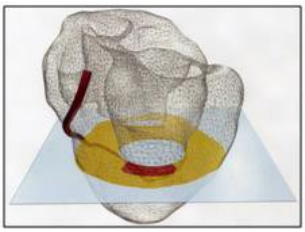
Université de Montréal






POSITION FOR A PH.D. STUDENT

Site: Institut universitaire sur la réadaptation en déficience physique de Montréal, Montreal Children's Hospital

Laboratory /Group of: Dorothy Barthélemy and Myriam Srour

Web site: https://crir.ca/recherche/laboratoires-2-2/laboratoires-2/laboratoire-de-neuromobilite/
https://mcgill.ca/geneneurodisorderslab

Title and subject description: Determine mechanisms underlying motor lateralization during gait (CIHR funded)
Identifying changes occurring in the central nervous system that lead to gait anomalies in individuals with mirror movements.

Project description: Introduction: Lateralization of motor control refers to the ability to perform movements on only one side of the body and is essential for activities such as coordinated hand movements and walking. Lateralization of motor control depends on the correct communication between the right and left sides of the nervous system through crossing nerve fibers. Defective lateralized motor control can result in mirror movements (MM), involuntary movements that mirror voluntary ones on the opposite side of the body. In 2010, we reported that MM can result from mutations in DCC, a gene critical in guiding developing axons (long extensions of nerve cells) to the nervous system midline (Srour, 2010). Furthermore, though DCC deficits in animals result in locomotion deficits, the role of DCC in human gait circuitry and motor control of legs has not yet been explored.

Hypothesis: Individuals with DCC mutations will (i) exhibit MM during gait which will lead to deficits in left-right alternation during gait. Moreover, MM severity and distribution will correlate with (ii) impaired corticospinal mechanisms and (iii) impaired spinal mechanisms.

Methods: Electrophysiological methods such as *Transcranial magnetic stimulation* and *peripheral nerve stimulation* will be used to quantify changes occurring in the nervous system. Use of *3-D motion capture system* and *electromyographic* recordings will enable recordings of kinematic and muscular activity during gait.

Impact: Understanding the impact of DCC deficiency and MM on gait will help understand normal gait circuitry. The results will also be significant for other neurological population with MM (notably individuals with stroke or cerebral palsy) as it may explain parts of their deficits.

References: Barthélemy et al JNeurophysiol 2010, Jean-Charles et al JNeurophysiol 2017, Miranda et al 2019, Srour et al 2010

Mains themes/disciplines: Biomedical sciences, neurological sciences

Program: Neurosciences

Available: 2020. Successful candidates will have the opportunities to apply at various competitions for studentship. They will be given a salary by the researcher for the first year of Ph.D. if they do not obtain a salary award from funding agencies.

Contact info: Applicants should send a resume including university records and name and email of 2 references to dorothy.barthelemy@umontreal.ca and myriam.srour@mcgill.ca