

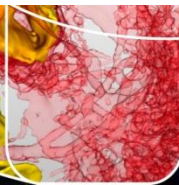


Academic Medical Center  
University of Amsterdam



# Endurance training in PPS: How to target intensity?

Eric Voorn



# Fitness And Cognitive behavioural TherapieS for Fatigue and ActivitieS in NeuroMuscular Diseases

FACTS-2-FSHD  
FACTS-2-ALS  
**FACTS-2-PPS**  
FACTS-2-patient perspectives



6 PhD students

[www.facts2nmd.nl](http://www.facts2nmd.nl)



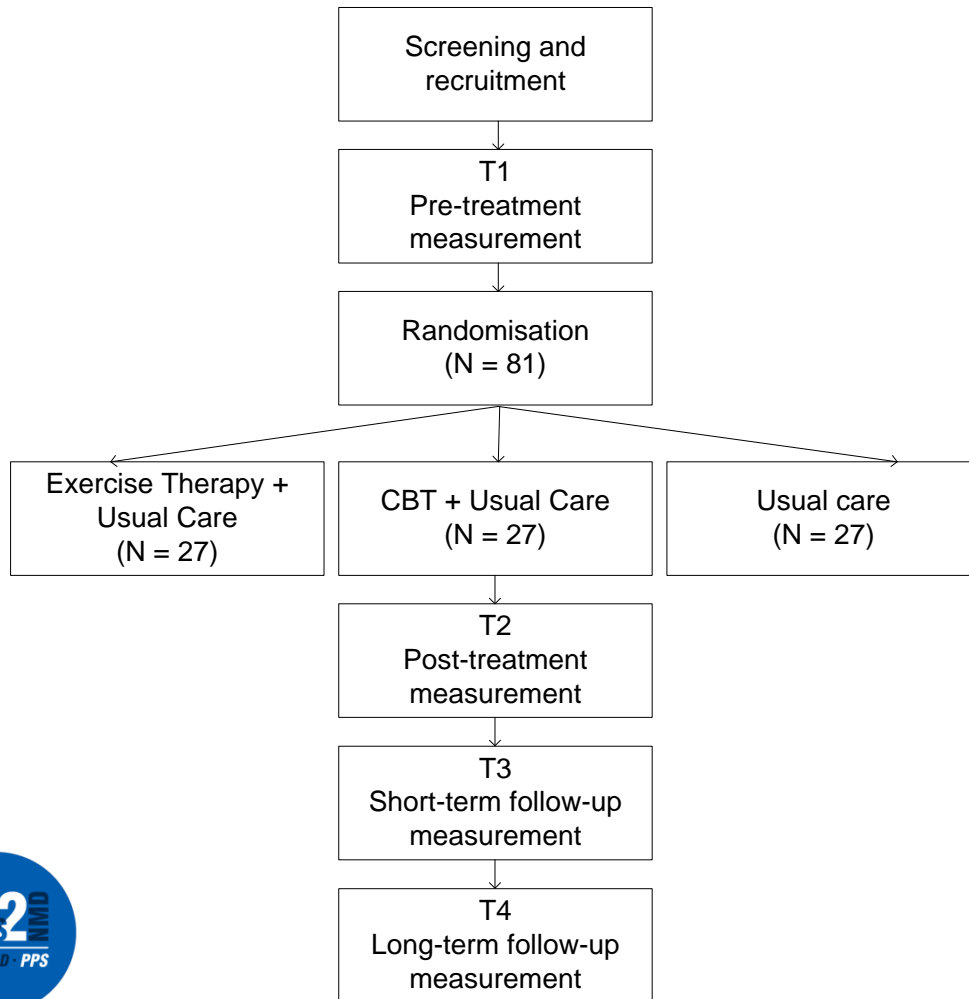
# Research questions

## FACTS-2-PPS

Does **exercise therapy/cognitive behavioural therapy** for patients with PPS reduce fatigue and improve activities and HRQoL as compared to usual care?



