Acute effects of aerobic exercise on neuroplasticity and motor learning

Background and objectives:

In the first portion of this symposium, Dr. Lundbye-Jensen will discuss evidence indicating that aerobic exercise has robust effects on memory processes when performed in close temporal proximity to a learning session. Here, I will present related work and a series of experiments conducted in our laboratory on young healthy humans to explore:

1) Specific aspects of movement and motor learning that are impacted by acute aerobic exercise
2) The neurophysiological effects of acute aerobic exercise on motor cortical circuits
3) (Epi)genetic contributions to inter-individual variability in exercise response

Key findings:

- Acute aerobic exercise benefits may have a specific impact on learning the timing of continuous movement patterns
- The neurophysiological effects of acute aerobic exercise on the motor cortex extend beyond circuits involving the exercised muscles and may create a favourable neural environment for induction of plasticity
- Genetic variants and DNA methylation patterns of genes encoding for brain-derived neurotrophic factor and the dopamine D2 receptor may influence an individual's response to acute aerobic exercise

Implications:

- Both increased aerobic fitness and motor re-learning are common goals in neurorehabilitation
- Increasing evidence suggests that strategic scheduling of aerobic exercise sessions may maximize plasticity and promote positive changes in motor behaviour
- A personalized medicine approach, including consideration of genetic information, may be necessary to optimally employ such a strategy
- Further work in clinical populations, across varying exercise prescriptions, and with different learning tasks are necessary before such strategies can be employed clinically

Dr. Michelle Ploughman will conclude the symposium by discussing related translational work, spanning from studies of animal models to human clinical trials.