

Cortical and reticular contributions to motor preparation and initiation

Dr. Anthony N. Carlsen

School of Human Kinetics, Faculty of Health Sciences, University of Ottawa

Monday, March 12, 2018

Western Interdisciplinary Research Building – Room 4190, 3:00-4:00pm

Over the past decade many studies have investigated response preparation through the use of a loud and startling acoustic stimulus presented during reaction time (RT) tasks. A common finding is that prepared actions are involuntarily triggered at short latencies when a startle reflex is induced, often resulting in mean premotor RTs of <70 ms. Thus, we and others have employed this phenomenon to investigate the early preparation of motor responses under varied circumstances and in different populations. One early hypothesis explaining this involuntary triggering of responses (the “StartReact” phenomenon) is that details of the motor plan are stored in brainstem centres (e.g., reticular formation) and triggered by startle reflex activation which bypasses normal cortical processing. However, this explanation has proved controversial with several studies both supporting and contradicting the notion of strong brainstem involvement. Some of the studies discussed here will provide data that addresses how the human central nervous system distributes preparatory activity in order to react to upcoming stimuli. Specifically, recent data from our lab using a TMS silent period and EMG-EMG coherence analysis suggests that multiple distributed sources of activation from both cortical and subcortical brain areas contribute to both the preparation and initiation of actions. Furthermore, the data indicate that the relative contribution of each area depends on the functional and/or anatomical requirements of the task to be performed. The results from these experiments has increased our knowledge of the brain structures involved in planned motor actions and has application to motor learning and rehabilitation, as well as other advanced technologies.