

The Respiratory Pattern as an Indicator of the Anaerobic Threshold

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Context

Obese patients → monitoring the level of activity

The **anaerobic threshold (AT)** is the level of exercise above which some body energy is produced without oxygen.

→ in exercises over the AT, anaerobic glycolysis occurs and leads to early exhaustion.

Measuring the AT in the field is useful

→ The respiratory pattern is candidate to be related to the AT.



Methods

Data

- 12 subjects wore a portable indirect calorimeter and an instrumented shirt
- ran on a treadmill in increments
 - Breathing rate (BR)
 - Ventilation (VT)
 - Heart rate (HR)



Hypothesis

The respiratory pattern is correlated with the AT and/or changes at the AT level.

Features

Variables:

- BR, VT, HR
- BR/HR, VT/HR (normalized by the HR)
- 1/BR, 1/VT, 1/HR, HR/BR, HR/VT (inverses)

Variability measurement:

- Variance
- Variance of a quadratic fit
- Cumulative variance (to find trends)



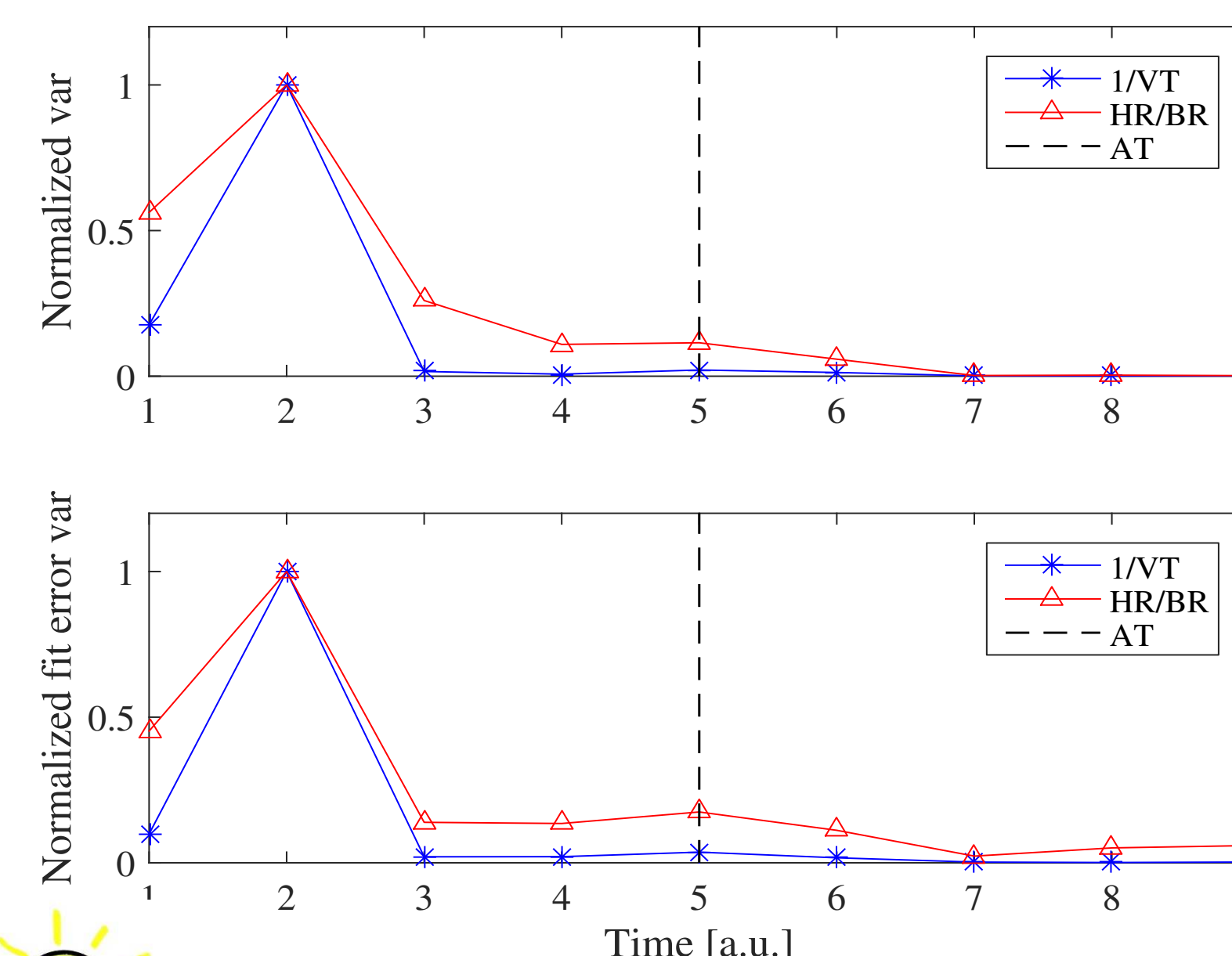
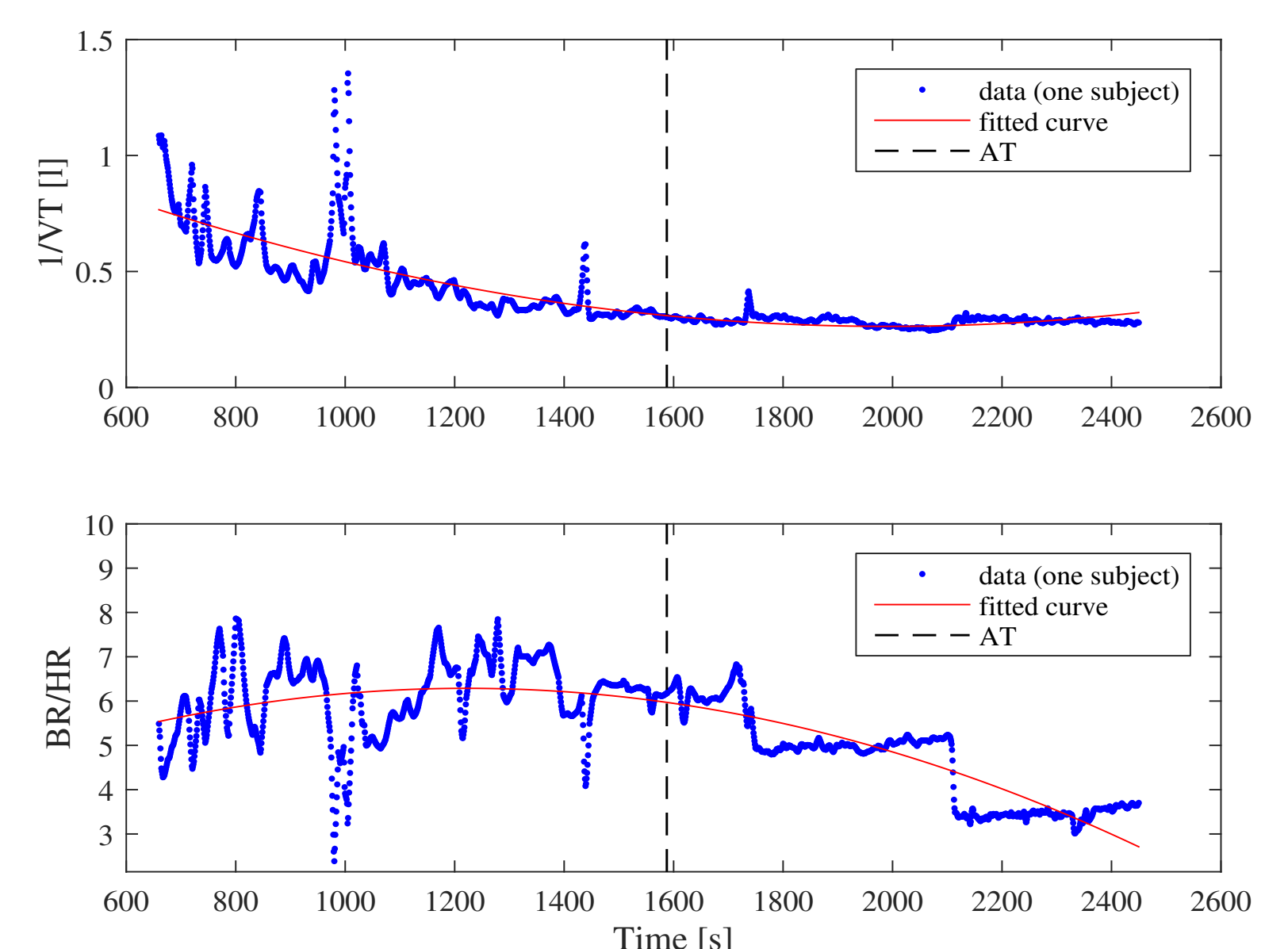
Analysis

- Statistical hypothesis testing
- Regression analysis

Results



1/VT and HR/BR show a markedly reduced variability after the occurrence of the AT. The quadratic fit is better after the AT.

