Feasibility and benefits of a high intensity eccentric cycling training for sedentary healthy people

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Introduction

Physical inactivity
- 31% of adults worldwide are inactive
- Impede physical fitness (deconditioning, sarcopenia), functional capacities, quality of life
- Contribute to develop noncommunicable diseases

Eccentric vs Concentric training
- ✓ Higher force development (up to 1.5 greater)
- ✓ Lower metabolic cost (HR and VO_2)
- ✓ Better tolerated
- ✓ Safe and appropriate in clinical rehabilitation

Eccentric cycling as a promising training modality

Purpose

We aimed to examine and to compare the **feasibility and efficiency** of a 12-week high intensity **eccentric cycling training** (EI) with a high intensity concentric cycling training (CI) on functional and muscular parameters in healthy elderly people

Methods

28 healthy adults (61,5 +/- 4,5yrs)
- Eccentric interval (n=15) — 120 – 135% PMA
- Concentric interval (n=13) — 80 – 90% PMA

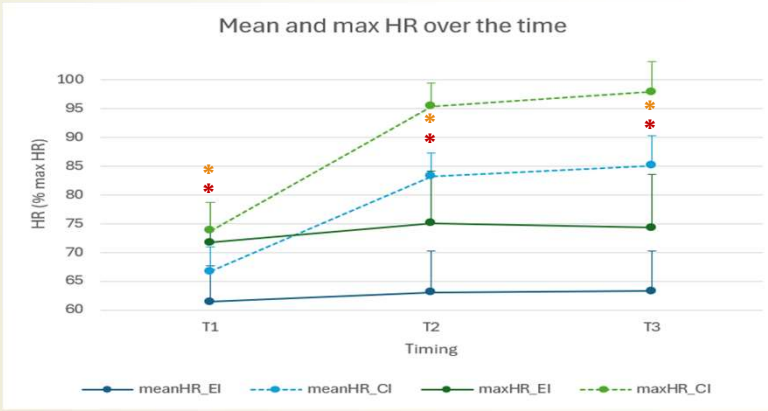
Pre-test – W1 → **Familiarization (T1) W2/W5 – Training (T2) W6/W9 – Training (T3) W10/W13** → **Post-test – W14**

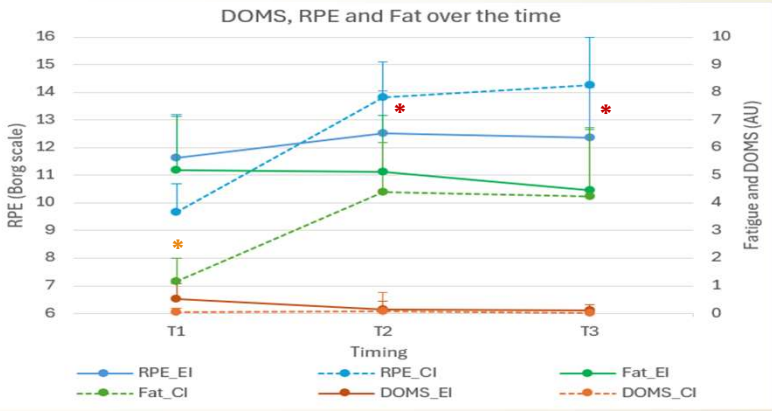
Rating of perceived exertion (RPE,Borg), Heart rate (HR), Muscle soreness (DOMS), Cognitive fatigue (Fat)

Maximal oxygen consumption (VO2 max), Maximal aerobic power (MAP), Maximal isometric force (MIF), Prehension, Balance error scoring system (BESS), Ten times sit to stand test (TTSST), Timed up and go (TUAG), 6–minute walking test (6MWT)

Results

Results indicated similar improvements regarding functional capacities in both groups (p<0.001). However, EI appeared to be better tolerated (lower HR and RPE, p<0.001) than CI, without onset of soreness. Only CI improved aerobic capacities.





* Mean HR : EI < CI during each phase (p<0.001)
* Max HR : EI < CI during each phase (p<0.001)

* RPE : EI < CI during T2 & T3(p<0.001)
* Fat : EI > CI during T1 (p<0.05)

Parameters	CI	EI	Parameters	CI	EI
MIF	**23,9%** (17.4 ; 39.2)	**13,5%** (7.5 ; 26.5)	*Prehension*	4.2% (2.9 ; 9.5)	4.7% (3.6 ; 7.2)
BESS	**34,5%** (14.3 ; 45.5)	**22,5%** (12.8 ; 29)	*TUAG*	**9,3%** (4.5 ; 13.8)	-1% (-9.4 ; 6.2)
TTSST	**10,5%** (5.5 ; 14)	**14%** (11 ; 16.5)	*VO_2 max*	**14%** (11.7 ; 15.4)	1% (-3.9 ; 7.8)
6 MWT	**4.2%** (1.5 ; 6.8)	**5.8%** (3.5 ; 7.2)	*MAP*	**17,8%** (12.7 ; 20.7)	3,8% (-1.6 ; 5.1)

Green Bold characters indicate a statistically significant difference (p<0.001); Red characters indicate non-sigificant difference

Conclusion

Our results demonstrate the **feasibility and effectiveness** of a high intensity **eccentric cycling training** in improving muscle and functional capacities. Its low metabolic cost makes it an **efficient modality** to counteract physical inactivity, deconditioning and sarcopenia **in sedentary elderly people**. However, concentric training appears more efficient to improve aerobic capacities in healthy population. This study shows promising results for pathological rehabilitation.

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