

Einstein's genius found in his big brain matter

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If you were asked to name a genius, physicist Albert Einstein is probably the first person you'd come up with. Now it turns out there was something special about his brain: He had an enormous corpus callosum.

The corpus callosum is a dense network of neural fibers. These can be thought of as something like wires conducting electrical impulses from the brain.

The corpus callosum stretches nearly the full length of the brain, right down the middle, from behind the forehead to the nape of the neck. It carries electrical signals between the brain's right and left halves, which are known as cerebral hemispheres. These signals makes brain regions with very different jobs work together.

Chances are, Einstein's large bundle of white matter is part of what made his mind so phenomenally creative.

Superhighway Of Connectivity

Even when he died at the age of 76, Einstein's corpus callosum was a real superhighway of connectivity, researchers reported this week. It was "thicker in the vast majority of subregions" than the corpora callosa of 15 elderly healthy males. And at five key crossings, it was also thicker than those of 52 healthy young men.

"You have a unique brain here," said brain mapping expert Dr. John C. Mazziotta. "Sometimes looking at the extremes of something tells you a lot about how the average works. That's why these kinds of studies have value."

After Einstein died in 1955, his family allowed his brain to be removed for scientific study. Numerous slides were made of cross-sections of the brain. Each served as a minute slice of the universe that lay beneath that shock of white hair.

Some of those slides still exist. But many have been lost or stolen. Without a full picture of Einstein's brain, neuroscientists — researchers who study the brain — were unable to look for the source of his genius.

Then, in 2010, a forgotten set of photographs unexpectedly came to light. They were found after evolutionary anthropologist Dean Falk noticed some striking photos in an old publication. Eventually, the originals were located among the papers of Dr. Thomas Harvey, who had removed Einstein's brain. It is these photos that are the basis of the new study.

"Enhanced Communications Routes"

Soon after their discovery, Falk was contacted by Chinese physicist Weiwei Men, an admirer of Einstein with a special interest in the brain. Men had heard that the new images included views of the physicist's corpus callosum. He suggested to Falk that they work together on a study.

Last year, the two researchers published a report that offered a remarkably detailed look at the organ's surface. The brain's extra folds showed evidence of unusual volume in a number of regions. And these were regions that were probably key to Einstein's spatial and mathematical creativity.

The high-resolution photos even revealed evidence of Einstein's lifelong love of playing the violin: A large "knob" was found on the surface of the primary motor cortex. This is the region where the left hand is usually represented.

The latest study is based on several of these same photographs. The pictures show the corpus callosum with great clarity.

The researchers were particularly impressed by the size of one part of Einstein's corpus callosum: the splenium. That region aids communication among the parietal, temporal and occipital lobes. The parietal and occipital lobes, in particular, are key to spatial thinking and mathematical operations. The splenium also keeps those regions in touch with the brain's intellectual command center, the prefrontal cortex.

Earlier studies of Einstein's brain found that some regions were bigger than those of normal people. This was particularly true of the prefrontal cortex and the parietal lobes. But, the authors wrote, Einstein's genius was related not only to the size of these parts of his brain. It also involved "enhanced communications routes between at least some parts of his two cerebral hemispheres." That is, because his corpus callosum was thicker than usual, communication between the two sides of his brain was better than average.

Exercising The Brain Like A Muscle

According to neuroscientist Peter U. Tse, the new report also supports the idea that the more we use our brains as we age, the less our brains decline. Einstein's brain was much more developed than those of the men around his age. But it was not so different from the brains of young men.

This might be because Einstein continued to exercise his brain strenuously. By doing so, he may have prevented the decline that usually comes with age.

"It might just be that Einstein's brain was more like a young person's brain," Tse said. "The brain is like a muscle." If we use it a lot, it's more likely to stay fit.

"We should therefore not conclude that Einstein's genius was caused by some part of his brain being slightly larger than average," he said. "It might be that his brain was slightly larger in these areas because he exercised these regions more than the average person."

But, added neuroscientist Alexander Schlegel, there is much more to genius than either cerebral size or ceaseless exercise of the brain.

Much of what made Einstein so successful, Schlegel said, was his "playfulness, curiosity and deep understanding." And these traits were "cultivated through a lifetime of hard work."