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Home-Based High-Intensity Interval Training Improves Muscle Capillarisation and eNOS/NAD(P)Hoxidase Protein Ratio in Obese Individuals with Elevated Cardiovascular Disease Risk

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Objective Obesity and inactivity lead to structural and functional muscle microvascular impairments associated with development of chronic disease. This study is the first to investigate the effect of a novel home-based high-intensity interval training (HIT) (Home-HT) intervention in obese individuals with elevated cardiovascular disease (CVD) risk on capillarisation and muscle microvascular eNOS/NAD(P)Hoxidase ratio. Comparisons were made with home-based moderate-intensity continuous training (Home-MICT) and supervised laboratory-based low-volume HIT (Lab-HIT) as control groups.
Methods Thirty-two sedentary obese adults (age 36±2 years; BMI 34.3±0.8 $kg \cdot m^{-2}$; O_{2peak} 24.6±1.0 $ml \cdot kg^{-1} \cdot min^{-1}$) were allocated to 12 weeks of Home-HIT (*n*=9), Home-MICT (*n*=13) or Lab-HIT (*n*=10). Muscle biopsies were taken pre- and post-training to assess specifically in the endothelial layer of muscle arterioles and capillaries the protein content of eNOS, serine^{1177} phosphorylated eNOS, NOX2 and p47^{phox}, and various capillarisation measures using quantitative immunofluorescence microscopy.
Results All interventions induced comparable increases in total eNOS content in terminal arterioles and capillaries (P<0.001). There was no change in ser^{1177} phosphorylated eNOS (arterioles P=0.802; capillaries P=0.311), but eNOS ser^{1177}/eNOS ratio significantly decreased following training in arterioles and capillaries (P<0.001). Training decreased NOX2 content (arterioles P<0.001; capillaries P<0.001), but there was no change in p47^{phox} content (arterioles P=0.101; capillaries P=0.345). All measures of capillarisation increased (P<0.05). These adaptations occurred alongside increased O_{2peak} (P<0.001) and whole-body insulin sensitivity (P=0.033). There were no significant differences between training programmes.
Conclusions The training effects of Home-HIT on skeletal muscle microvascular adaptations are comparable to those of traditional training methods, with the advantage that Home-HIT reduces barriers to exercise in obese individuals with elevated CVD risk.