Relationship between physiological parameters and paratriathlon performance in well-trained athletes

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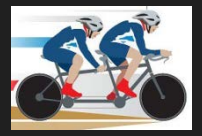
BRITISH TRIATHLON

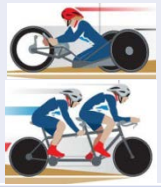
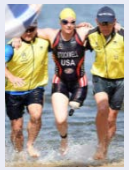
National Centre for Sport & Exercise Medicine

Working for Health & Wellbeing

Background

- Paratriathlon – a variant of triathlon modified for individuals with a physical or visual impairment:
  - 750m swim, 20km bike, 5km run.
- Paratriathlon is a multi-impairment sport:
  - Wheelchair athletes  
  - Ambulant athletes  
    - Includes athletes with comparable activity limitation and an impairment of, but not limited to:
      - Muscle Power,
      - Limb Deficiency,
      - Hypertonia,
      - Ataxia and/or Athetosis,
      - Total or Partial Visual Impairment.

Physical preparation for the Event

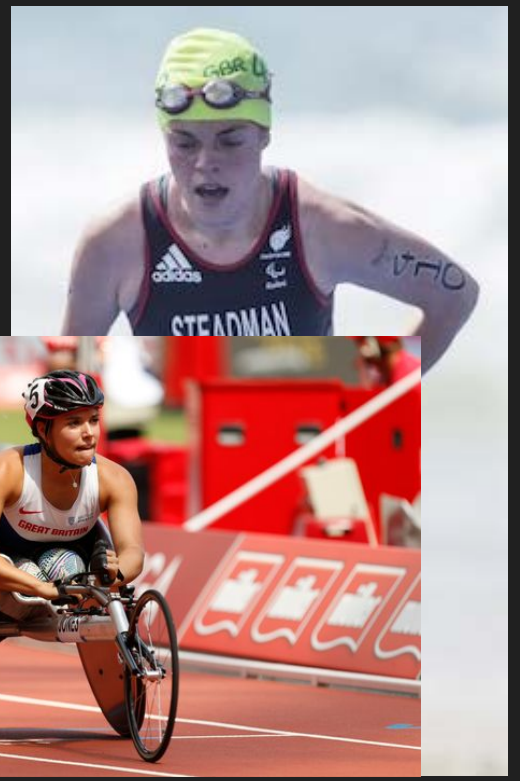
Discipline	Time	Percentage
Swim 	12:44 (01:47)	17.8 (2.3)
Bike 	33:55 (3:18)	47.5 (3.4)
Run  	18:40 (3:20)	26.0 (3.7)
Transitions 	6:15 (1:37)	8.7 (2.0)
* Data from Liverpool (UK) 2014 (PT1-PT5)		

Talent Profiles

- New Paralympic Sport

- Talent Confirmation Programme

- Talent Transfer Programme
  - Swimming to Paratriathlon
  - Wheelchair Racing to Paratriathlon
  - Cycling to Paratriathlon



Physiology and training of a World-Champion paratriathlete.

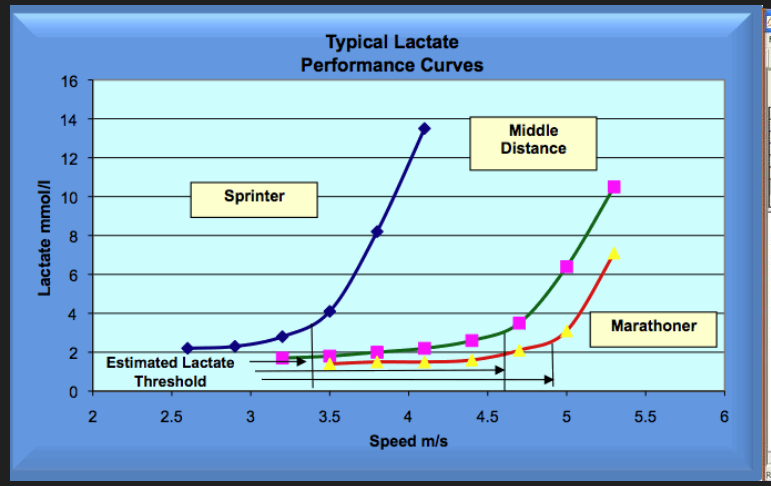
Mujika et al. IJSPP (2015)

