage is severe. The brain can recover from minor brain injuries like concussions. No permanent disability results.

For nearly all patients who live through a severe brain injury, permanent, irreversible damage results.

If neurons are damaged or lost, they can't grow back, but the synapses, or connections between neurons, can. Essentially, the brain creates new pathways between neurons. In addition, areas of the brain not originally associated with a particular function can take over for damaged areas and allow the patient's brain to again carry out the lost function.

11. You can learn through subliminal messages.

Discussion Questions

What is a subliminal message?

Where are subliminal messages found? What messages do they usually send?

How could a subliminal message affect the brain (physical mechanism)?

Multiple Choice Question

You go to the movies, and halfway through the movie, you start craving a tall, cold Coke. Why?

- A. The woman next to you is enjoying her Coke.
- B. A subliminal message embedded in the movie has told you that you want a Coke.
- C. You are dehydrated.
- D. You are a creature of habit and you always get a Coke at the movies. You decided not to get a Coke this time but your body still expects it.
- >>E. None of the above

Myth Details

A subliminal message is a message embedded into images or sound meant to penetrate into our subconscious and influence our behavior (ex. messages inserted into a movie that flash for a fraction of a second and tell moviegoers to drink Coca-Cola and eat popcorn).

In 1974, the FCC banned such messages but did the messages work? The jury is out. The researcher that studied the subliminal "drink Coca-Cola and eat popcorn" messages lied about his results. Other similar studies have had no measurable effect on audiences.