# Study design



## Study protocol

*Koopman FS, et al. Exercise therapy and cognitive behavioural therapy to improve fatigue, daily activity performance and quality of life in Postpoliomyelitis Syndrome: the protocol of the FACTS-2-PPS trial. BMC Neurology 2010;10: 8.*

## Trial registration

*Dutch Trial Register  
NTR1371.*



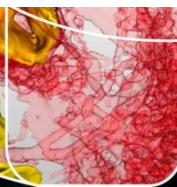
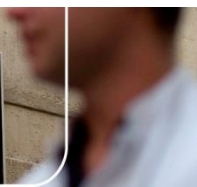
# Results...

## ...coming soon!

### Registration still possible

[www.polioconference.com](http://www.polioconference.com)





# Exercise in PPS

- **Aerobic exercise**
- Strengthening
- Aquatic exercise



# Aerobic exercise in PPS

## BOX 18.4 Aerobic Exercise Prescription Summary

### Intensity

20–30% of MHHRR if no history or full recovery from weakness  
40–60% of MHHRR if history of variable recovery from weakness and currently stable, but up to 40% of MHHRR if recent new weakness

### Duration

30–40 continuous minutes, with intervals for the first few weeks if needed, if no history or full recovery from weakness  
15–20 minutes divided into intervals of approximately 3 minutes if history of variable recovery from weakness, and up to 15 minutes if recent new weakness

### Frequency

2–5 days per week, with only 3 nonconsecutive days if history of variable recovery from weakness and currently stable or especially if new recent weakness

### Mode

Non-weight-bearing activities preferred (arm or leg cycling, or both; swimming and water walking/exercises)

Walking advised only if lower extremities are functional and capable of up to 2–3 minutes duration without symptoms

### Special Considerations

Must determine extent of limb function prior to prescribing aerobic exercise

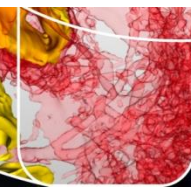
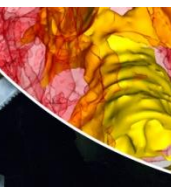
Even if no history of weakness, some of the exercise session should consist of non-weight-bearing activities

The patient must not exercise beyond RPE of “hard” even if no history of weakness

The patient must stop and modify exercise amounts if increased fatigue, weakness, or pain results

Adequate hydration is encouraged, especially in warmer than usual temperatures

Clinical Exercise Physiology: *Application and Physiological Principles* (2004)

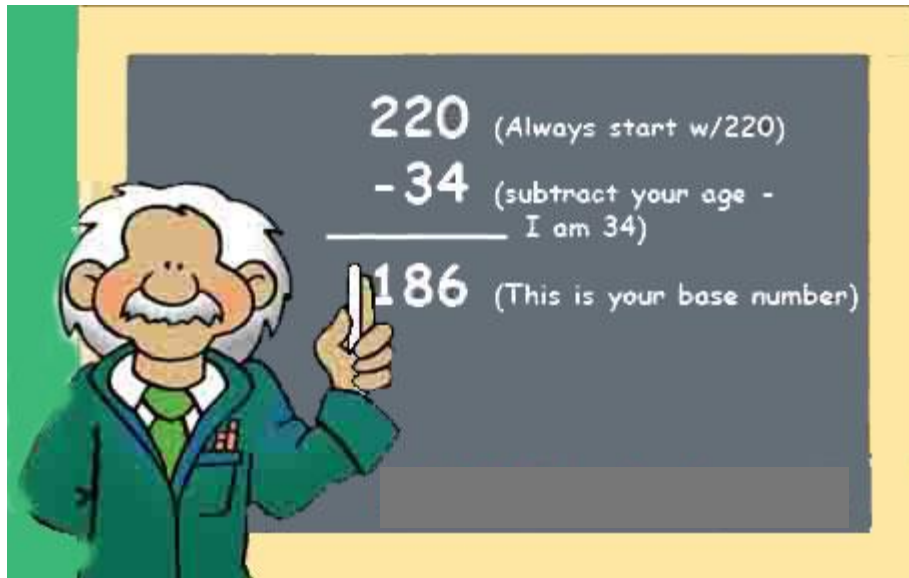


# Problem

- Determining target intensity for endurance training is delicate: exercise levels should be sufficiently high, however, they should avoid overload.
- Physical therapists often have to adjust intensity when applying current guidelines.



