“DoC DoC”, your attention please!

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Editorial

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Although our conscious stream appears as very rich, multisensorial experience, it is well established that it only represents a very small proportion of the very large amount of cognitive processes that take place in our brain. It is also known that our conscious thoughts are highly dependent on attentional modulation (Chica and Bartolomeo, 2012). Indeed, attention capacities are limited, and attentional resources can be easily captured by any interferent task, making us potentially blind to certain stimuli. This phenomenon, well known by magicians, is usually referred to as “inattentional blindness” and has been extensively explored and illustrated by striking examples such as the gorilla illusion (Simons, 2000) and motion-induced blindness (Bonneh et al., 2001).

Event related potentials (ERPs) can be used to probe cognition - including conscious access - to stimuli. However, many paradigms require participants to be attentive and to actively participate to specific tasks, raising sensitivity issues especially when applied to patients suffering from disorders of consciousness (DoC patients, Rohaut et al., 2019). For instance, similarly to the gorilla experiment in healthy subjects, we previously demonstrated that the P3b component of the P300, an ERP reflecting conscious access to stimuli, can disappear with an interfering visual task in healthy subjects (Bekinschtein et al., 2009). In DoC patients with impaired but partially preserved awareness, it is likely that attentional modulation capacities are impaired, and this dimension of their cognition might have important implications for their diagnosis and rehabilitation.

In this volume of *Clinical Neurophysiology*, Morlet et al. report a retrospective study of DoC patients, in which detection of voluntary endogenous attention modulation to external stimuli has been performed using ERPs (Morlet et al., 2022). In this study they asked clinically unresponsive patients to focus their attention on different stimuli delivered simultaneously, testing their ability (1) to follow a command, and (2) to modulate their attention. They found 21% of responders to these two tasks, which is in line with the works reported during the last 15 years exploring DoC patients. Indeed, several studies reported covert consciousness in 10 to 20% of patients. Interestingly, the present study reports acute intensive care unit patients fulfilling the clinical criterion for coma (9/37, 24%) who were in a situation known as “cognitive motor dissociation”. Finally, the authors show that the presence of covert awareness can have a huge prognostic value with a high PPV (93%) but a low NPV (44%) for consciousness recovery.

As underlined by the authors, bedside electrophysiological approaches could have a much higher impact than fMRI, especially for acute unstable patients in the intensive care unit, and could even be used for long term monitoring. For example, endogenous attention modulation abilities could be used as a surrogate marker of the patients’ level of comfort/discomfort with this type of paradigm. Indeed, the scarce attentional resources available to DoC patients can easily be captured by stimuli such as pain or respiratory discomfort. This scarcity of available attentional resources can be conceptualized metaphorically as a dim light with a narrow beam in the dark, as opposed to a bright light with a wide beam for a conscious subject. It could prevent conscious processing of novel stimuli that would fall out of the narrow dim light attracted by the irritative stimuli (e.g., pain). In sum, the degree of attention modulation ability would negatively correlate with the degree of discomfort. More generally, these aspects of attentional resource allocation are important to take into account in clinical evaluation since discomfort can result in the underestimation of the patient’s level of consciousness. If an irritative stimulus is capturing all attentional resources, this can prevent patients from perceiving novel stimuli such as the patient’s relatives’ or caregivers’ attempts to interact with them.

Finally, the proposed ERP technique might also have important implications to identify patients as candidates for future brain computer interfaces. Indeed, considering that brain computer interface techniques currently need strong attentional engagement from the participant, this kind of paradigm can help selecting cognitive motor dissociation patients that have the required level of attentional resources (Rohaut et al., 2019).

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