Handbike training under free-living conditions

The effects on physical fitness and health outcomes

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Adelante - Rijndam – Vogellanden – Sint Maartenskliniek

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Introduction

- From bed rest to physical activity

Stoke Mandeville Games (1948)

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Introduction

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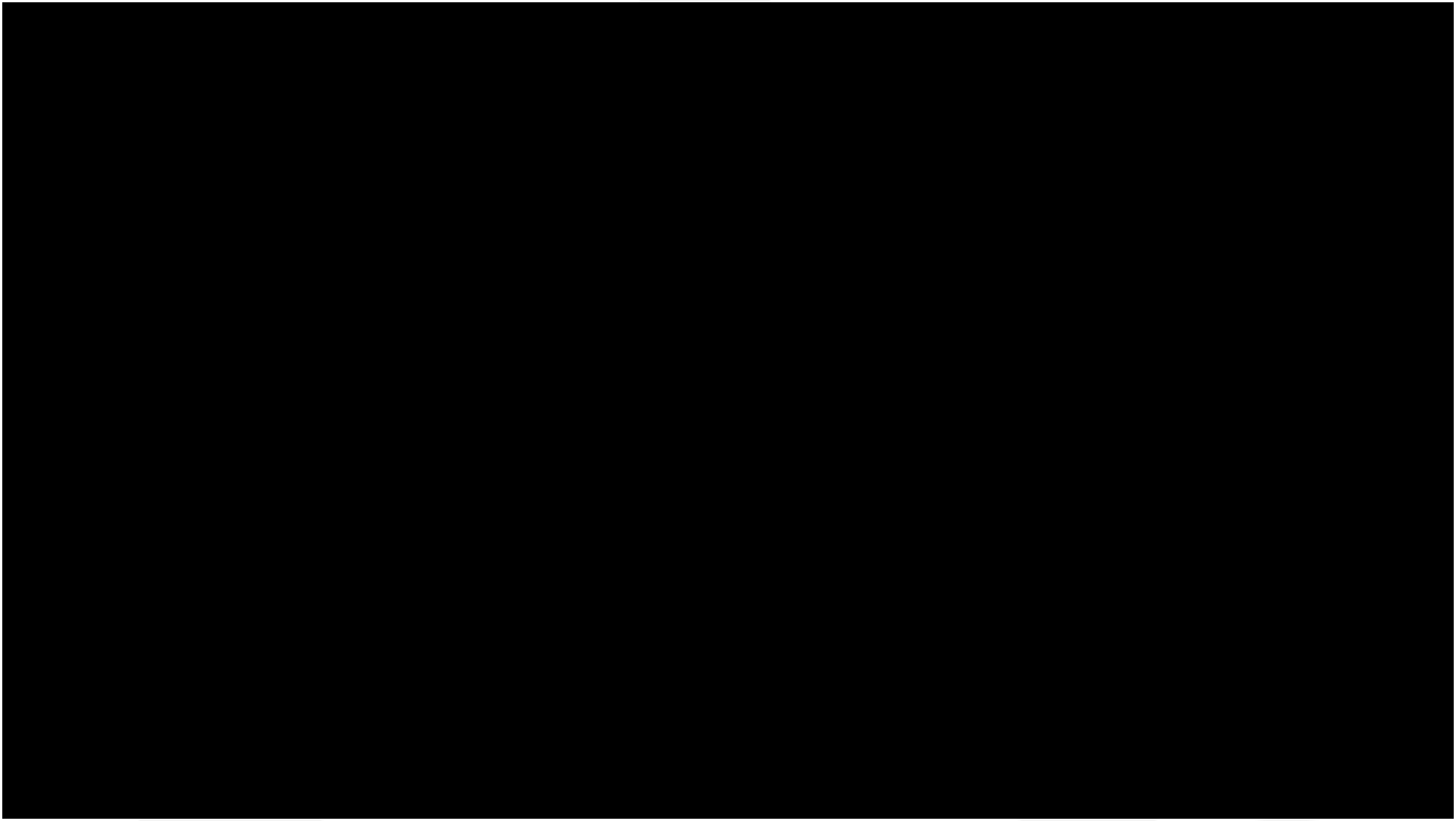
- In comparison to wheelchair propulsion:

- More efficient (Dallmeijer et al., 2004)
- Less straining for arms and shoulders (Arnet et al., 2012)



https://www.youtube.com/watch?v=3wDU3LKiIFY

Goals of the project

- Encourage wheelchair-users to initiate or keep training after the rehabilitation period
- Confidence, new goal in life, learning from others
- Not only elite, able-bodied athletes are capable of incredible performances; wheelchair-users as well!

