**Reduced NIRTRS measurement area during ramp cycling exercise**

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**Abstract:** Near-infrared time-resolved spectroscopy (NIRTRS) can quantitatively evaluate O2 dynamics by calculating the optical path length (PL). It is assumed that PL becomes shorter as absorbers increase (e.g. an increase in deoxygenated hemoglobin during exercise). In addition, it is clear that PL is influenced by fat layer thickness (FLT), which lengthens PL. The purpose of this study was to compare muscle O2 dynamics and the changes in optical properties measured by NIRTRS during ramp cycling exercise between FLT-matched subjects with different aerobic capacity. Endurance trained males (TR, n = 8, age: 20 ± 1 years, FLT: 3.7 ± 0.5 mm, VO2peak/W: 64.6 ± 3.3 ml/kg/min) and untrained males (CON, n = 8, age: 21 ± 3 years, FLT: 3.7 ± 0.6 mm, VO2peak/W: 47.0 ± 4.9 ml/kg/min) performed ramp cycling exercise test until exhaustion. FLT at the NIRTRS measurement site, vastus lateralis muscle, was measured by an ultrasound device, and O2 uptake was measured by a breath-by-breath gas exchange measurement system. Total hemoglobin concentration (Total-Hb), oxygenated hemoglobin concentration (Oxy-Hb) and deoxygenated hemoglobin (Deoxy-Hb) were monitored by a three wavelength (760 nm, 800 nm and 830 nm) NIRTRS system (TRS-21, Hamamatsu Photonics K.K., Japan). PL in each wave length (PL760, PL800 and PL830) was also monitored continuously. There was no significant difference in FLT between groups, although VO2peak/W was significantly different. With increasing exercise intensity, Total-Hb and Deoxy-Hb significantly increased and Oxy-Hb decreased in both groups. Total-Hb and Oxy-Hb during exercise were significantly higher in TR than CON, furthermore, Deoxy-Hb during exercise also tended to be higher in TR (P = 0.07). There were no significant differences in changes in PL760, PL800 and PL830 during exercise between groups. In addition, PL760, PL800 and PL830 significantly decreased with an increase in exercise intensity. In particular, PL760 at peak exercise shortened more than 10% compared to start of exercise in both groups, even though PL830 decreased only a few percent. These findings suggest that measurement area monitoring O2 dynamics was reduced during exercise. Additionally, changes in PL may be particularly great at PL760.

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