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My Brain on Video Games

By MATT RICHTEL

Jim Wilson/The New York Times Matt Richtel playing a video game while having his brain scanned. Watch an audio slide show in which he describes the experience.

I'm lying in a $3 million M.R.I. scanning tube, a noise-canceling headset on my ears and a mirror contraption on my head that lets me see a television hung on the nearby wall.

This has got to be among the weirdest ways anyone has ever played a video game.

That's what was going through my mind last month as I participated in an unusual experiment. While I was inside the machine at the University of California at San Francisco, researchers were sitting in a room nearby watching real-time images of the inside of my brain. (See an audio slide show about the experience and the science.)

On two monitors, they saw changes in blood flow to various regions of my brain as I used a controller to maneuver a racing car along a winding track. And as I drove, I tried to ignore, or at other times react to, different shapes popping onto the screen.

The red areas show the parts of the brain that were active during multitasking.

"So," I asked after the test finished, hoping my brain looked at least healthy and maybe somehow impressive to a neuroscientist, "what happened to my brain? What did it look like?"

"It's not that simple," responded the research leader, Dr. Adam Gazzaley, a neurologist at the university.

Indeed not. It turns out that the test results, while they did show changes in activity in key brain regions (read on to the bottom and, no, my brain isn't somehow impressive), were not particularly revelatory. But what is fascinating are the new ways scientists are using this type of technology to measure and map the ethereal concept of attention.

For several decades, neuroscientists have used imaging machines to explore the brain. Early work in the 1990s involved such simple tests as discovering or verifying what parts of the brain get involved in particular tasks. (Hand squeeze = motor cortex! Uncork champagne = also, probably, motor cortex.)

More recently, the researchers have been trying to map neural networks so that they can understand, for example, what parts of the brain get involved — and how they cooperate — when someone experiences pain, or makes a decision. Doing so, it turns out, is as hard as trying to guess all the ingredients in an Iron Chef's stew, and their proportions, by peeking into the pot.

But scientists argue that this work is important given the role attention appears to play not just in daily life but in a host of maladies — like attention deficit disorder and schizophrenia — in which someone appears to become overly focused on trivialities or, by contrast, unable to focus at all. I've written about some of this research in a series of articles this year.

It's sort of cosmic to contemplate the idea of breaking down attention into its anatomical components. "Look, honey, my auditory cortex is absolutely paying attention to you. It's only my visual cortex that is focused on Angry Birds!"

Other researchers are doing related work. At the University of Utah, neuroscientists have been imaging the brains of Air Force fighter pilots and others identified as

“supertaskers,” meaning that they seem better able to switch quickly among tasks. The images show differences between these subjects and less able multitaskers in three areas of the brain that are involved with setting priorities.

The Utah researchers say more effective task switchers appear to have a neurochemical advantage that makes them less likely to overreact or become overwhelmed by task switching.

Dr. Gazzaley said such imaging research could have implications for everyday life.

“Distraction and interruption or multitasking are contributors to deficits in memory,” he said. “One of our main questions is whether we can train these abilities.”

The imaging experiment was step two in their process of discovery. Step one was an experiment his lab recently finished that tested people’s abilities to both multitask and to focus amid distraction.

The preliminary results, reported last month at a neuroscience conference in San Diego, surprised them. They found that, in general, people’s ability to juggle two tasks drops off in their 30s and then sharply in their 40s. The researchers had expected to find that multitasking — or, more precisely, the ability to switch comfortably between tasks — drops off only when people are much older.

Hal Pashler, a cognitive scientist at the University of California at San Diego who is well known for his studies of attention and focus, told me to view those preliminary results with some caution. He said that researchers have routinely found that people in their 20s also suffer “huge” performance costs when they try to multitask. In other words, 20-somethings, you can’t actually study while texting and watching odd animal videos.

Regardless, Mr. Pashler said the next step in Dr. Gazzaley’s experiment was worth taking but highly challenging: he wants to marry the results of the behavioral study on multitasking abilities with the data his lab is just beginning to collect using the M.R.I. machine. I was among the first subjects of that project, which the lab expects to delve further into next year as it seeks to detail what is happening inside the brain at the moment subjects are interrupted and lose focus.

A few days after my scan, Dr. Gazzaley got a chance to look more closely at what happened inside my head when I was trying to multitask, switching between “driving” and reacting to other objects on the screen, as opposed to when I was doing those tasks individually, without interruption. Simply put, when my attention was divided, it taxed certain areas of my brain used in setting priorities and trying to determine or assert control.

“The results are neither surprising nor novel and consistent with existing literature,” Dr. Gazzaley explained, which I suppose is comforting, though I maintain that while I may not be a supertasker I can get a heck of a lot done after I’ve had a Starbucks Peppermint Mocha.

Dr. Gazzaley said he hoped new findings might emerge next year when the lab gathers data on more people, refines the tests and adds a new component. In addition to imaging the brains of multitaskers, they plan to simultaneously monitor them using electroencephalography (EEG), which will enable them to measure more precisely the communication patterns among regions of the brain during the instant of interruption.

“This is a jumping-off point,” he said. “This is the start of the experiment.”

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