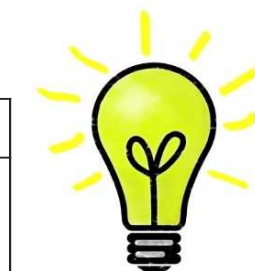
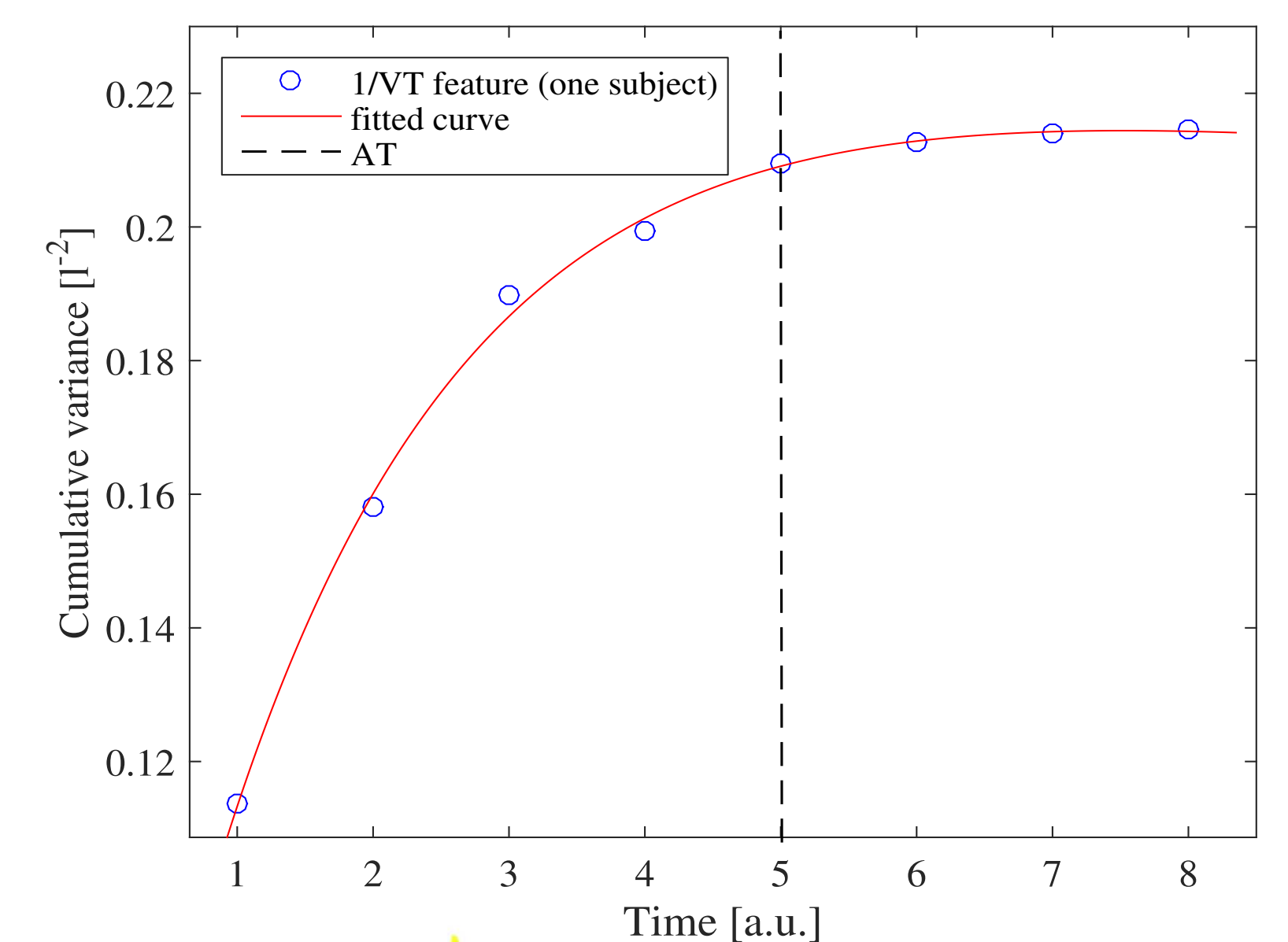


Their variance and their fit error variance are clearly smaller after AT occurrence.



