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A novel framework for a neuropsychological architecture of motor and cognitive control

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Attentional control has been described in temporal or top-down theories as a supervisory system gathering multiple cognitive processes whose neural basis has been identified, for at least some of them, within the prefrontal cortex (e.g., energizing, setting, monitoring) whereas for others it seems to be more distributed in the brain (e.g., inhibiting). In the meanwhile, theories of decision have described a random walk process determined by the distance to the thresholds and the accumulation of evidence. Using these frameworks, I describe a series of studies in which we show how useful motor control may be, should it uses manual or eye movement reaction times, to assess attentional control thus extending neuropsychological testing. I also describe intervention studies showing how motor trainings can modulate motor or attentional control as assessed by static posture or eye movements. To account for the results, I suggest a physiological framework bridging attentional and decision models, putting the emphasis on two processes, inhibition and decision, and introducing two modulators for regulating these two processes. Future work concerns the assessment and modulation of attention through action. Specifically, the project aims first at proposing measurement of attentional control using eye movements, second at developing motor trainings based on eye or body movements to boost attentional control, and third at modulating attentional control using repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS). In all, the research project may help to explore further the cognitive processes involved in attentional control and identify their neural bases.

Biography

Olivier A Coubard has completed his PhD from Collège de France in Paris and Post-doctoral studies from Fondation Ophtalmologique Rothschild-Université Pierre Mendès France and CNRS-Université Paris Descartes. He is the Director of the Neuropsychological Laboratory CNS-Fed in Paris, France. He has published and communicated more than 100 references and has been serving as Associate Editor in *Frontiers in Integrative Neuroscience*.

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