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# Feasibility and benefits of a high intensity eccentric cycling training

Annual Congress Of Physical and Rehabilitation Medicine – 2024



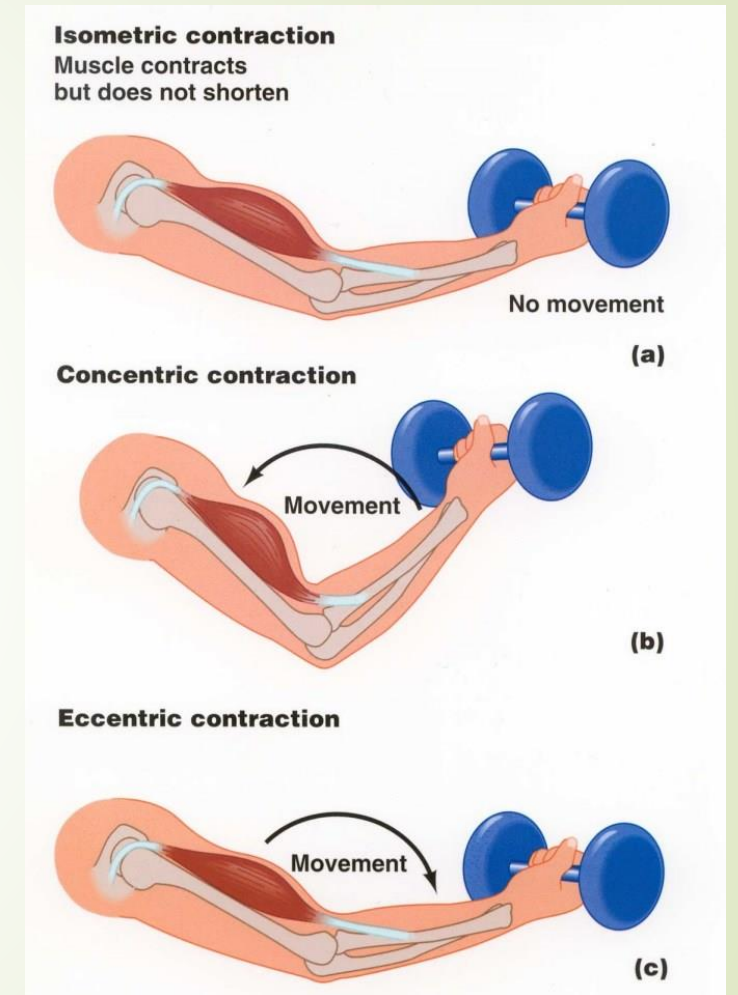
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13/11/2025

# Eccentric Contraction

- « Lengthening of the muscle while contracting »
- **Features** in comparison to Concentric
  - Higher **forces**
  - Lower **metabolic** cost
  - Unique **neural** strategies
- Benefits in rehabilitation for frail people :  
Heart Failure, COPD, Elderly



# Objectives

- Evaluate the **feasibility** of a 12-weeks high intensity interval **eccentric** cycling training
- Compare the **benefits** of an eccentric versus a concentric cycling training (deconditioned healthy people >55 yo)
  - *Muscular function*
  - *Functional capacities*
- **Optimize** physical **reconditioning** and chronic pathologies **rehabilitation** (sedentarity, neuropathologies, geriatric pathologies,...)



Pre-test  
W1

Phase 1 : Familiarization  
( W2 to W5)

Phase 2 : Training  
(W6 to W9)

Phase 3 : Training  
(W10 to W13)

