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HIGH-INTENSITY INTERVAL EXERCISE ENHANCES VASCULAR FUNCTION TO A GREATER EXTENT THAN MODERATE-INTENSITY CONTINUOUS AEROBIC EXERCISE: A CASE STUDY REPORT

Armin PARAVLIĆ[1,2], Simon ISKRA[1], Gašper TURNŠEK[1], Kristina DROLE[1]

[1] Faculty of Sport, University of Ljubljana, Slovenia
[2] Science and Research Centre Koper, Institute for Kinesiology Research, Slovenia

Corresponding author:
Armin PARAVLIĆ,
Faculty of Sport, University of Ljubljana, Gortanova 22, 1000 Ljubljana, Slovenia
Phone: +386 68948557
E-mail: armin.paravlic@fsp.uni-lj.si

ABSTRACT

This case study compared the acute effects of high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) on vascular and microvascular function in a healthy male subject (age: 34 yrs; body mass index: 25.82 kg/m^2). Key vascular parameters were assessed, including augmentation index (AIx), carotid-femoral and brachial-ankle pulse wave velocity ($_{cf}$PWV, $_{ba}$PWV), flow-mediated slowing (FMS%), and tissue saturation index (TSI) recovery slope. HIIT induced a greater reduction in $_{ba}$PWV (mean difference [MD]: 0.9 m/s) and a higher increase in FMS% (MD: 8%) compared to MICT, indicating more favourable changes in peripheral arterial stiffness and endothelial function. Additionally, the reoxygenation slope for TSI was more pronounced after HIIT, suggesting improved microvascular recovery. Interestingly, AIx increased following MICT (MD from baseline: 11%) but slightly decreased after HIIT (MD from baseline: −5%). These findings suggest that exercise intensity plays a critical role in determining vascular adaptations, with HIIT showing superior acute benefits.

Keywords: *HIIT, MICT, endothelial function, pulse-wave velocity, endothelial stiffness*

VISOKOINTENZIVNA INTERVALNA VADBA IZBOLJŠA DELOVANJE OŽILJA BOLJ KOT SREDNJEINTENZIVNA KONTINUIRANA AEROBNA VADBA: POROČILO O ŠTUDIJI PRIMERA

POVZETEK

V tej študiji primera so bili primerjani akutni učinki visokointenzivnega intervalnega treninga (HIIT) in zmerno intenzivnega kontinuiranega treninga (MICT) na žilno in mikrožilno funkcijo pri zdravem moškem udeležencu (starost: 34 let, indeks telesne mase: 25,82 kg/m²). Ocenjeni so bili ključni žilni parametri, vključno z indeksom augmentacije (AIx), karotidno-femoralno in brahialno hitrostjo pulznega vala (cfPWV, baPWV), upočasnitvijo pretoka po ishemičnemu stimulusu (FMS%) in naklonom okrevanja indeksa nasičenosti tkiva (TSI). HIIT je povzročil večje zmanjšanje baPWV (povprečna razlika [MD]: 0,9 m/s) in večje povečanje FMS% (MD: 8 %) v primerjavi z MICT, kar kaže na ugodnejše spremembe periferne arterijske togosti in endotelijske funkcije. Poleg tega je bil po HIIT izrazitejši reoksigenacijski naklon TSI, kar nakazuje izboljšano mikrožilno okrevanje. Zanimivo je, da se je AIx po MICT povečal (MD glede na začetno vrednost: 11 %), po HIIT pa se je rahlo zmanjšal (MD glede na začetno vrednost: −5 %). Ti izsledki nakazujejo, da ima intenzivnost vadbe ključno vlogo pri določanju žilnih prilagoditev, pri čemer HIIT izkazuje boljše akutne koristi.

