

## This is Your Brain on Writing

Carl Zimmer NY Times

A novelist scrawling away in a notebook in seclusion may not seem to have much in common with an NBA player doing a reverse layup on a basketball court before a screaming crowd. But if you could peer inside their heads, you might see some striking similarities in how their brains were churning.

That's one of the implications of new research on the neuroscience of creative writing. For the first time, neuroscientists have used fMRI scanners to track the brain activity of both experienced and novice writers as they sat down — or, in this case, lay down — to turn out a piece of fiction.

The researchers, led by Martin Lotze of the University of Greifswald in Germany, observed a broad network of regions in the brain working together as people produced their stories. But there were notable differences between the two groups of subjects. The inner workings of the professionally trained writers in the bunch, the scientists argue, showed some similarities to people who are skilled at other complex actions, like music or sports.

The research is drawing strong reactions. Some experts praise it as an important advance in understanding writing and creativity, while others criticize the research as too crude to reveal anything meaningful about the mysteries of literature or inspiration.

Dr. Lotze has long been intrigued by artistic expression. In previous studies, he has observed the brains of piano players and [opera singers](#), using fMRI scanners to pinpoint regions that become unusually active in the brain.

Needless to say, that can be challenging when a subject is singing an aria. Scanners are a lot like 19th-century cameras: They can take very sharp pictures, if their subject remains still. To get accurate data, Dr. Lotze has developed software that can take into account fluctuations caused by breathing or head movements.

For creative writing, he faced a similar challenge. In previous studies, scientists had observed people doing only small tasks like thinking up a plot in their heads.

Dr. Lotze wanted to scan people while they were actually writing. But he couldn't give his subjects a keyboard to write with, because the magnetic field generated by the scanner would have hurled it across the room.

So Dr. Lotze ended up making a custom-built writing desk, clipping a piece of paper to a wedge-shaped block as his subjects reclined. They could rest their writing arm on the desk and scribble on the page. A system of mirrors let them see what they were writing while their head remained cocooned inside the scanner.

To begin, Dr. Lotze asked 28 volunteers to simply copy some text, giving him a baseline reading of their brain activity during writing.

Next, he showed his volunteers a few lines from a short story and asked them to continue it in their own words. The volunteers could brainstorm for a minute, and then write creatively for a little over two minutes.

Some regions of the brain became active only during the creative process, but not while copying, the researchers found. During the brainstorming sessions, some vision-processing regions of volunteers became active. It's possible that they were, in effect, seeing the scenes they wanted to write.

Other regions became active when the volunteers started jotting down their stories. Dr. Lotze suspects that one of them, the hippocampus, was retrieving factual information that the volunteers could use.

One region near the front of the brain, known to be crucial for holding several pieces of information in mind at once, became active as well. Juggling several characters and plot lines may put special demands on it.

But Dr. Lotze also recognized a big limit of the study: His subjects had no previous experience in creative writing. Would the brains of full-time writers respond differently?

To find out, he and his colleagues went to another German university, the University of Hildesheim, which runs a highly competitive creative writing program. The scientists recruited 20 writers there (their average age was 25). Dr. Lotze and his colleagues had them take the same tests and then compared their performance with the novices'.

As the scientists [report](#) in a new study in the journal *NeuroImage*, the brains of expert writers appeared to work differently, even before they set pen to paper. During brainstorming, the novice writers activated their visual centers. By contrast, the brains of expert writers showed more activity in regions involved in speech.

"I think both groups are using different strategies," Dr. Lotze said. It's possible that the novices are watching their stories like a film inside their heads, while the writers are narrating it with an inner voice.

When the two groups started to write, another set of differences emerged. Deep inside the brains of expert writers, a region called the caudate nucleus became active. In the novices, the caudate nucleus was quiet.

The caudate nucleus is a familiar part of the brain for scientists like Dr. Lotze who study expertise. It plays an essential role in the skill that comes with practice, including activities like board games.

When we first start learning a skill — be it playing a piano or playing basketball — we use a lot of conscious effort. With practice, those actions become more automatic. The caudate nucleus and nearby regions start to coordinate the brain's activity as this shift happens.

“I was really happy to see this,” said [Ronald T. Kellogg](#), a psychologist who studies writing at Saint Louis University. “You don’t want to see this as an analog to what James Joyce was doing in Dublin. But to see that they were able to get clean results with this, I think that’s a major step right there.”

But Steven Pinker, a Harvard psychologist, was skeptical that the experiments could provide a clear picture of creativity. “It’s a messy comparison,” he said.

Dr. Pinker pointed out that the activity that Dr. Lotze saw during creative writing could be common to writing in general — or perhaps to any kind of thinking that requires more focus than copying. A better comparison would have been between writing a fictional story and writing an essay about some factual information.

Even the best-designed scanning experiments might miss signs of creativity, Dr. Pinker warned. The very nature of creativity can make it different from one person to the next, and so it can be hard to see what different writers have in common. Dr. Pinker speculated that Marcel Proust might have activated the taste-perceiving regions of his brain when he recalled the flavor of a cookie. But another writer might rely more on sounds to evoke a time and place.

“Creativity is a perversely difficult thing to study,” he said.