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Aim of the study

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The effects of 4 months handbike training under free-living conditions on physical fitness and health outcomes

Methods

- Former patients of 9 Dutch rehabilitation centers (2013 and 2014)

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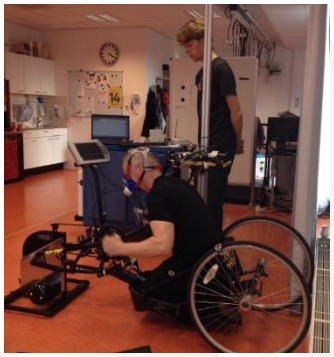
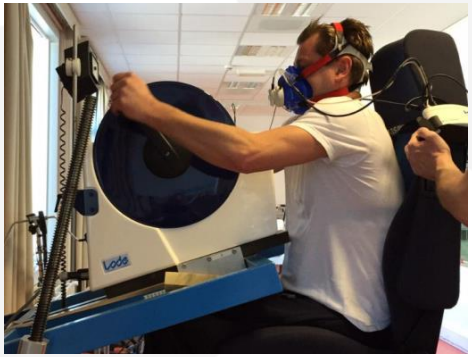
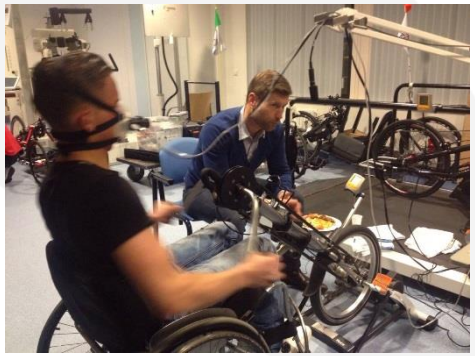
- Exercise testing in **February** and **June** (Popeak, VO2peak)



Cyclus2



Lode arm-crank



Tacx roller

Treadmill

Methods

- Anthropometrics (BMI, waist circumference)
- Questionnaires (time since injury, injuries during the training period, classification, training)

- Training was self-regulated: free-living conditions

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Results

	N	Mean (SD) / % of total
Age (yrs)	57	40.0 (12.9)
Gender (% m)	57	84%
Height (cm)	58	179 (10)
Body mass (kg)	57	77.5 (15.0)
Time since injury (yrs)	52	9.4 (9.6)
Type of injury	55	
Tetraplegia	2	3.6%
Paraplegia	43	78.2%
Amputation	3	5.5%
Spina Bifida	3	5.5%
Other	4	7.3%