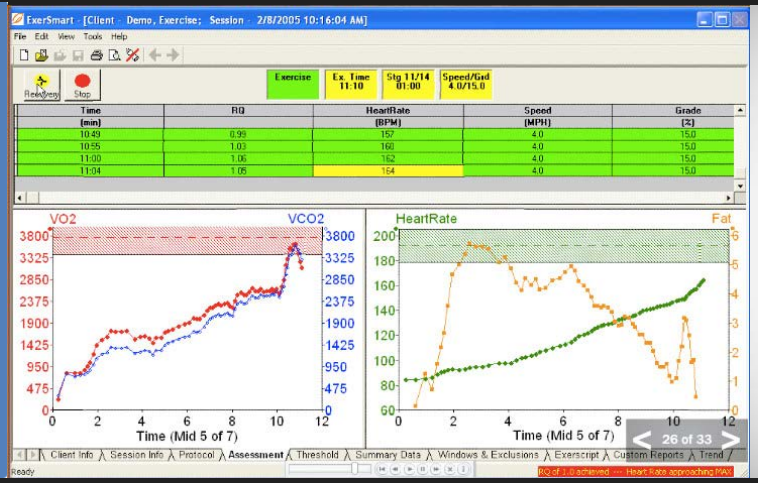
Below the knee amputee.

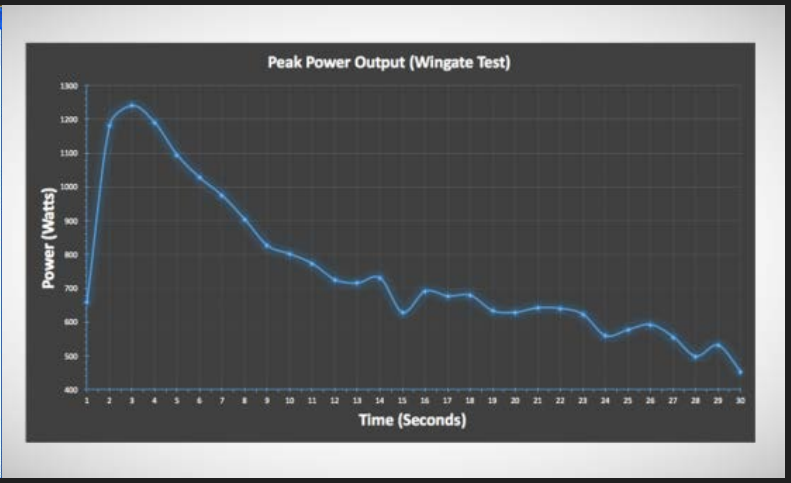
Positive training adaptations across 84 wk period.

The training volume for each discipline was lower than previously reported for competitive able-bodied Olympic-distance triathletes.

Purpose

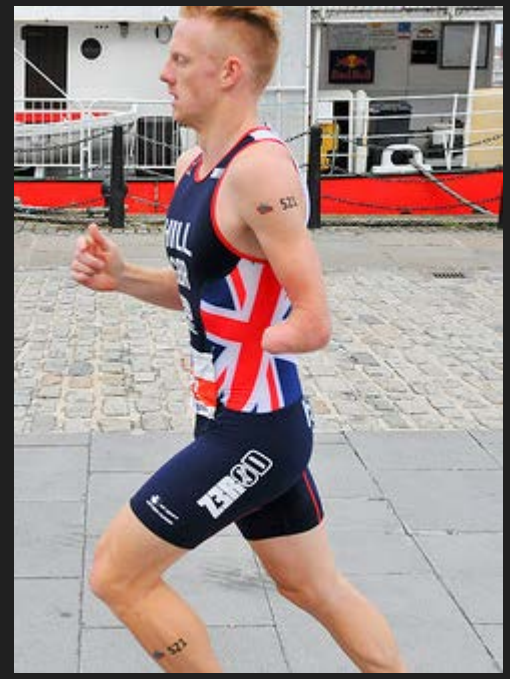






To determine which physiological variables were associated with performance.

