

Into the Grey Zone: Detecting Covert Conscious Awareness in Behaviourally Non-Responsive Individuals

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The thought of being ‘locked in’ following a brain injury or aware during general anaesthesia troubles us all because it awakens the old terror of being buried alive. But what does it mean to be awake, but entirely unable to respond and what can this tell us about consciousness itself? In recent years, rapid technological developments in the field of neuroimaging have provided a number of new methods for revealing thoughts, actions and intentions based solely on the pattern of activity that is observed in the brain. I will describe how we are using some of these methods, including functional magnetic resonance imaging (fMRI), electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS), to detect covert conscious awareness in patients who are behaviourally entirely non-responsive (e.g. vegetative, comatose) and even to allow some of these individuals to communicate their wishes and thoughts. From this perspective, I will contrast those circumstances in which imaging data can be used to infer awareness in the absence of a reliable behavioural response, with those circumstances in which it cannot. This distinction is fundamental for understanding and interpreting patterns of brain activity in various states of consciousness (including vegetative state, coma, anaesthesia and sleep), and has profound implications for clinical care, diagnosis, prognosis, ethics and medical-legal decision-making after severe brain injury. It also sheds light on more basic scientific questions about how consciousness is measured and the neural representation of our own thoughts and intentions.