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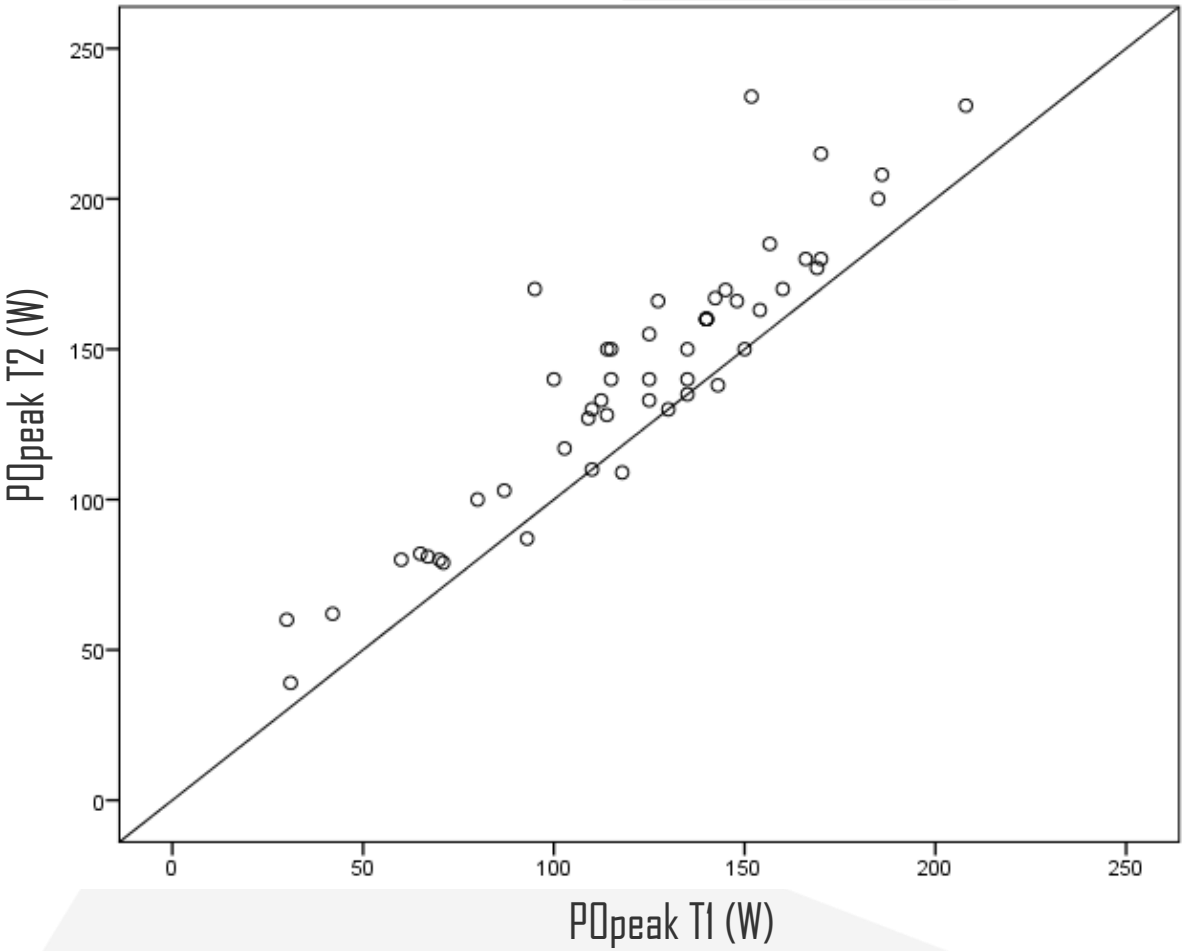
Changes POpeak



