



The impact of omega-3 polyunsaturated fatty acid supplementation on the cardiovascular response to low-intensity exercise, hypoxia and heat exposure: a randomized controlled trial

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Older adults show an altered response to physiological stress than younger adults. As the cardiovascular system ages, mechanisms to maintain homeostasis are altered in response to hypoxia⁽¹⁾, heat⁽²⁾ and exercise⁽³⁾. Omega-3 Polyunsaturated Fatty Acids (N-3 PUFAs) can improve exercise tolerance by increasing blood flow in healthy subjects⁽⁴⁾. We hypothesized that N-3 PUFAs would improve homeostatic responses in older adults during hypoxia, heat exposure and low-intensity exercise.

23 Healthy older adults (50–75 years old) took part in a randomized controlled trial requiring them to take 5 g of N-3 PUFAs (n = 11) or a placebo supplement (n = 12) per day for 6 months. Each participant attended two sessions at baseline where they completed an 8-minute walking test designed to estimate $\text{VO}_2 \text{max}^{(5)}$, were exposed to hypoxic conditions (12% oxygen) for 10-minutes and stood at 38°C for 10-minutes. During each of these assessments, Systolic Blood Pressure (SBP), Mean Arterial Pressure (MAP), Diastolic Blood Pressure (DBP) and Heart Rate (HR), Cardiac Output (CO), Stroke Volume (SV) and Systemic Vascular Resistance (SVR) were recorded using CNAP® technology. Measurements were taken 2-minutes prior to the assessment and immediately after the assessment was completed. These visits were repeated at 3-months and 6-months. Values were normalised to the pre-test average of their treatment group to correct for random variation between visits. Data are expressed as mean +/- SD of changes in Arbitrary Units (AUs). Statistical analysis was performed using a $2 \times 3 \times 4$ factorial ANOVA on Jamovi 2.3.13.

Hypoxia: 10-minutes of hypoxia exposure caused increases in SBP (0.17 ± 0.23 ; $P < 0.001$) DBP (0.14 ± 0.23 ; $P = 0.004$) and MAP (0.13 ± 0.19 ; $P < 0.001$) with N-3 PUFAs compared to the placebo after 6-months. **Heat:** 10-minutes of heat exposure caused increases in SVR after 3-months (0.17 ± 0.21 ; $P < 0.001$) and 6-months (0.13 ± 0.26 ; $P = 0.002$) with N-3 PUFAs compared to the placebo. **Walking:** 8-minutes of walking at a self-selected pace caused an increase in CO (0.29 ± 0.36 ; $P < 0.001$), HR (0.2 ± 0.27 ; $P < 0.001$) and a decrease in SVR (-0.09 ± 0.18) With N-3 PUFAs compared to the placebo.

Increased blood pressure during hypoxia with N-3 PUFAs may reflect an increase in blood flow without a compensatory vasodilatory response (a non-significant increase in CO was seen with N-3 PUFA at 6-months compared to the placebo). The increase in SVR during heat exposure may represent greater thermal tolerance following N-3 PUFAs due to less vasodilation maintaining MAP during heat stress. The increase in CO and decrease in SVR suggest an improvement in blood flow in response to low-intensity exercise. This would suggest greater delivery of nutrients to the muscle during movement, making the task easier for older adults.

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