

The ventilatory threshold in patients with Postpoliomyelitis Syndrome

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BACKGROUND

- The ventilatory threshold (VT) is commonly used to target aerobic training intensity, and is usually assessed through graded maximal exercise testing.
- In patients with Postpoliomyelitis Syndrome (PPS) these tests may result in excessive fatigue and prolonged recovery, and are therefore not feasible.
- Since the VT is reached below maximal work intensities, submaximal incremental exercise testing may also be used to assess VT.
- To date it is unknown whether the VT can be determined in PPS patients using submaximal incremental exercise testing.

OBJECTIVES

To investigate whether the ventilatory threshold can be determined in subjects with PPS using submaximal incremental exercise testing and if not, whether this is related to muscle strength of the quadriceps.

METHODS

- 60 subjects with PPS (table 1) performed a submaximal incremental exercise test on a cycle ergometer with continuous recording of heart rate and gas exchange variables using a portable breath-by-breath gas analysis system.
- Work rate was incremented 10 W/min until (1) the subject reached 80% of the predicted heart rate reserve (HRR), or (2) the pedalling frequency dropped below 60 rpm.
- At each work load and at the end of the exercise test subjects rated their perceived exertion on the Borg Scale (range 6-20).
- Two independent observers determined the VT, through visual inspection of the gas exchange plots using the V-slope method and ventilatory equivalent method (Wasserman et al., *Principles of exercise testing and interpretation*, 2005).
- Peak torque of the quadriceps was assessed during isokinetic contractions at 60°/sec.

RESULTS

- VT could be identified in 47 (78%) of the 60 subjects and occurred at a mean heart rate reserve of 43% (SD 13) (table 2)

Table 2: Exercise parameters at the moment of the VT

| | VT (n=47) |
|--|----------------|
| Power Output (W) | 48 (SD 15) |
| % Heart rate reserve | 43 (SD 13) |
| VO ₂ (ml/min/kg) | 14.1 (SD 2.6) |
| RER (VCO ₂ /VO ₂) | 0.88 (SD 0.06) |
| V _E (L/min) | 29 (SD 6) |
| Borg Scale | 12 (SD 2) |

- Subjects in whom VT was identified differed from subjects without VT only with respect to maximum power output reached in the incremental test: 86 W (SD 26) vs 59 W (SD 27), $p = 0.001$.
- Isokinetic strength values did not differ significantly between both groups (median value strongest quadriceps: 100 vs. 52 Nm, $p = 0.15$ and median value sum score left and right quadriceps : 149 vs. 81 Nm, $p = 0.39$, Mann-Whitney test).

Example of ventilatory threshold

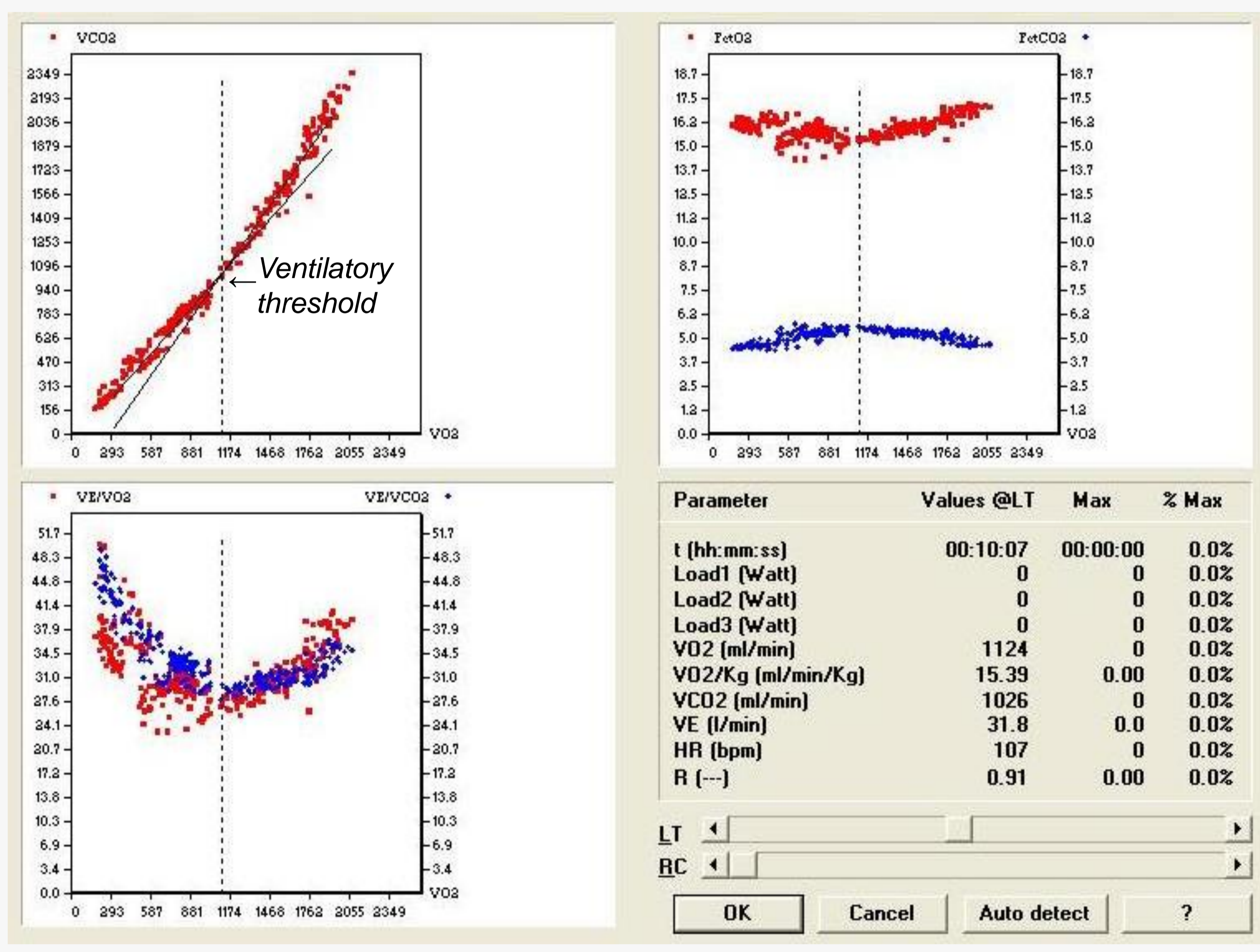


Table 1: Subject characteristics

| | PPS (n=60) |
|-----------------------------------|---------------|
| Sex (male/female) | 21/39 |
| Age (yrs) | 58.7 (SD 8.3) |
| BMI (kg/cm ²) | 26.0 (SD 3.3) |
| Residual paresis in 1 leg/ 2 legs | 41/17 |

CONCLUSIONS

In the majority of the PPS patients VT can be determined and lies within the normal range. The absence of VT in some PPS patients is associated with a lower exercise capacity and may be related to a reduced muscle strength. In PPS patients training intensity should be based upon VT.