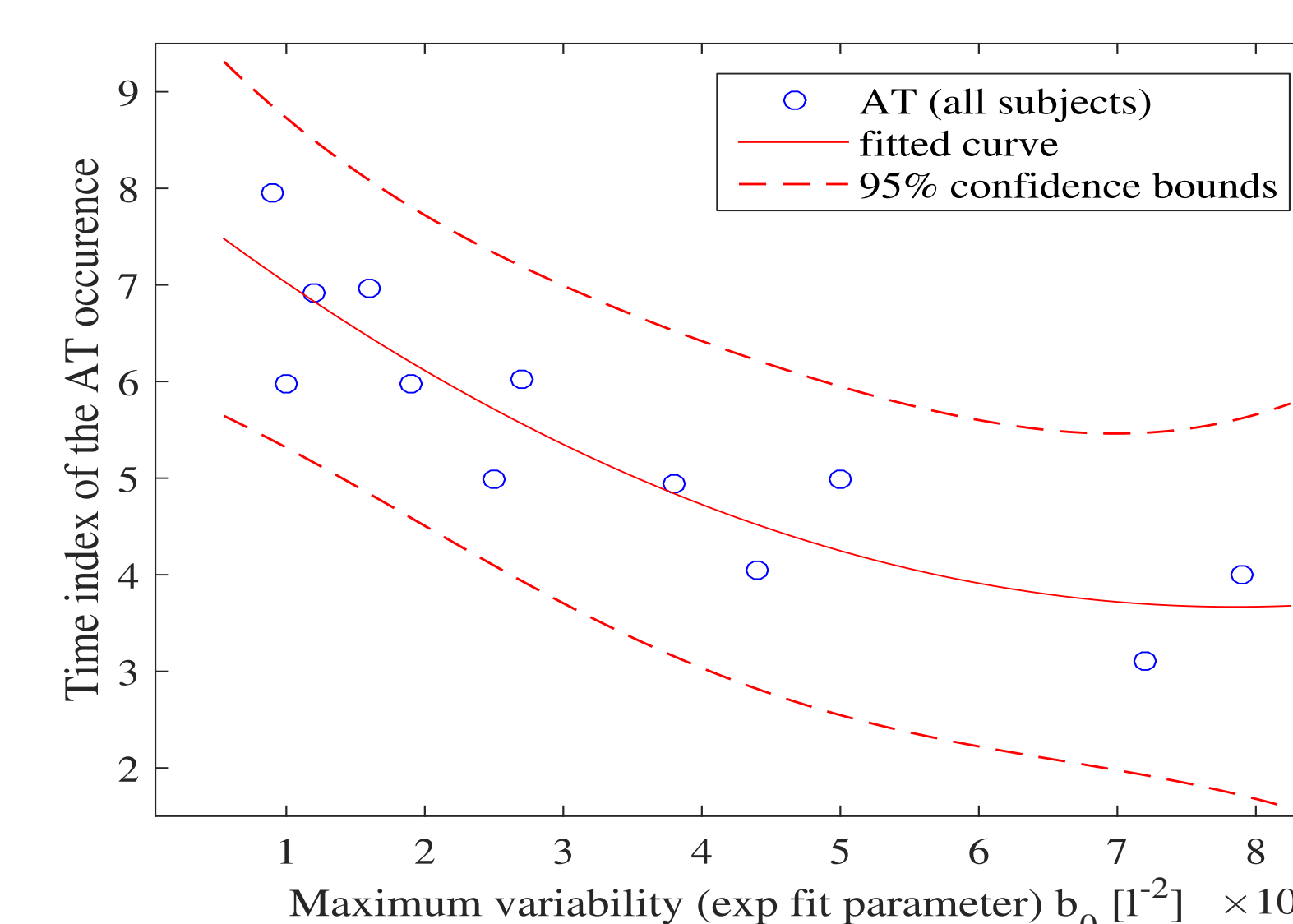
An exponential fit on the cumulative variance shows a plateau at high exercise intensity.

→ However this decrease is not statistically related to AT



The plateau of the cumulative variance is related to the AT.

→ The AT can be predicted by the ventilatory variability



Conclusions

- ✓ The variance of respiratory variables decreases with exercise intensity but apparently not always at the AT level.
- ✓ The cumulative variance of respiratory variables is inversely correlated with the AT.
- ✓ Variables recorded with an **instrumented shirt** may predict the AT **in the field** (work in progress).

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