14 Trained Male Paratriathletes (PT1-PT5 pre 2017 classification), 2 days laboratory testing and 1 competition day



Credit Loughborough University/ Phil Wilson and British triathlon/ Paul Cooper

Characteristics

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Parameter	All (n=14)		
Age (yrs)	31.9 (8.6)		
Body Mass (kg)	66.4 (9.1)		
30s Wingate Test			
PPO (W)	587 (155)		
MPO (W)	498 (124)		
Peak cadence (revs/min)	132 (15)		
Aerobic Capacity			
$\dot{V}O_2$ pk (L/min)	3.74 (0.62)		
MAP (W)	293 (65)		
HR (bt/min)	183 (8)		

Characteristics

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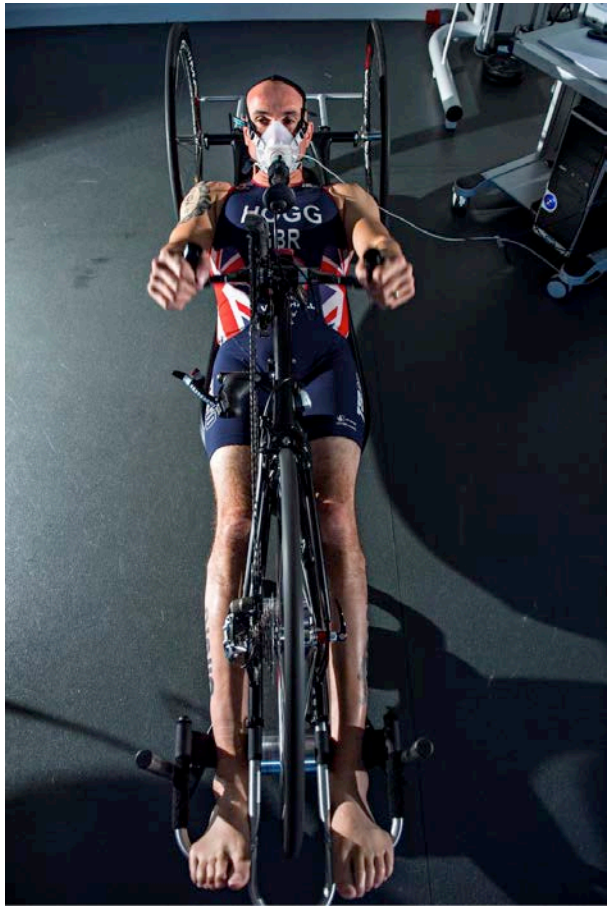
Parameter	All (n=14)	Wheelchair (n=4)	
Age (yrs)	31.9 (8.6)	34.8 (7.4)	
Body Mass (kg)	66.4 (9.1)	67.7 (14.2)	
30s Wingate Test			
PPO (W)	587 (155)	398 (41)	
MPO (W)	498 (124)	345 (29)	
Peak cadence (revs/min)	132 (15)	122 (17)	
Aerobic Capacity			
$\dot{V}O_2$ pk (L/min)	3.74 (0.62)	3.07 (0.27)	
MAP (W)	293 (65)	210 (17)	
HR (bt/min)	183 (8)	185 (8)	



Characteristics

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Parameter		Wheelchair (n=4)	Ambulant (n=10)
Age (yrs)		34.8 (7.4)	34.8 (9.1)
Body Mass (kg)		67.7 (14.2)	65.9 (7.1)
30s Wingate Test			
PPO (W)		398 (41)	663 (109)
MPO (W)		345 (29)	560 (86)
Peak cadence (revs/min)		122 (17)	136 (13)
Aerobic Capacity			
$\dot{V}O_2$ pk (L/min)		3.07 (0.27)	4.01 (0.51)
MAP (W)		210 (17)	326 (41)
HR (bt/min)		185 (8)	182 (8)