# Current guidelines intensity



Relative to estimated maximal  
heart rate (**%HRR**)

|    |                  |
|----|------------------|
| 6  |                  |
| 7  | Very, very light |
| 8  |                  |
| 9  | Very light       |
| 10 |                  |
| 11 | Fairly light     |
| 12 |                  |
| 13 | Somewhat hard    |
| 14 |                  |
| 15 | Hard             |
| 16 |                  |
| 17 | Very hard        |
| 18 |                  |
| 19 | Very, very hard  |
| 20 |                  |

Based on rating of  
perceived exertion  
(**RPE**)



# Solution?

The **anaerobic threshold (AT)** may be useful to overcome this problem.



# Anaerobic threshold



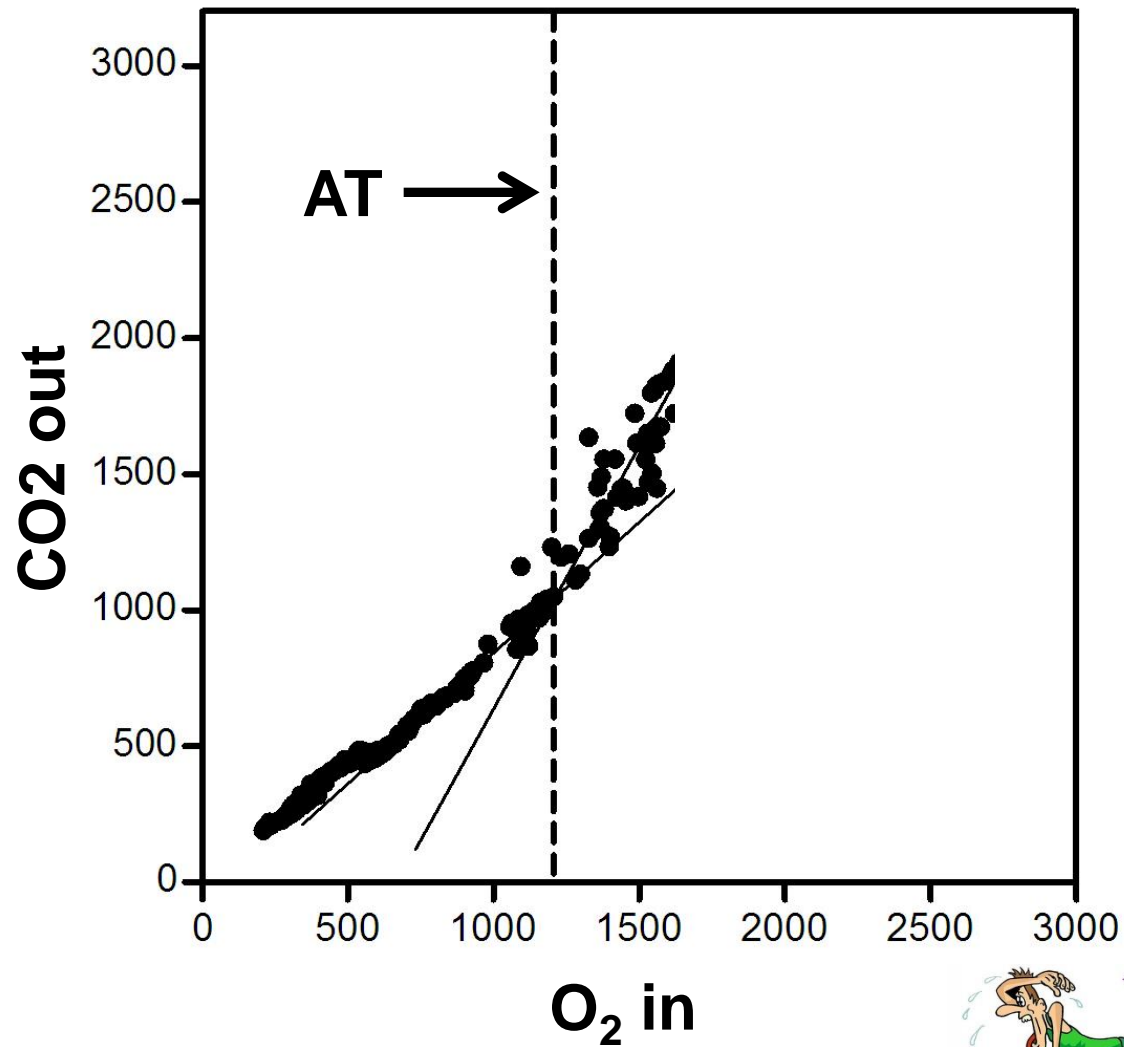
$\text{CO}_2 \text{ out} = \text{O}_2 \text{ in}$



