

"Hidden consciousness" may be present in 25% of unresponsive patients

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A severe brain injury can leave patients unresponsive to stimuli, but they may be more aware than we realize. A new study of brain activity has shown that up to a quarter of unresponsive patients may exhibit “hidden consciousness.”

After a severe brain injury, such as trauma or a stroke, patients can enter a state where they stop responding to stimuli in their environment, such as sound, light, pain and instructions. This can include a comatose state, which is like a persistent deep sleep; a vegetative state, where the patient may appear awake and even have their eyes open, but still don't respond; and a minimally conscious state, where patients may even track movement with their eyes but can't respond to commands.

But this doesn't necessarily mean these patients aren't at least partially aware of what's going on. Over the past few decades scientists have detected signs of "[hidden consciousness](#)" in some unresponsive patients. In tests, instructions like "imagine opening and closing your hand" were given to patients while their brain activity was being monitored through functional magnetic resonance imaging (fMRI) or electroencephalography (EEG).

And sure enough, in some cases these measurements indicate intelligent reactions are occurring in the brain, even without an obvious physical sign, like the patient actually opening and closing their hand. This indicates that for some patients the issue isn't with cognition but their motor skills, leading to a condition called cognitive motor dissociation.

"Some patients with severe brain injury do not appear to be processing their external world," said Yelena Bodien, lead author of the new study. "However, when they are assessed with advanced techniques such as task-based fMRI and EEG, we can detect brain activity that suggests otherwise. These results bring up critical ethical, clinical, and scientific questions – such as how can we harness that unseen cognitive capacity to establish a system of communication and promote further recovery?"

The new study examined 241 participants from six different facilities across the US, UK and Europe, over the past 15 years. They were all unresponsive in either comatose, vegetative or minimally conscious states, tested with fMRI, EEG or both, anywhere from a few days to years after sustaining their injury.

Intriguingly, the study found that as many as 25% of the patients were able to repeatedly follow instructions over the course of several minutes. That's higher than the estimates raised in previous studies, which suggested 15 to 20%.

There were some caveats though. Because the data was gathered by many different teams over a long period of time, the methods weren't standardized, so there could be some variability. Complicating things further, the study also analyzed another 112 participants who could respond to verbal instructions. However, only 38% of these patients showed brain activity consistent with hidden consciousness, suggesting the brain activity and the tests to find it are still quite complicated.

Coming up with guidelines for how to assess cognitive motor dissociation will be the focus of future work, the team says. A better understanding of consciousness in these states could improve outcomes for patients, with some

promising early results in [sparkling consciousness using ultrasound](#) or [vague nerve implants](#).

“Families have told us that once a positive test result revealing cognitive motor dissociation is shared with the patients’ clinical team, it can change the way that the team interacts with their loved one,” said Bodien. “Suddenly, the team is paying more attention to subtle behavioral signs that could be under volitional control, or speaking to the patient, or playing music in the room. On the other hand, failing to detect cognitive motor dissociation can have serious consequences, including premature withdrawal of life support, missed signs of awareness, and lack of access to intensive rehabilitation.”

The research was published in the [*New England Journal of Medicine*](#).

Sources: [Mass General Brigham](#), [Columbia University](#)