COMPARISON OF THE CARDIO-RESPIRATORY RESPONSE DURING DEEP WATER RUNNING TRAINING VS INDOOR CYCLING TRAINING IN HEALTHY ATHLETIC SUBJECTS

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INTRODUCTION

Sports may lead to lower limb mechanical injuries. To recover from those, it is advised to practice unloaded sports such as **INDOOR CYCLING** to maintain a good physical condition with limited mechanical stresses[1]. Despite the **indoor cycling training**, the injured athletes often lose cardio-pulmonary capacity and suffer from **physical deconditioning**. Therefore, we studied an alternative training : **DEEP WATER RUNNING.**

DEEP WATER RUNNING

Deep water running has previously been showed to **reduce lower-limbs overload, improve muscle strength[2] and balance[3],** while water resistance forces the subject to **exert greater force than moving in air[4]**.

OBJECTIVE

Compare the cardio-pulmonary parameters of two continuous trainings : **DEEP WATER RUNNING** and **INDOOR CYCLING.**

HYPOTHESIS

Deep water running could **highly sollicit the cardio-respiratory** system due to **water physical properties,** and therefore be an **appropriate training** for injured athletes, thanks to the **few biomechanical stresses** that this training represents.

SAMPLE & DATA

age (yo)	height (cm)	weight (kgs)	BMI
24±3	174±8	67±7	22±1

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$VO_{2\ max}$ = 42±5 ml/min/kg

- ✓ VCO_2 (carbon dioxide production)
- ✓ VO_2 (oxygen consumption)
- ✓ VE (ventilation)
- ✓ RER (respiratory exchange ratio)
- ✓ HR (heart rate)
- ✓ Blood lactate

PROTOCOL

HR at VT = First Ventilatory Threshold

INDOOR CYCLING

CPET = Cardio-Pulmonary Exercise Test

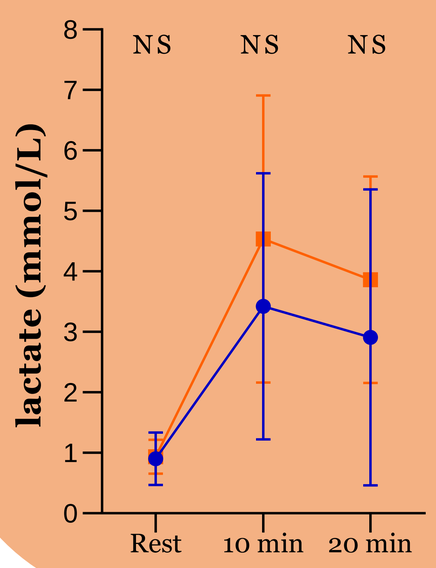
DEEP WATER RUNNING

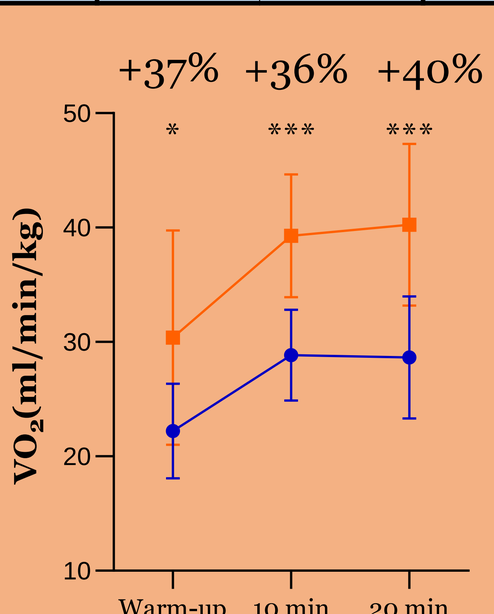
24h ≥ training ≤ 72h

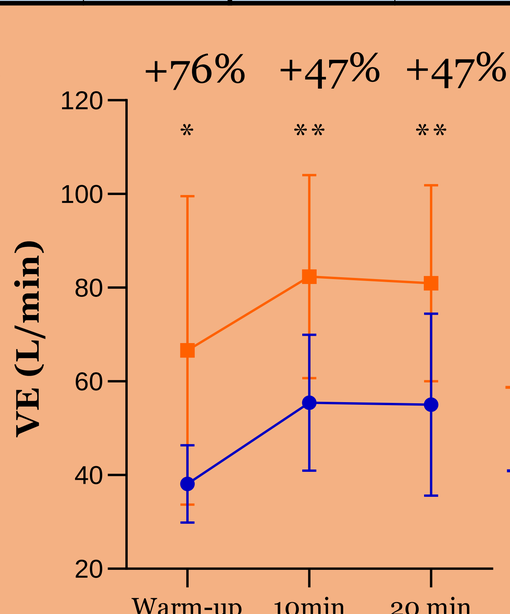
REST → 5 min HR at 80% VT (Warm-up) → 10 min HR at 100% VT (Post 10 min) → 2 min Rest → 10 min HR at 100% VT (Post 20 min) → END

RESULTS

	Warm-up		Post 10 min		Post 20 min	
	Deep Water Running	Indoor Cycling	Deep Water Running	Indoor Cycling	Deep Water Running	Indoor Cycling
Lactate (mmol/L)	0,9±0,3 (rest)	0,9±0,4 (rest)	4,5±2,4	3,4±2	3,9±1,7	2,9±2,3
%max			50%	39%	43%	33%
VO2 (ml/min/kg)	30±9 *	22±4	39±5 ***	29±4	40±7 ***	29±5
%VT1	134%	93%	170%	124%	175%	124%
%max	73%	53%	95%	70%	97%	70%
VE (L/min)	67±33 *	38±8	82±22 **	55±13	81±21 **	55±18
%VT1	152%	84%	185%	124%	184%	122%
%max	54%	31%	67%	46%	67%	45%







Deep Water Running
Indoor Cycling

CONCLUSION

When training is calibrated by HR, VE and VO_2 are about **40% higher** during deep water running than cycling. This might be explained by a **better venous return** and a **higher stroke volume**, due to lower limbs **hydrostatic compression**. **With limited biomechanical constraints and a higher VE and VO_2 than cycling, DEEP WATER RUNNING could be proposed for injured athletes before going back to the field.**

[1] Glass & al., 1995
[2] Foley & al., 2003
[3] Simmons & Hansen, 1996
[4] Miyoshu & al., 2004

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