$\text{CO}_2 \text{ out} > \text{O}_2 \text{ in}$

**Transition = AT**

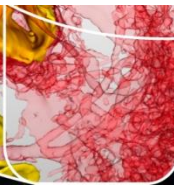




Start



End



# Research questions

- Can the AT be identified in individuals with PPS using submaximal exercise testing?
- How do current guidelines for training intensity prescription relate to the AT?

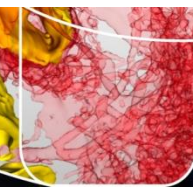
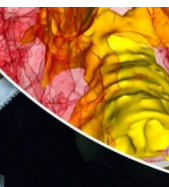
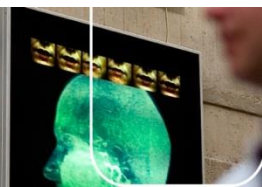
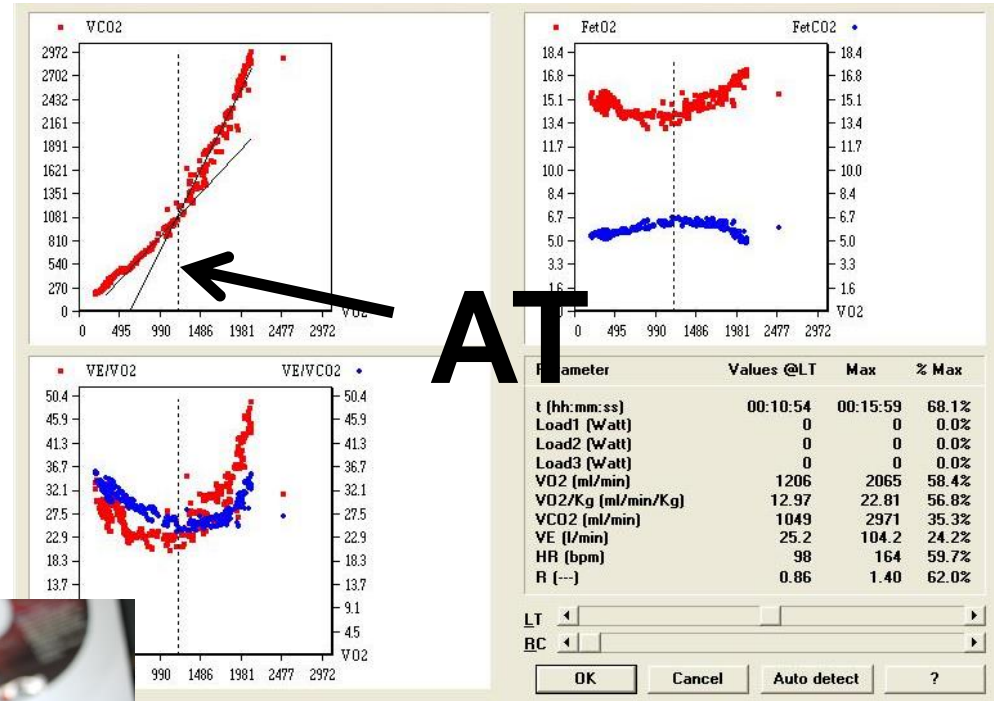


# Cohort study

- 82 individuals with PPS.
- Submaximal incremental exercise test.
- Two independent observers identified the AT.