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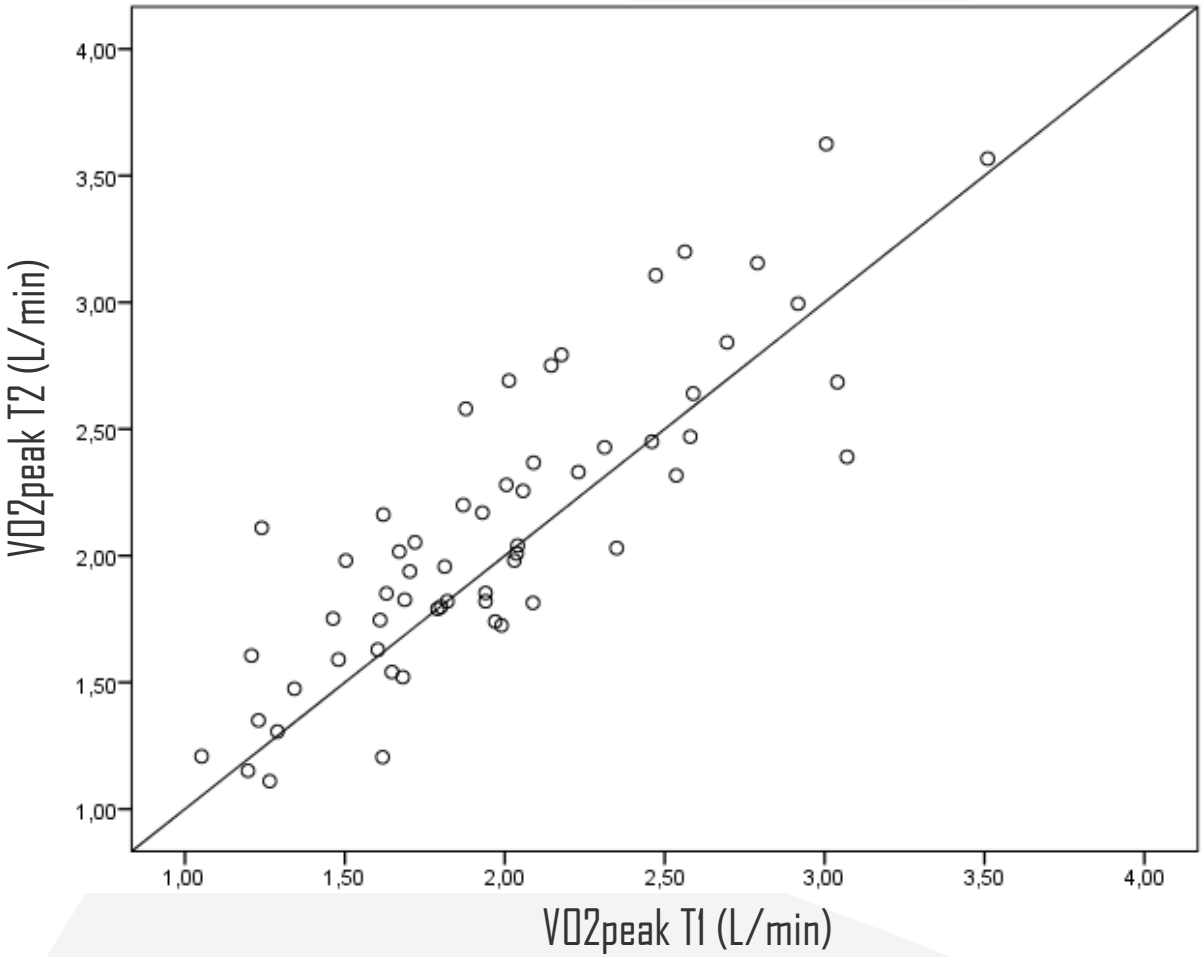
T1: 122 (40) W
T2: 141 (43) W
+17%, $p<0.001$

