

Neuroimaging: Voodoo, New Phrenology, or Scientific Breakthrough? Introduction to Special Section on fMRI

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In 2009, I published an article by Ed Vul, Christine Harris, Piotr Winkielman, and Hal Pashler, claiming that a significant number of fMRI studies were based on a statistical error leading to false conclusions. The original title of the article contained the word “voodoo,” and the article travelled around the neuroscience community very quickly. On the day after I accepted the article, a friend emailed me from Thailand where she had just read the manuscript. The so-called “voodoo article” fired a shot heard round the world, and I subsequently received scores of emails about it, both praising me and damning me for publishing the manuscript.

It became clear to me that in the neuroimaging community the issue of statistical approaches has been a topic of continuing debate and development. However, it also appeared to me that something much deeper was at issue. There were those who believe that neuroimaging is breakthrough science that, regardless of methodological and statistical challenges, will provide the first true understanding of the human mind. A recent article in *Scientific American* by Thomas Insel (2010) represents the type of hope for breakthroughs that many have for the neuroscience approach, especially when combined with genetics. In discussing psychological disorders such as depression, obsessive-compulsive disorder, and posttraumatic stress disorder, Insel writes that imaging gives us, for the first time, the ability to see the physical dysfunctions that cause the mental symptoms. Insel proffers that a shift will occur in psychiatry from subjective “mental” phenomena to neuroscience, revolutionizing prevention and treatment in a way that will bring true and lasting relief. Recognizing that environmental factors usually play a role in the development of some mental illnesses, Insel nonetheless believes that neuroscience is the route to prevention and cure.

On the other side of the debate are scientists who are deeply skeptical of placing too much faith in neuroscience and are offended by the bold claims made by a few neuroimagers. As an outsider to the debate, I wondered: What can we hope to learn about the mind from neuroimaging, and what can it not tell us? In a quick reading of the literature, I learned that there

are many methodological challenges, related, for example, to discerning meaningful signals against the background of much noise. It is well known that fMRI has poor temporal resolution in comparison with methods such as EEG. There are issues of how to interpret neural activity in “hot” areas, and the fact that complex psychological phenomena such as emotions are unlikely to be restricted to a single area. But I wondered about a deeper issue: If we solve all of the technical problems and have perfect images, how much will they tell us about psychological processes?

In reading the emails regarding the Vul et al. (2009) article, it was clear that some psychologists were offended by the bold claims of some fMRI practitioners. The perception seems to be that the proponents of imaging are saying that most of what went before in psychology was rather worthless, and we now finally have the effective tool to truly understand psychology in a scientific way. Thus, I invited several leading neuroscience-psychologists to write articles that discuss the promises and issues facing neuroimaging. I asked them specifically, “What can the method tell us, and what is it unlikely to tell us?”

Gregory Miller wrote the lead article in this section, with a broad attack on naive interpretations of fMRI data. Although a practitioner of the method, his article is skeptical and raises problems that serious scholars must confront. For instance, he raises the issue of reductionism, the question of whether one can ever fully understand one level, the psychological, by referring to a lower level, such as the neuroanatomical. A key issue for Miller is what constitutes an adequate explanation and whether brain regions involved in functioning can ever provide more than a fragmentary understanding of phenomena. To say that Miller would be deeply skeptical about Insel’s claim that neuroscience will be the primary vehicle for discovering how

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to prevent and cure mental illness would probably be an understatement.

The next article, by Gonsalves and Cohen, places neuroimaging within the broader framework of the multiple converging methodologies used in neuroscience and in the behavioral sciences. They suggest that neuroimaging, when combined with other approaches, has advanced our understanding and give examples from their area of expertise: human memory.

Poldrack discusses whether fMRI is the new “phrenology,” naively mapping complex human psychological processes to discrete brain areas and then claiming that the process is explained. Poldrack claims that if 19th-century phrenology were still alive, fMRI would undoubtedly give it empirical support. To combat naive localization, Poldrack argues that we need selective association between psychological functions and brain areas—not just any association. He claims that there are, upon careful examination, few, if any, unique structure-function associations that have been discovered. Based on this, Poldrack recommends the types of questions that should be asked and the types of fMRI data that should be collected.

Finally, Beck reviews evidence showing that the public and popular media are quite credulous when it comes to brain findings and brain images in particular. This places a burden on neuroimaging researchers to cautiously explain what their findings do and do not show.

In their comment on the target articles, Decety and Cacioppo see fMRI as a valuable tool in the toolbox of multiple methods that must be used by behavioral scientists. They argue for behavioral measures that provide fine-grained analyses of brain-behavior relations, biological measures that permit

mapping neural events at different spatial and temporal scales, and experimental studies using methods such as transcranial magnetic stimulation. Shimamura offers a very thoughtful overview of the advances and concerns raised by the rapidly growing fMRI method.

It seems to me that fMRI is one approach among many biological methods, and that it can work in combination with those other methods to greatly enrich our understanding of psychology. At the same time, these methods must be combined with sophisticated psychological understanding from additional sources to fully understand the phenomena we study. Readers will draw their own conclusions about the value and pitfalls of neuroimaging. Hopefully this special issue will help move the discussion forward so that we can draw more thoughtful and informed opinions about what the method can and cannot tell us and how best to use it in combination with other methods. The hubris some see in the fMRI community might simply be youthful enthusiasm. I cannot predict the future, and only time will tell which side of the debate is correct or whether some middle ground is best. In the meantime, I say let 1,000 flowers bloom, and we will in the future see which approaches are best.

References

- Insel, T.R. (2010). Faulty circuits. *Scientific American*, 302, 44–51.
- Vul, E., Harris, C., Winkelman, P., & Pashler, H. (2009). Puzzlingly high correlations in fMRI studies of emotion, personality, and social cognition. *Perspectives on Psychological Science*, 4, 274–290.