

Skeletal Muscle Oxygenation during Plantarflexion Exercise in Young-Old and Older-Old Adults

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ABSTRACT

The aging process is associated with a gradual decrease in exercise performance, leg muscle blood flow and oxygenation, and endothelial vascular reactivity. **Purpose:** To examine potential differences in femoral artery flow-mediated dilation (fa-FMD) and calf muscle oxygenation (HbO₂) during low-intensity plantarflexion exercise in older adults. **Methods:** 43 young-old (YO; n=24, 67 ± 1 years) and older-old (OO: n=19, 70 ± 1 years) individuals were included in this study. We measured body fat % and leg lean mass (LLM) by DEXA and handgrip maximal voluntary contraction (MVC) using a dynamometer. VO_{2max} was estimated using a submaximal treadmill test. fa-FMD was assessed by Doppler ultrasound, measuring the relative change in diameter from baseline to peak hyperemic response following 5 min of muscle ischemia. After a 10-min semi-recumbent rest, participants performed three sets (3-min each) of rhythmic plantarflexion exercise at increasing intensity (20, 30 and 40 pounds) separated by 1-min of rest. Percent changes (%Δ) in muscle HbO₂ from baseline to the 3rd min of each set was monitored by near-infrared spectroscopy (NIRS) on the medial gastrocnemius muscle. **Results:** There were no between-group differences in VO_{2max}, MVC, LLM, body fat %, and fa-BF (*P*= .07). The OO group had significantly lower fa-FMD compared to the YO group (5.7 ± 1.4 vs 6.7 ± 1.6%, *p* < .05). During exercise, the OO group exhibited a higher %Δ in HbO₂ compared to the YO in sets 2 (-60.0 ± 21.2 vs. -44.7 ± 17.2%, *p* < .05) and 3 (-66.7 ± 18.8 vs. -52.6 ± 18.2%, *p* < .05). **Conclusion:** There was a lower calf muscle oxygenation during low-intensity plantarflexion exercise performed at the same absolute intensity in OO compared to YO adults. Exercising at a greater relative intensity may explain the lower calf muscle oxygenation in OO adults.