Characteristics

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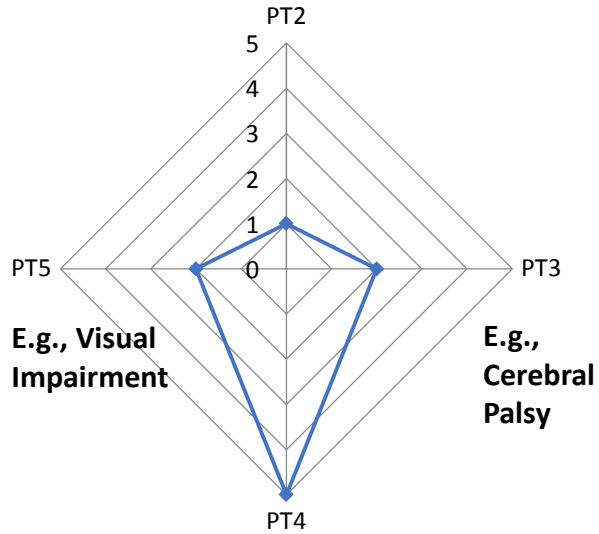
Parameter			Ambulant (n=10)
Age (yrs)			34.8 (9.1)
Body Mass (kg)			65.9 (7.1)
30s Wingate Test			
PPO (W)			663 (109)
MPO (W)			560 (86)
Peak cadence (revs/min)			136 (13)
Aerobic Capacity			
$\dot{V}O_2$ pk (L/min)			4.01 (0.51)
MAP (W)			326 (41)
HR (bt/min)			182 (8)

Race Time 1:04:52 (0:06:03)*
17:46:28
% splits (S,B,R)

E.g., Transfemoral Amputee



E.g., Visual Impairment

E.g., Cerebral Palsy

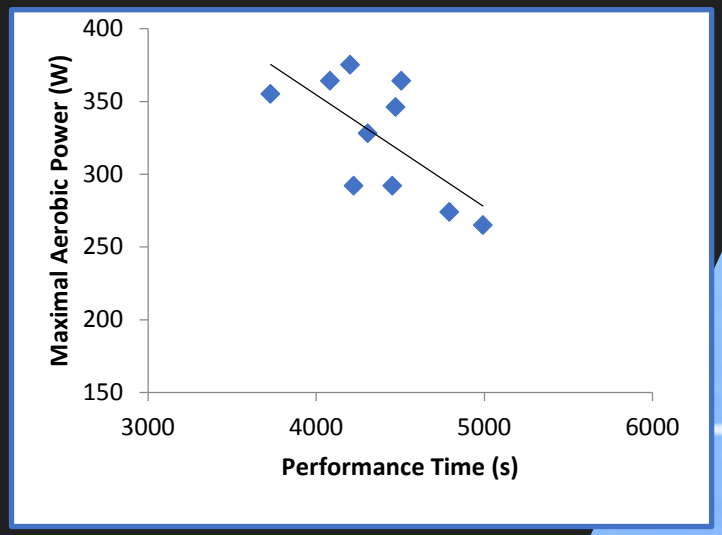
E.g., foot drop, leg transtibial amputee, arm transradial amputee

