Thinking in Tongues

What can we learn from a babbling brain?

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Last week, the *New York Times* reported that neuroscientists had gotten a look, for the first time, at the brains of devout Christians engaged in speaking in tongues. The test subjects believe that God takes possession of their minds and babbles through their mouths. And now, says the *Times*, "they have some neuroscience to back them up."

The scientists compared the brain activity of their subjects in two conditions—first while they sang gospel songs, and second as they engaged in trancelike glossolalia replete with ecstatic bodily experiences. According to the research report, they found diminished activity in the dorsolateral prefrontal cortex, which normally lights up when you're doing something on purpose. "The amazing thing was how the images supported people's interpretations of what was happening," the study's lead author, Andrew Newberg, told the *Times*. If the test subjects said they were in a state of utter abandon, the pictures of their brains proved it.

This certainly isn't the first time a new brain-imaging study has been touted as biological proof of a subjective experience. Recent *Times* articles have highlighted research into the neural structures associated with dread, hysteria, and even schadenfreude. Another study scanned subjects who had been hypnotized to show that their brain activity matched up with their altered perceptions. Last year, a British team fed subjects dessert while they were inside a functional MRI machine, and color-spattered slices of cortex revealed activation in the orbitofrontal pleasure centers. "Eating ice cream really does make you happy," began the article in *TheGuardian*.

These studies play with the ticklish notion that our brain mediates all of our inner experience—whether we're angry, or in love, or enjoying a vanilla ice-cream cone. Every feeling can be expressed in patterns of neural activity spread out on a computer screen. But does the specific pattern associated with enjoying ice cream tell us anything new—about the brain, or ice cream, or ourselves? If your test subject tells you he likes ice cream, what do we learn from the fact that his brain thinks so too?

Let me be clear: I'm a dyed-in-the-wool materialist. I believe that each and every aspect of our minds derives from the firing patterns of neurons in our brains. But there's something absurd about the way these imaging studies use brain images to validate subjective experience. It's as if we're not sure if we can believe in the enjoyment of ice cream on its own terms.

I used to scan brains for a living, and a major pharmaceutical company hired the lab where I worked to study a new drug for chronic pain. We were supposed to test the cortical responses of patients undergoing treatment for chronic pain; in practice, that meant we'd strap them to a table, slide them into the functional MRI machine, and subject them to painful stimuli while we

scanned their brains. Outside the scanner, the patients were more than happy to rate the amount of pain they were experiencing on a numbered scale—and according to their reports, the drug seemed to be working fine. But our sponsors wanted more. Could our MRI machine show that the drug had an effect on their *brains* as well? Could it prove the drug was working as a biological fact—with before-and-after pictures of their cortical pain centers?

We were looking for a drug to make people feel better, but we couldn't take their word for how they felt. The scanner was less a diagnostic tool than a lie detector: A patient might claim to like the treatment, but we'd provide the neuroscience to back him up.

What about the people speaking in tongues? You don't have to believe in spiritual possession to accept that glossolalia feels like a partial loss of control. The fact that the scanner shows ebbing blood flow in the prefrontal cortex doesn't tell us much more than that. We learn that our test subjects aren't lying—they really do feel like someone is talking through them. And we learn, once again, that brain imaging works. Blood flow, indeed, correlates with brain activity, and blood flow in certain parts of the brain corresponds to the sensation of control.

In fact, brain-imaging studies like this one don't leave much room for negative results. Researchers typically use five or 10 subjects to image cerebral blood flow under two conditions—while subjects perform an experimental task (like speaking in tongues) and a control task (like gospel singing). By comparing the two pictures, they can figure out the places where brain activity is specific to each condition. Differences between the experimental and control tasks can appear in any of a large number of the brain's cortical structures, and they can look like either increases or decreases in blood flow. With so many possible outcomes, you might get some false positives through random chance, so researchers have to correct their statistics for multiple comparisons. Not everyone does this. The glossolalia researchers, for example, chose to skip this step. Even when scientists take it, there's a very good chance that their analysis will produce some positive results. As long as the two tasks they choose for their subjects aren't exactly the same, they should end up with a list of brain structures associated with one task but not the other.

The bias toward positive findings can make it hard to interpret an imaging experiment. If you're the scientist, you might make the somewhat tautological argument that whatever turns up on your scans constitutes a "network" of brain areas associated with the thing you're studying. If you scan the brains of people speaking in tongues, ergo, you find the brain areas associated with speaking in tongues. Which is a good thing for you, because positive results make for juicy newspaper articles.