FRIDAY MORNING, JULY 12, 2013

Invited Address:
Rostral Prefrontal Cortex: the Seat of Metacognition
Presenter: Paul W. Burgess
8:45–9:45 a.m.

P.W. BURGESS. Rostral prefrontal cortex: the seat of metacognition.
Most of the brain deals with information relating to present or past experience. In contrast, the frontal lobes are the seat of “the future” in human cognition. They support processing relating to “what if?” thoughts, such as “what if X happened?” or “what would happen if I did it this way rather than the usual way?” They also then enable us to carry out these future new courses of action. The possibilities we consider are shaped by our knowledge of social rules, what we know or believe about ourselves or think that we know about other people, our risk preferences and how we understand them, and a range of other types of processing such as our propensity to mind-wander, to maintain an inner dialogue with ourselves, or conversely to attend carefully to the external world and not get distracted by our inner thoughts. Arguably, these are the highest cognitive functions of man. Very recently, work has begun to show that the largest single subpart of the frontal lobes (variously called rostral PFC, area 10, or frontopolar cortex), which is the anterior part just behind the forehead, plays a critical role in these kinds of “metacognitive” processes. People with damage to rostral PFC can show a range of problems in everyday life, including changes in social behaviour, judgement, and their ability to organise themselves, and carry out intended actions. Remarkably, the latest evidence from neuropsychological and neuroimaging studies, plus investigations of autism spectrum disorders, strongly suggests that rostral prefrontal cortex shows a high degree of functional specialisation, with different sub-regions contributing to different kinds of processing. The new discoveries about what this region does, after approximately 150 years of almost complete ignorance about it, holds the promise of understanding many clinical phenomena that have until now been considered mysterious and not amenable to assessment or intervention.

Correspondence: Paul W, Burgess, PhD, Institute of Cognitive Neuroscience, UCL, 17 Queen Square, London WC1N 3AR, United Kingdom. E-mail: p.burgess@ucl.ac.uk

FESN Invited Symposium:
Neuropsychological Rehabilitation: From Bench to Bedside
Chair: Guy Vingerhoets
10:00–11:30 a.m.

G. VINGERHOETS. Neuropsychological Rehabilitation: From Bench to Bedside.
Symposium Description: Neuropsychological rehabilitation is a rapidly expanding field of neuropsychology that for a long time lacked academic interest and empirical scrutiny. But things are clearly changing for the better. Improved assessment tools of parameters that are relevant for the cognitive recovery of brain injured patients are being developed, new treatment strategies are explored and compared to existing ones, and novel insights from neuroimaging and neurostimulation are gradually finding their way to the clinic. The aim of this symposium is to bring together researchers working on various aspects of neuropsychiatric rehabilitation at the interplay between cognitive neuroscience, neuroimaging, and neuropsychology. Illustrative of the great diversity of this field, the contributions will address the problems of impaired awareness following brain injury and how to measure it, the importance of executive and working memory dysfunction and its assessment in rehabilitation, relevant predictors for recovery from disorders of consciousness and problems of communication in patients with reduced consciousness, and the obstacles for neurostimulation (research) in the clinical setting. The contributions of the presenters demonstrate an empirical and theoretically based approach of neurorehabilitation that gives rise to a valid and evidence-based therapeutic approach of the brain-damaged individual.

Correspondence: Audrey Vanhaudenhuyse, University of Liege, Liege B-4000, Belgium. E-mail: audrey.vanhaudenhuyse@ulg.ac.be

A. VANHAUDENHUYSE, How Neuroimaging Techniques Can Help to Diagnose Disorders of Consciousness?
Objective: Survivors of severe brain damage classically go through different clinical entities before partially or fully recovering consciousness. Coma is defined as “unarousable unresponsiveness”.

Participants and Methods: After some days to weeks, coma patients who recover will eventually open their eyes. When this return of “wakefulness” is only accompanied by reflexive motor activity and devoid of any voluntary interaction with the environment, the patient is considered in a vegetative state. The term recently replaced by the unsensory wakefulness syndrome. This late stage may be a transition to further recovery, or not.

Results: Signs of voluntary motor activity should be actively searched for as they herald a minimally conscious state. Sometimes patients awaken from their coma fully conscious but paralysed, only able to communicate by small eye movements - this condition is called the locked-in syndrome. The term challenges patients represent a major clinical problem in terms of clinical assessment, treatment, and daily management. Integration of neuroimaging and ERPs techniques should improve our ability to disentangle diagnostic and prognostic differences on the basis of underlying mechanisms and better guide our clinical therapeutic options in these patients. Moreover, by definition, patients in a minimally conscious state cannot communicate and the issue of well-being of these patients therefore remains open. Quality of life, however, can be investigated in patients with a locked-in syndrome. Healthy individuals and medical teams sometimes assume that the quality of life of these patients is such that their lives are not worth living.

Conclusions: In collaboration with the French Association for Locked-in syndrome, we observed that the majority of these patients suffering from severe disabilities may report a good quality of life despite being socially isolated or having major difficulties in activities of daily living.

Correspondence: Audrey Vanhaudenhuyse, University of Liege, Liege B-4000, Belgium. E-mail: audrey.vanhaudenhuyse@ulg.ac.be

Objective: Hemispatial neglect is a severely disabling disorder in which patients fail to attend to one side of space and/or their body. Hemispatial neglect following stroke has a high prevalence and it is an important predictor of poor functional outcome.

Participants and Methods: Many attempts have been made to ameliorate signs of neglect, and the therapeutic efficacy has been modest. A possible new intervention is low intensity transcranial direct current stimulation (tDCS), which is capable of modulating cortical excitability by polarizing neural tissue as a consequence of constant voltage to the scalp. In particular, anodal tDCS is considered to increase cortical excitability, whereas cathodal tDCS decreases cortical excitability.

Results: Previous research on the neurophysiological basis of neglect suggests that inhibiting the overactive intact hemisphere and increasing the neuronal excitability in the damaged hemisphere might reduce hemispatial neglect. In the present double blind placebo controlled study we tested this hypothesis by applying anodal stimulation over the damaged hemisphere, and cathodal stimulation over the contralateral intact hemisphere. Patients were stimulated daily for two periods of five days, with one period involving placebo and the other real tDCS.