# Submaximal exercise test

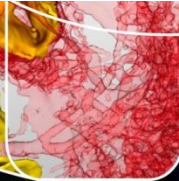
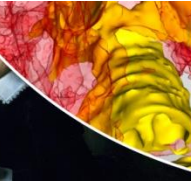
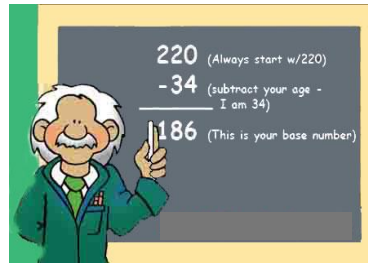
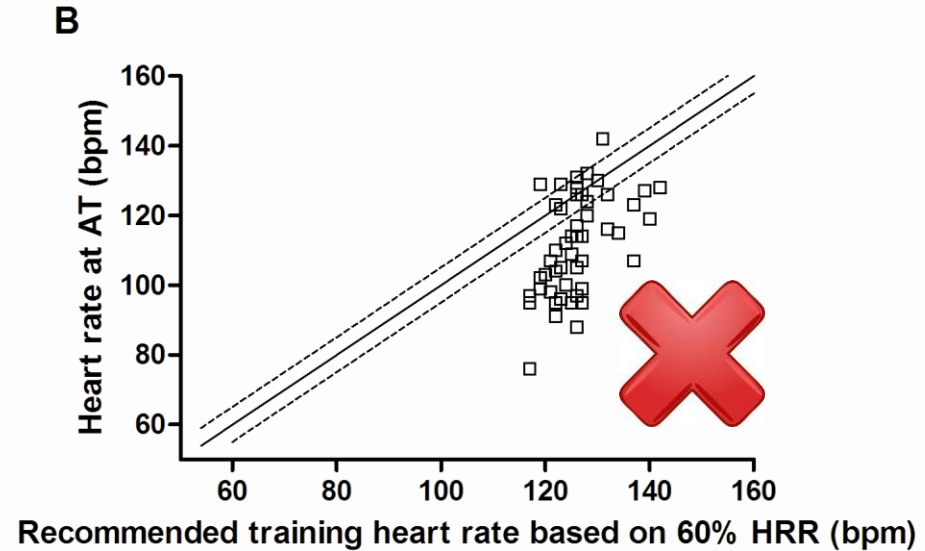
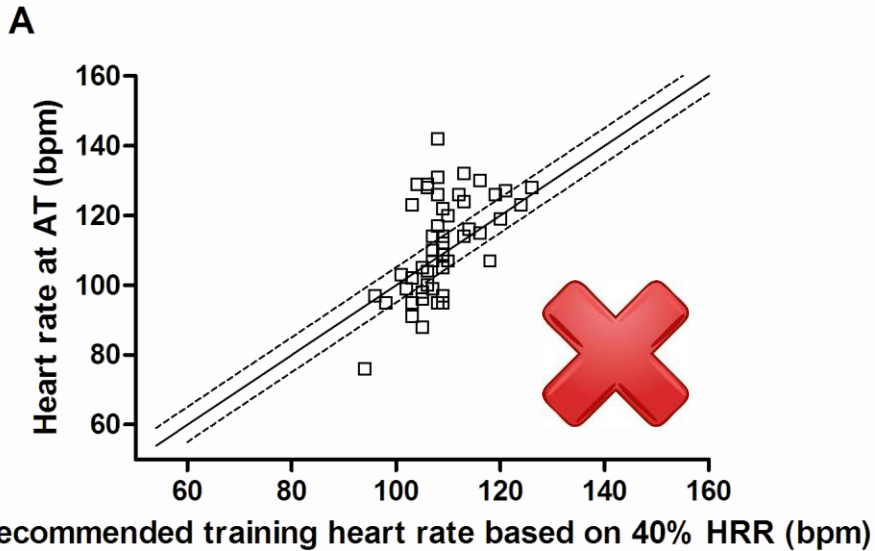