Changes VO2peak



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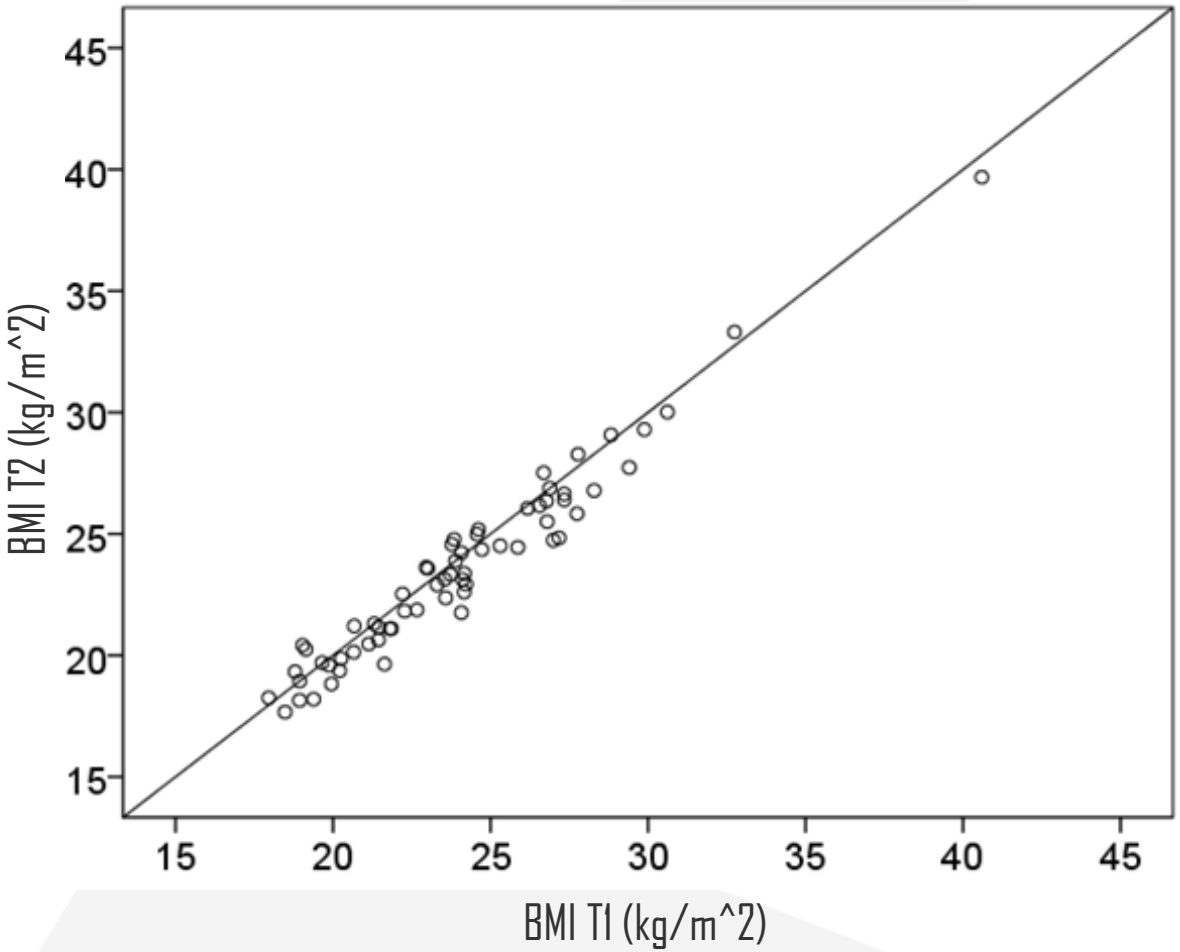
T1: 1.98 (0.54) l/min
T2: 2.11 (0.58) l/min
+7%, p=0.002