Post-test  
W14

4

## Pre / Post evaluations



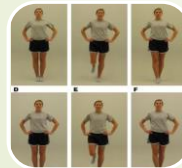
Maximal Isometric  
Quadriceps Force



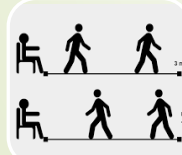
Prehension



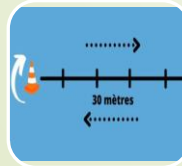
10 Times Sit-To-Stand



Balance Error Scoring  
System

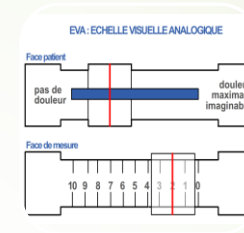


Time Up And Go



6 Minutes Walking  
Test

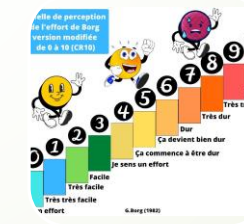
## Training Parameters



Muscle Soreness (VAS)

échelle de Borg	Perception de l'intensité de l'effort	Lien avec une sensation d'activité sportive
6	Aucun effort	
7	Entraînement facile	Echauffement / Retour calme
8		
9	Très facile	
10		
11	Facile	
12	Zone d'entraînement optimale	
13	Moyennement difficile	Zone cible
14		
15	Difficile	
16		
17		
18		
19		
20		

Rating of Perceived Exertion  
(Borg)