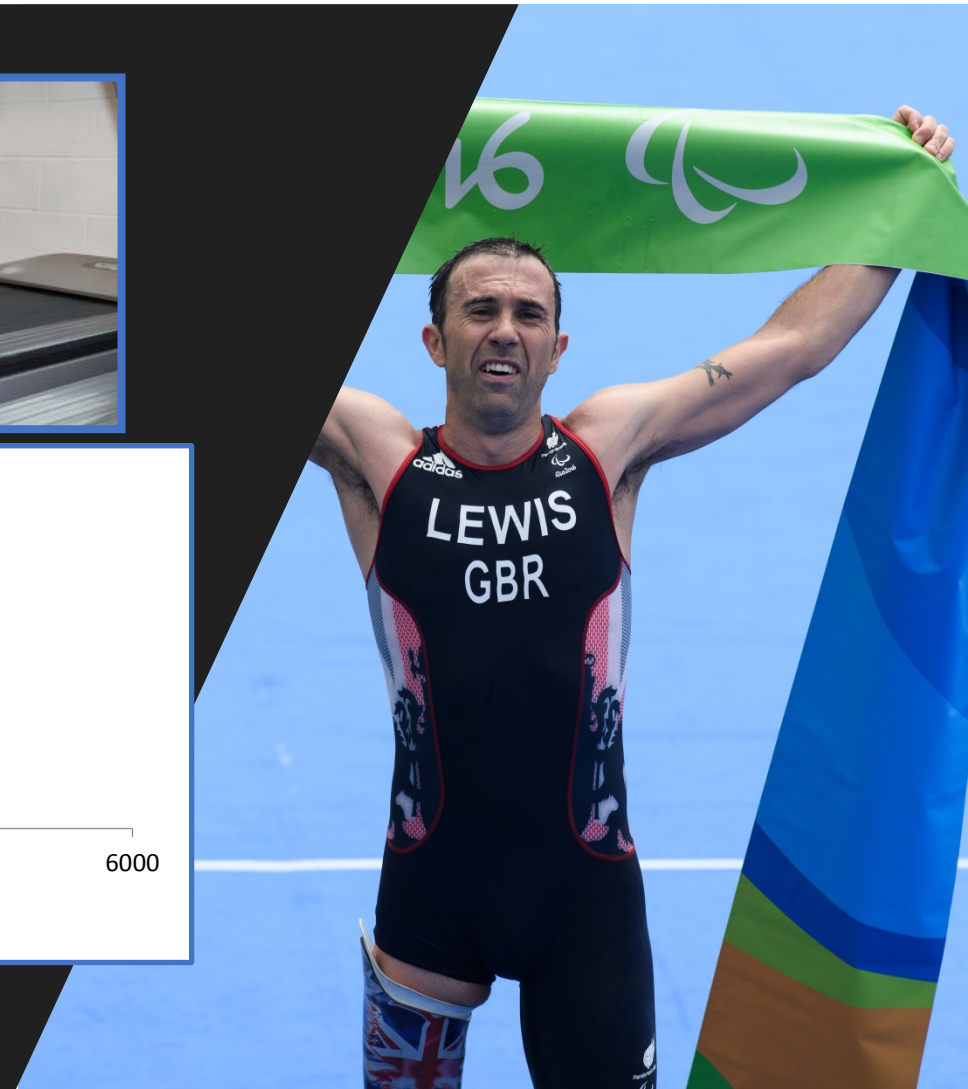
*Range 1:02:09-1:23:11

Predictors of Performance

Parameter	R value
Aerobic Capacity	
MAP (W)	0.67[1]
30s Wingate	
PPO (W)	0.68[1]
MPO (W)	0.67[1]
Peak cadence (revs/min)	0.71[1]
20km Cycling Time Trial	
Power Output (W)	0.66[1]
$\dot{V}O_2$ pk (L/min)	0.64[1]

- Data from Liverpool (UK) 2014 (PT2-PT5)
- [1]P<0.01





Key Points

- To try and understand a paratriathletes capabilities of success:
  - Peak aerobic capacity test;
  - 30s Wingate test;
  - 20 km Time Trial.

- Not in total agreement with Olympic literature which would include:
  - Peak aerobic capacity test;
  - **AND** measures of running economy

Key Points

- To try and understand a paratriathletes capabilities of success:
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  - **30s Wingate test;**
  - 20 km Time Trial.