Changes BMI



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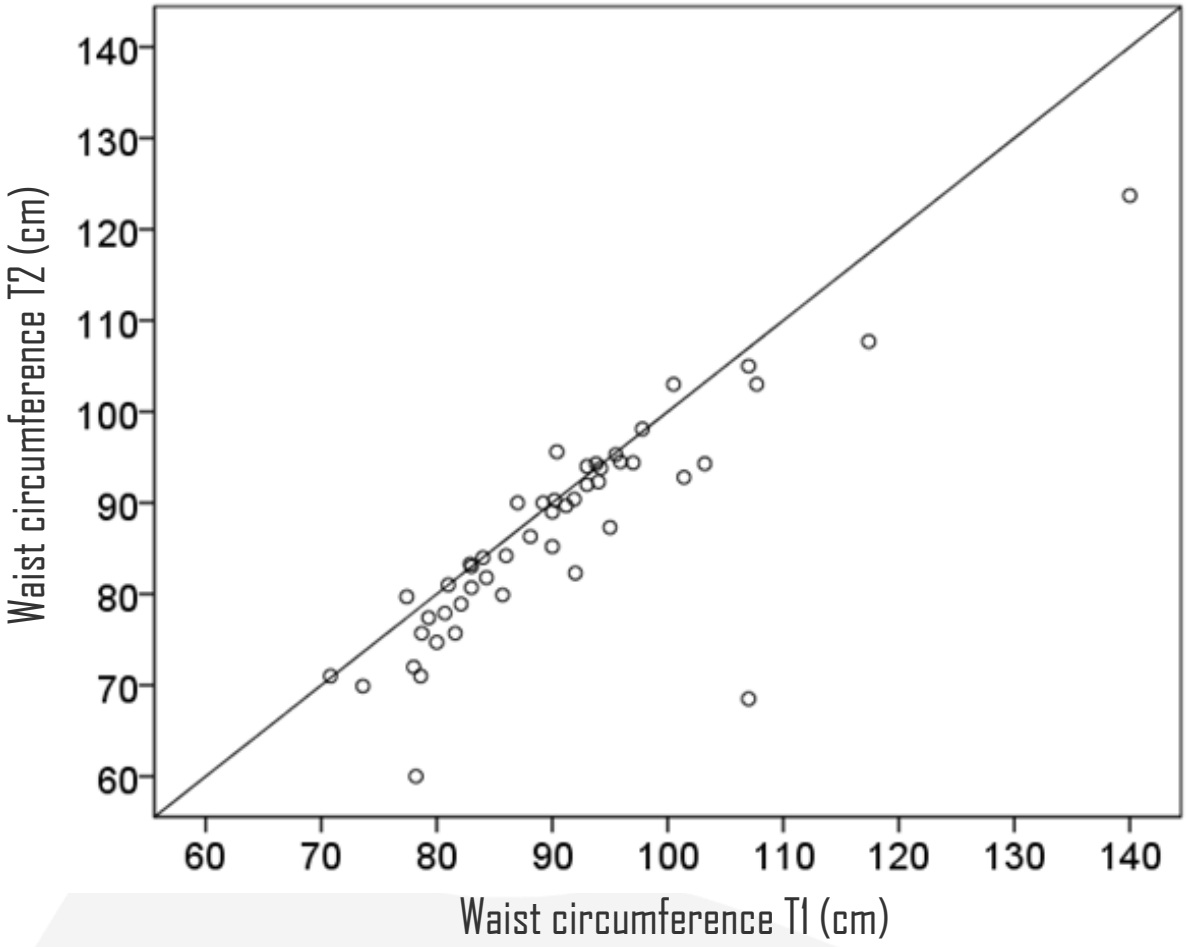
T1: 24.1 (3.9) kg/m^2
T2: 23.6 (3.7) kg/m^2
-2.1%, $p<0.001$

