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Four weeks of high-intensity interval training improves vascular endothelial function and cardiopulmonary exercise testing performance in both young cancer patients and healthy individuals

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Introduction
Solid tumors are often characterized with abnormal vascular structures, reduced perfusion and endothelial dysfunction which collectively limits therapy delivery. Preclinical data suggest that aerobic exercise of high-intensity may create a tumor-suppressive environment, enhancing treatment efficacy. This study investigates the effects of high-intensity interval training (HIIT) on vascular endothelial function using dynamic retina-vessel analyzer (DRVA) in cancer patients under acute therapy and healthy participants of similar age.

Methods
This non-randomized controlled trial with two arms was registered with the German Clinical Trials Register (DRKS00035528). Following medical clearance, cancer patients (n=9; 2M/7F; age 33±5 y) and healthy individuals (n=9; 2M/7F; age 30±4 y) underwent a four-week HIIT intervention. The HIIT protocol consisted of three weekly sessions, each including seven 1-minute intervals at 90% peak power output (PPO), interspersed with 2-minute recovery periods at 30% PPO. Data on primary and secondary outcomes were collected both before and after the intervention. The primary outcome measure was DRVA (Imedos-Health, Jena, Germany) and its derived biomarkers of the dominant eye. Secondary outcomes included CPET-data.

Results
There were no significant differences between the groups at baseline in age, BMI, or intraocular pressure. The adherence to HIIT was 92% and 93%, for cancer patients and healthy participants, respectively. Healthy participants exercise at 229 W±60, while the PO was 177±77 for cancer patients. Both groups showed improvements in some primary outcomes: DRVA-derived artery constriction, while flicker light-induced dilation capacity was reduced in cancer patients. CPET performance improved, with higher PPO and sustained efforts exceeding one minute compared to baseline in both groups. Peak $\dot{V}O_2$ increased in healthy, while cancer patients maintained their peak $\dot{V}O_2$.

Conclusion
Our preliminary data analysis suggests that four weeks of HIIT improve vascular endothelial function to some extent, even during acute treatment. Future research should investigate how HIIT influences therapy delivery and treatment responses.

Keywords

Oxygen transport, microvascular circulation, acute treatment, survivorship.

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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