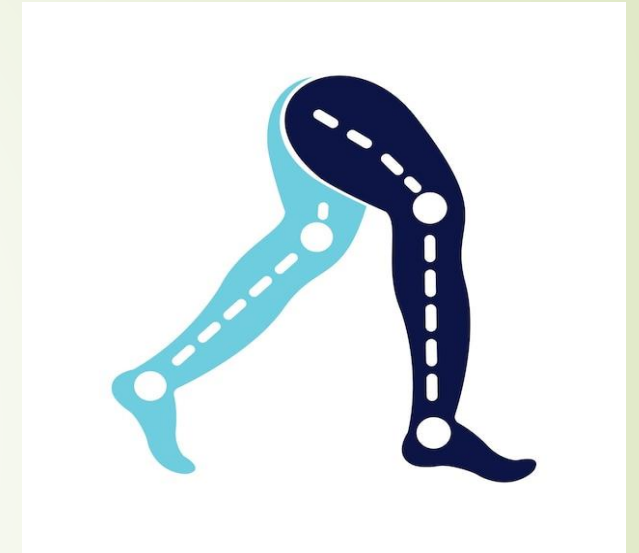
Mental Demand



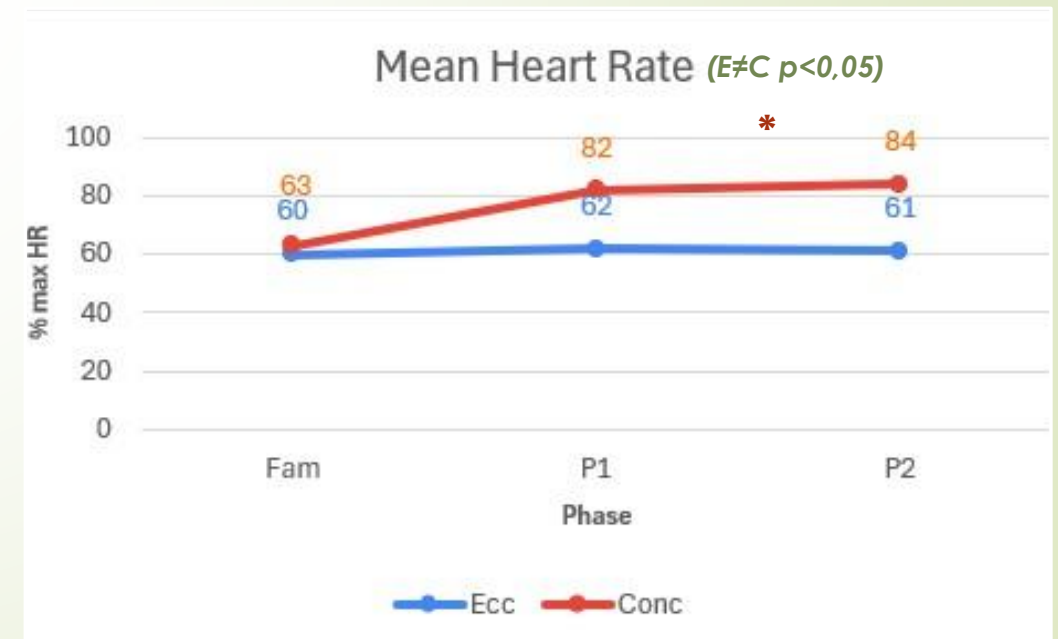
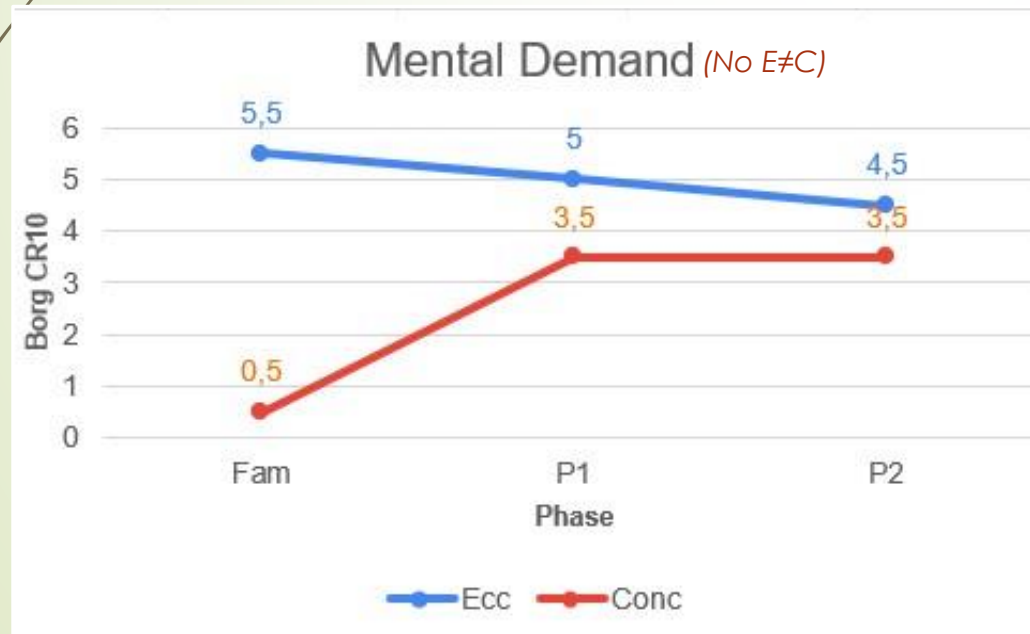
Mean & Max Heart Rate

# Pre / Post measurements

Muscular & Functional Parameters (NS E ≠C)	Concentric		Eccentric
Maximal Isometric Force	28%	=	19%
Prehension	-4%	=	-1%
Balance	20,9%	=	21,25%
TTSST	5%	=	13%
TUG	7,5%	=	-5,05%
6 MWT	2,71%	=	6,12%



Aerobic Capacities (* E≠C p<0,05)	Concentric		Eccentric
VO <sub>2</sub> max	12%	≠	-1,1%
MAP	17%	≠	4%
VE	15,8%	≠	3%
LT1	X		X
LT2	X		X



# Conclusion

## HIICT

- ✓ **Feasible**
  - ✓ No Soreness
  - ✓ Low RPE
  - ✓ Good adherence
  - ✓ Better tolerated than Conc
  
- ✓ **As efficient as conc**
  - ✓ Muscular benefits
  - ✓ Functional benefits
  
- ✓ **Lower metabolic cost**
  - ✓ Lower HR (*significantly*)
  
- ✓ **Higher mental demand**
  
- ✗ **No aerobic improvements**
  - ✗ Conc more efficient



Neurological and Functional Rehabilitation Center - Fraiture

## Perspectives

- Evaluation of **health-related parameters** (blood samples)
  
- **Moderate VS High intensity** eccentric cycling training
  
- **Neuromuscular** responses



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