

EEG can detect awareness in people previously thought to be in permanently vegetative state

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A study published Online First by the *Lancet* shows that -- using a cheap, portable electroencephalography (EEG) device -- awareness can be detected in people previously thought to be in a permanently vegetative state. The article is by Professor Adrian M Owen and Dr. Damian Cruse, Centre for Brain and Mind, University of Western Ontario, London, ON, Canada, and colleagues.

Although functional MRI (fMRI) studies have shown that some of these [patients](#) are consciously aware, issues of expense and accessibility preclude the use of fMRI assessment in most of these individuals. However, the [physical stress](#) incurred by patients when they are transferred to a suitably equipped fMRI facility is substantial. Movement artifacts often occur in imaging datasets from patients who are unable to remain still. And metal implants, including plates and pins, which are common in traumatically injured people, can completely rule out use of fMRI. In this new study, the authors assessed the effectiveness of a portable [EEG](#) device to detect awareness.

The trial involved 16 patients at two European centres: Addenbrooke's Hospital, Cambridge, UK and University Hospital of Liege, Belgium. Each patient had either traumatic [brain injury](#) (5) or non-traumatic brain injury (11), and had been diagnosed using official criteria for vegetative state. Patients were asked to imagine movements of their right-hand and toes (a novel approach to detecting awareness in patients who lack any

ability to respond physically). The authors assessed the 16 patients diagnosed in the vegetative state, and also 12 healthy controls. Three (19%) of 16 patients could repeatedly and reliably generate appropriate EEG responses to two distinct commands, despite being behaviourally entirely unresponsive. Two of these three had [traumatic brain injury](#) and the other one had non-traumatic brain injury. No significant relationship was observed between patients' clinical histories (age, time since injury, cause, and behavioural score) and their ability to follow commands. The authors say: "Our findings show that this EEG method can identify covert awareness in patients diagnosed in the [vegetative state](#) with a similar degree of accuracy to other methods of detection; it is a considerably cheaper and more portable bedside technique...this method could reach all vegetative patients and fundamentally change their bedside assessment."

They add: "The degrees of freedom provided by EEG could take this technique beyond binary responses to allow methods of communication that are far more functionally expressive, based on many forms of mental state classification. The development of techniques for the real-time classification of these forms of mental imagery will enable routine two-way communication with some of these patients, allowing them to share information about their inner worlds, experiences, and needs."

In a linked Comment, Professor Morten Overgaard, Cognitive Neuroscience Research Unit (CNRU), Aalborg and Aarhus University, Denmark, and Rikke Overgaard, CNRU Centre of Functionally Integrative Neuroscience and MindLab, Aarhus University, Denmark, say: "A new classification system is necessary if the goal is to understand the cognitive functioning of patients in the vegetative or minimally conscious states. Such a system should begin with a much more explicit attempt to use objective methods that have been correlated with reports of subjective experience in healthy individuals."

More information: Paper online: www.thelancet.com/journals/lan...
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