- Not in total agreement with Olympic literature which would include:
  - Peak aerobic capacity test;
  - **AND** measures of running economy

20km Time-Trial

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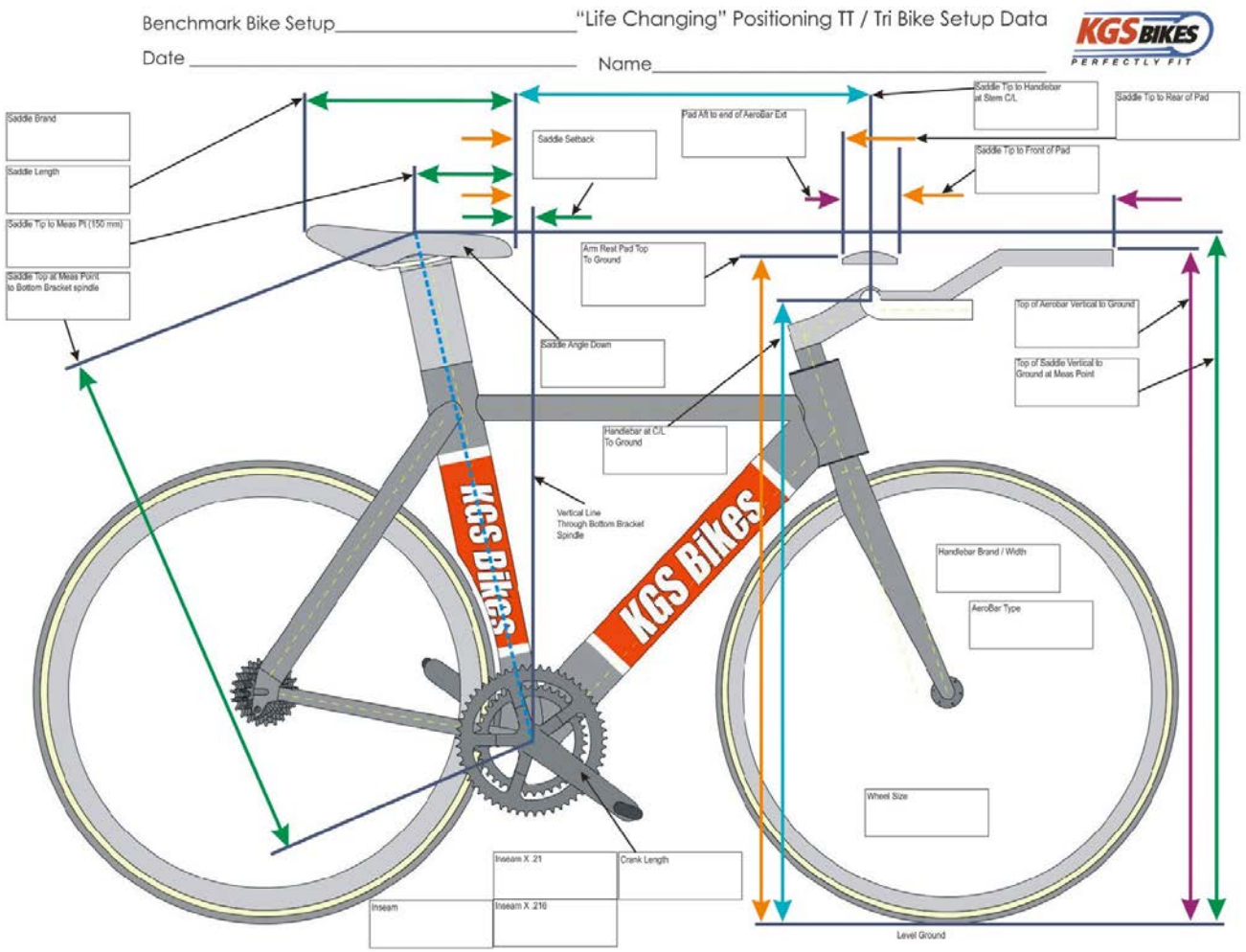
- Strong associations were found between bike trial performance:
  - GME (r=0.81; P<0.01)
  - Mean cadence (r=0.70; P<0.01)
  - Peak cadence (r=0.72; P<0.01)



Conclusions

- Results not in total agreement with the Olympic literature.
- Paratriathletes display **excellent** levels of fitness.
- Our data – good range of performance times; yet wide **range** of impairments.
- **More data** is warranted to fully understand the physiology and performance and hence training requirements.
- Evidence that athletes must work on **technical factors**; such as **cadence** (bike manipulations – indirectly efficiency).

Thankyou for listening

Any questions?

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