# Intensity-dependent Changes in Cerebral Oxygenation during a Cycle Ergometry measured by fNIRS: A Comparison between Experts and Non-experts

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## Background

It is well known that endurance exercise promotes the cardiovascular, pulmonary and musculoskeletal system (Moghetti, Bacchi, Brangani, Donà & Negri, 2016; Nystoriak & Bhatnagar, 2018; Vuori, 1995). Contrarily to our profound knowledge about peripheral adaptions to exercise, evidence about the effects of endurance exercise on brain function and structure is rather sparse.

## Methods

The present study aimed to investigate exercise-dependent adaptions to different intensity levels in motor-related brain regions. Moreover, expertise effects as differences between trained endurance athletes (experts, EX) and non-experts (NE) during a cycling test were investigated using multi-distance functional near-infrared spectroscopy (fNIRS). Initially, participants performed an incremental cycling test (ICT) in order to assess peak power output (PPO). In a second session, participants cycled at individual intensity levels of 20, 40 and 60% of PPO while measuring cerebral oxygenation by means of fNIRS and cardiorespiratory responses.

## Results

Our results revealed exercise-induced decreases of deoxygenated hemoglobin (HHb), indicating an increased activation in motor-related brain areas such as primary motor cortex (M1), premotor cortex (PMC) and supplementary motor area (SMA). However, we could not find any differential effects in brain activation between EX and NE while cycling.

## Conclusions

We provide evidence that cycling at several intensity levels leads to hemodynamic response alterations within the human motor system measured as decreases in HHb. Future studies should extend this multi-distance fNIRS approach using whole-brain configurations which seems to be crucial in studies aiming to assess neural activation in a sports-related context.

## References

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