Ključne besede: *HIIT, MICT, endotelijska funkcija, hitrost pulznega vala, endotelijska togost*

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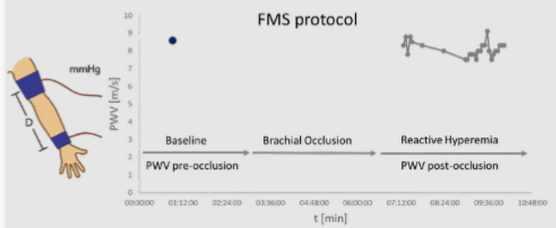
METHODS

SUBJECT

	Healthy
Height:	1.76 m
Weight:	80 kg
AIx	10 %
$_{cf}$PWV	7,6 m/s
$_{ba}$PWV	8,6 m/s
$_{ba}$FMS	13 %

FMS ASSESSMENT



STUDY PROTOCOL

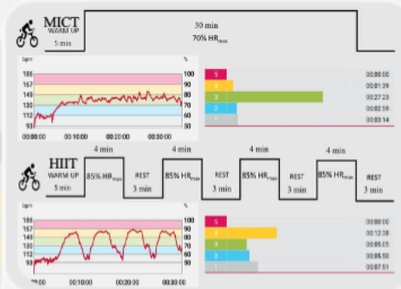
- $_{ba}$PWA, $_{cf}$PWV, $_{ba}$FMS, TSI

Visit 1 – baseline + 30 min rest + MICT

Visit 2 – baseline + MICT

Visit 3 – baseline + HIIT

EXPERIMENTAL CONDITION



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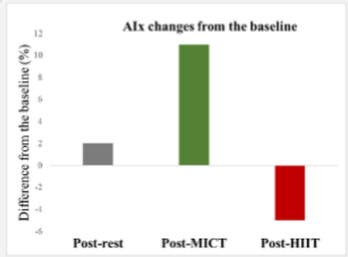
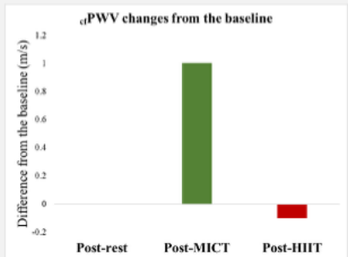
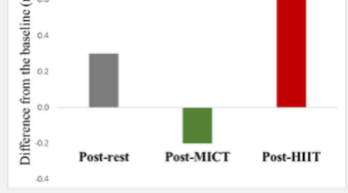
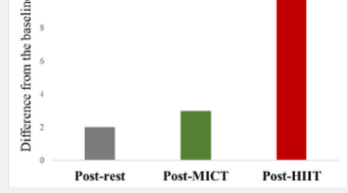
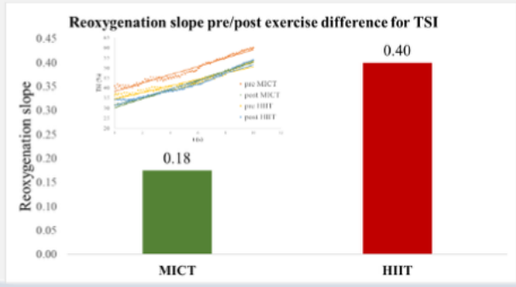
RESULTS











DISCUSSION

- The AIx increased following MICT and slightly decreased after HIIT.
- The differences between $_{cf}$PWV and $_{ba}$PWV suggest distinct responses in central and peripheral arterial stiffness following exercise bouts of varying intensities.
- The better improvement of ▲FMS% after HIIT compared to MICT, indicates improved endothelial function.
- The higher reoxygenation slope after HIIT indicates a greater improvement

CONCLUSIONS

- Exercise intensity plays an important role in determining arterial stiffness and endothelial function.
- HIIT appears to have more favorable short-term effects on both endothelial and microvascular function compared to MICT, which is consistent with previous findings.

ba – brachial artery; AIx – Augmentation Index PWA - Pulse Wave Analysis; FMS – Flow-Mediated Slowing; cf – carotid femoral; PWV - Pulse Wave Velocity; MICT – Moderate-intensity continuous training; HIIT – High-intensity interval training; HRmax – maximal heart rate, TSI – tissue saturation index

Armin H. Paravlic1,2, Simon Iskra1, Gasper Turnsek1, Kristina Drole1
1Faculty of Sport, University of Ljubljana, Slovenia
2Science and Research Centre Koper, Slovenia