# Results (1)

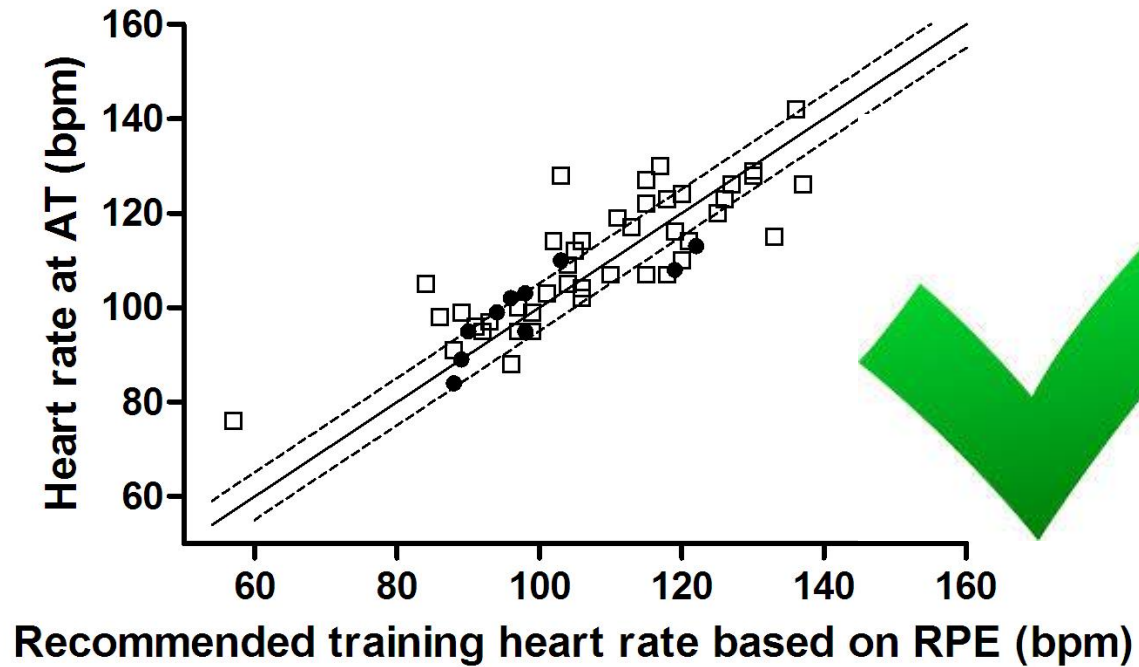
The AT was identified in 77% of the participants.



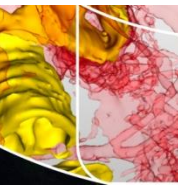
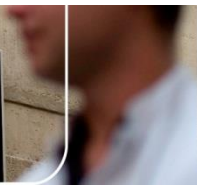
# Results (2)



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|    |                  |
|----|------------------|
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| 18 |                  |
| 19 | Very, very hard  |
| 20 |                  |



# Answers to our questions

- The AT can be identified in most individuals with PPS through submaximal exercise testing.
- Current guidelines for intensity prescription based on RPE relate quite well to the AT, and, better than prescription based on HRR.



# Conclusions

- Submaximal testing can be used to identify the AT.
- If the AT cannot be identified, prescription should, preferably, be based on RPE.

|    |                  |
|----|------------------|
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# Future research

A next step is to study the feasibility of training at the AT in individuals with PPS.

