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Martha J. Farah
*University of Pennsylvania*, mfarah@psych.upenn.edu



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**Open Peer Commentaries**

# That Little Matter of Consciousness

**Martha Farah, University of Pennsylvania**

Brain imaging holds great promise for improving our understanding of disorders of consciousness and for guiding diagnosis and treatment of these disorders. It is also a new approach and the published literature is still small and not entirely consistent. Fins and colleagues (2008) have therefore undertaken the important and timely project of formulating recommendations for future research. They make a number of valuable points, but strangely they omit any mention of the issues that make this research so uniquely challenging and important—issues related to consciousness.

Neuroimaging of severely brain-damaged patients is important because, in the authors' words, it has "provided clues of otherwise elusive conscious processes in the injured human brain." Yet in analyzing the literature and formulating their recommendations, they write that that "the major challenges are patient selection and study design, and standardization of the technology, including stimulus selection and experimental protocols." The aspects of study design to which they refer concern correlations with established diagnostic criteria to address issues of nosology and diagnosis and longitudinal designs to address issues of prognosis. What has been overlooked are the issues of conceptual analysis and study design that make imaging consciousness different from imaging other brain phenomena such as demyelination, plaques, or blood flow. Analyzing the literature on brain imaging of consciousness in terms of sample size and scanning parameters is a little like analyzing a steamy love scene in a movie in terms of lighting and camera work. Granted, these are important to get right, but they're not what we're most interested in!

Consciousness is at the heart of the distinction between the vegetative state (VS) and minimally conscious state (MCS). It is also essential for determining our ethical obligations to a patient; for example, determining whether custodial care is enough and whether we should supply pain relief for painful conditions or procedures. Yet unlike most neurological signs and symptoms, the presence of consciousness in a noncommunicative patient cannot be measured, observed, or ascertained by examination. We are left with a particularly intractable form of the classic philosophical "problem of other minds"; in other words, the problem of inferring the mental experience of another being from the observable behavior of that being. Whereas only the philosophical skeptic would doubt that a talking, behaving human has conscious experiences, in the case of severely brain-damaged patients it is often difficult to know. Patients who appear to be in a VS may instead be in MCS or even "locked-in"; that is, fully conscious yet unable to communicate (Bauer et al. 1979). How might the imaging of brain activity provide information about patients' mental processes when their behavior does not? According to virtually all conceptions of mind–brain relations in contemporary philosophy of mind (identity theories, varieties of functionalism, supervenience theories), one cannot be in the brain state corresponding to a mental state without also being in that mental state. Thus, brain imaging gives us a perspective on thought processes, including conscious thought processes, that is direct in a way that behavior is not (Farah, 2008).

Of course, in order for brain imaging to live up to its potential as a tool for studying consciousness in severely brain-damaged patients, some conceptual and empirical groundwork is needed. So here I offer additional recommendations for future neuroimaging research on disorders of consciousness, to supplement those already offered in the Target Article. These recommendations focus on the ways in which consciousness is operationalized in imaging studies, the implicit assumptions involved in operationalizing consciousness in these ways, and implications for future research.

Functional brain imaging has been used in three qualitatively different ways to infer the mental status of severely brain-damaged patients. The logic of the experimental designs, and their consequent strengths and weaknesses, differ across the three cases. The first recommendation is therefore to bear these differences in mind and avoid treating them as equivalent when interpreting the results of studies and attempting to integrate the results of multiple studies.

Examples of all three approaches can be found in Table 1 of the Target Article. One approach is to show preserved high-level cognitive processing by patients' brains, of the kind normally accompanied by consciousness. This approach is exemplified by the study of Schiff et al. (2005). Patients in MCS were scanned while recordings of either meaningful speech or backwards speech were played to them. The difference in brain activation in response to forward and backward speech was used as a measure of their brains' processing of meaningful speech per se; that is, without auditory processing that is common to both meaningful and meaningless speech sounds. Surprisingly, the MCS patients

Address correspondence to Martha Farah, University of Pennsylvania, Center for Cognitive Neuroscience, 3720 Walnut St., Philadelphia, PA 19104. E-mail: mfarah@psych.upenn.edu

showed patterns of brain activity that were qualitatively similar to those evoked in normal healthy subjects, suggesting that large-scale networks underlying language comprehension were to some degree preserved in these severely brain-damaged individuals. Although the authors of the study were careful to interpret these results as indicating preserved language function but not necessarily consciousness, the results have been described elsewhere as indicative of consciousness (Carey, 2005) and the finding is discussed in most reviews of consciousness in VS and MCS. The implicit assumption here is that higher cognitive processes, such as those involved in speech recognition, cannot be carried out unconsciously, and so evidence of these cognitive processes is evidence of consciousness. This assumption is supported by everyday experience, but it is not true under all circumstances. As pointed out by Levy (2008), the cognitive psychology literature contains many examples of dissociated cognition and awareness. More to the point, brain damage can lead to just this type of dissociation (Farah et al. 1993). In short, *cognition* is not the same as *consciousness*. To demonstrate consciousness, other approaches are needed.