Changes waist circumference



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T1: 90.9 (12.4) cm
T2: 87.2 (11.4) cm
-4.1%, p=0.001

Discussion

- Free-living conditions
- Improvements comparable to other studies of similar duration (Valent et al., 2007)
- Studies of longer duration = larger improvements (Davis et al., 1991; Hicks et al., 2003)

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life after the HandbikeBattle?

Discussion

- Popeak > VO2peak
  - Technique?
  - Fiber type transition?

- Central of peripheral adaptations?

- What about the PEF?

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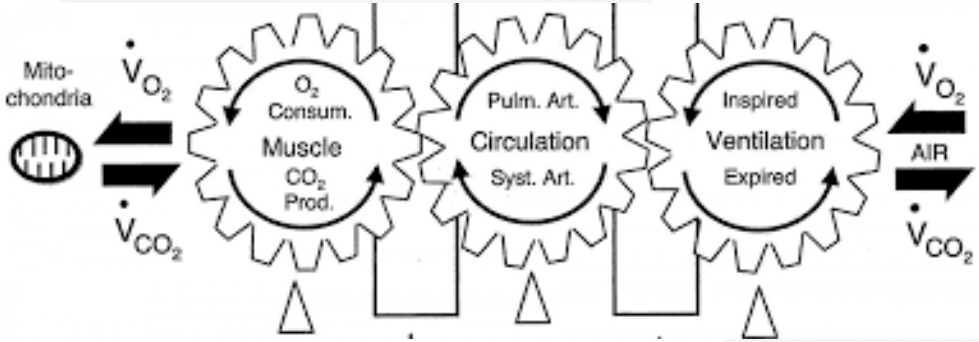
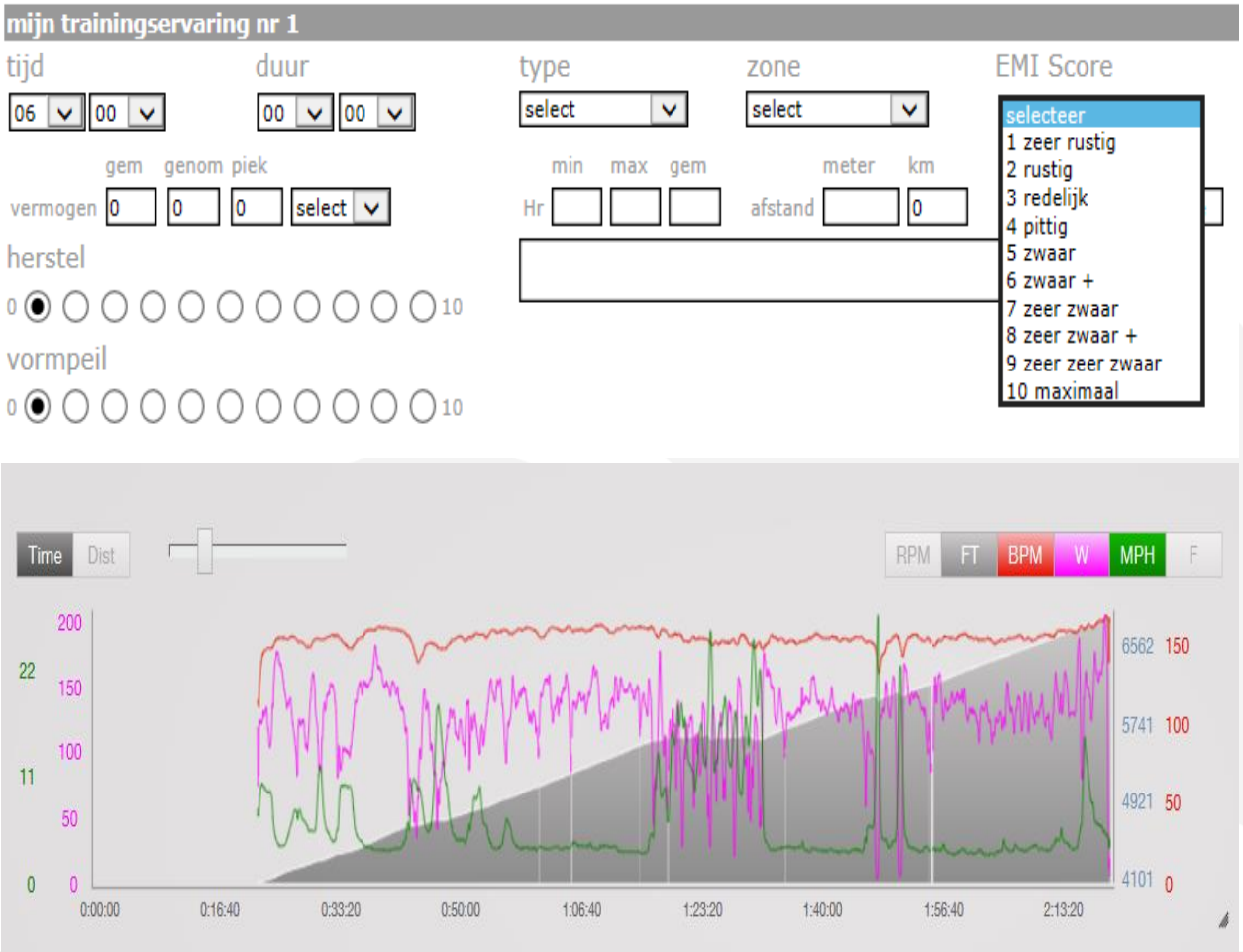


(Wasserman et al., 1979)

Monitoring training



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Conclusion

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The HandbikeBattle provokes training regimes among participants of sufficient load for substantial improvements in physical fitness and health outcomes

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Reade – Heliomare – Beatrixoord – De Hoogstraat – Het Roessingh
Adelante - Rijndam – Vogellanden – Sint Maartenskliniek


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TOP END

Possible determinants large ΔPOpeak

- Comparison groups with ΔPOpeak above or below median (18W)

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	P-value
Age (yrs)	0.02
Gender (frequency m/f)	0.92
Time since injury (yrs)	0.29
Classification (frequency <H3.2/>H3.2)	0.54
Upper-extremity complaints (frequency yes/no)	0.97
POpeak T1 (W)	0.88

Validity internal measures

Participant	N training sessions	TSS – sRPE (R^2)	TSS – HR (R^2)
1	23	0.94	0.87
2	23	0.93	0.98
3	10	0.86	0.87
4	28	0.92	0.86
5	14	0.97	0.94
6	31	0.70	0.77
7	45	0.74	0.81
8	11	0.93	0.50

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- Strong correlations for most individuals
- Promising tools for future research