A second approach to detecting consciousness in severely brain-damaged patients makes use of previous cognitive neuroscience research on the neural correlates of consciousness. It involves showing preservation of patterns of activity that have been demonstrated, in previous research, to distinguish conscious from unconscious processing. This approach is exemplified by Boly and colleagues (2004) listed
Q3 in Table 1 of the target article. In this study, investigators used simple clicks as probes to activate the brain and looked to see what parts of the brain became active and whether the activity in these different parts was intercorrelated. The implicit assumption here is that consciousness arises with certain patterns of brain activity — perhaps activity in certain regions, such as medial frontal and parietal areas, or activity that is correlated across certain brain areas. Such an association between patterns of activation and consciousness would have to be demonstrated initially by experimental manipulations of consciousness in normal brains and then used as a signature of consciousness in the damaged brain. Boly et al. sought patterns of activation like those demonstrated in other studies to mark conscious auditory perception and found them in MCS but not VS patients. A weakness of this approach comes from the paucity of brain imaging studies in which conscious and unconscious processing have been directly compared. To advance research using this approach, we need more such studies, using different subject populations and different methods of manipulating conscious awareness of stimuli, to provide a more general and reliable "brain signature" of consciousness.

The third and final approach that has so far been taken is to use brain activity as a surrogate for overt behavior in examining patients for consciousness. This was used by Owen and colleagues (2006) to demonstrate command following in a patient who met criteria for VS. The commands in this case were to imagine playing tennis or taking a walk through the rooms of one's home, and the patient's compliance with these commands was demonstrated by patterns of brain activity characteristic of imagined motor activity and imagined navigation. The implicit assumption for this approach is that such commands cannot be followed without conscious awareness. If it were the case that hearing the request to imagine playing tennis could automatically and unconsciously trigger motor imagery, then Owen et al.'s findings would not be evidence of consciousness. However, this seems implausible. After all, when a patient squeezes the examiner's hand on request, we take that as evidence of consciousness and do not ask whether the squeeze could have been triggered unconsciously. Nevertheless, this approach could be strengthened by devising commands that result in recognizable patterns of brain activity but are even less plausibly attributed to automatic and unconscious associations with specific words or phrases.

In sum, three research strategies that have been used so far to detect consciousness in severely brain-damaged patients. One is based on an incorrect assumption about the relation between consciousness and cognition, and these studies should not be used for evidence concerning patients' conscious awareness. In contrast, the other two strategies hold promise. Their potential can be more fully realized by further research on the neural correlates of consciousness in the healthy brain and the development of new protocols using brain activity as a surrogate for behavioral responses. ■

## REFERENCES

Bauer, G., Gerstenbrand F., and Rumpl E. 1979. Varieties of the locked-in syndrome. *Journal of Neurology* 221: 77–91.

Boly, M., Faymonville M. E., Peigneux P., Lambermont B., Damas P., Del Fiore G., Degueldre C., Franck G., Luxen A., Lamy M., Moonen G., Maquet P., and Laureys S. 2004. Auditory processing in severely brain injured patients: Differences between the minimally conscious state and the persistent vegetative state. *Archives of Neurology* 6(2): 233–238.

Carey, B. February 8, 2005. New signs of awareness seen in some brain-injured patients. *New York Times*. Q4

Farah, M. J. 2008. Neuroethics and the problem of other minds: Implications of neuroscience evidence for the moral status of brain-damaged patients and nonhuman animals. *Neuroethics* 1: 9–18.

Farah, M. J., O'Reilly, R. C., and Vecera, S. P. 1993. Dissociated overt and covert recognition as an emergent property of a lesioned neural network. *Psychological Review* 100: 571–588.

Fins, J. J., Illes, J., Bernat, J. L., Hirsch, J., Laureys, S., and Murphy, E. R. 2008. Consciousness, imaging, ethics, and the injured brain. *American Journal of Bioethics (AJOB- Neuroscience)* 8(9): x-xx.

Levy, N. 2008. Going beyond the evidence. *American Journal of Bioethics (AJOB-Neuroscience)* 8(9): x-xx.

Owen, A. M., Coleman, M. R., Boly, M., Davis, M. H., Laureys, S., and Pickard, J. D. 2006. Detecting awareness in the vegetative state. *Science* 313(5792): 1402.

Schiff, N. D., Rodriguez-Moreno, D., Kamal, A., Kim, K. H., Giacino, J. T., Plum, F., and Hirsch, J. 2005. fMRI reveals large-scale network activation in minimally conscious patients. *Neurology* 64(3): 514–523.

## Queries

Q1. Au: Please provide pages for quotes.
Q2. Au: Pls. provide Table 1.
Q3. Au: of the target article or of Boly et al.?
Q4. Au: Please provide page.