# Watt vs. $VO_2$ in the 4-minute all-out test (new dataset)

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The new data include some extra observations (311 vs. 249 in the previous dataset), along with a few observations reporting times recorded in during races (is that true?) in K1 500 and 1000 m. The data and outcomes seem in line with the ones we previously had (Fig. 1).

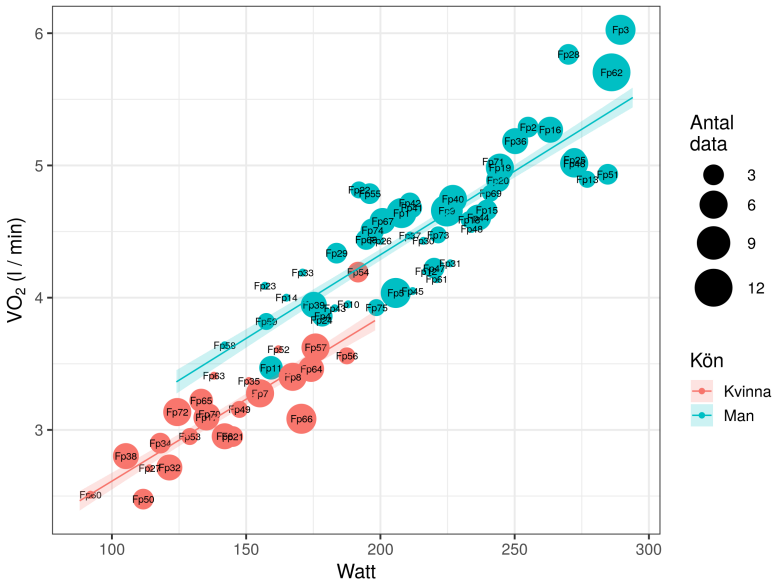


Figure 1: Data overview with ME regression lines by gender. Shaded areas represent standard errors.

The mixed-effects model estimations show that the number of Watts, the weight and the gender all are highly significant predictors of $VO_2$ consumption (Tab. 1). The model itself fits the data well (marginal Marginal $R^2 = 0.91$). The model was then used to estimate general tables showing the relation between the result in the 4' all-out test and $VO_2$ consumption by gender and weight for a wide range of the predictors (enclosed as a separate file).

In addition, I tentatively produced a picture of the relation between $VO_2$ and results on the 1000 m race (note that results are measured in seconds). There are only 8 observations for the latter variable, which makes almost impossible to do a serious analysis. Still a relation between the two data seems to exists (as it obviously should, given human physiology), and clearly appear Figure 2. Note also that, despite having so few data, the correlation between the two variables is relatively strong ($r = -0.79$) and the $p$-value is somewhat significant ($p = 0.019$), which is surprising given the few data and the many variables that could affect the race time (wind, etc.). With more data it would be probably possible to have stronger evidence about this relation.

| | Estimate | S.E. | df | $t$ | $p$ |
|---|---|---|---|---|---|
| (Intercept) | 0.800 | 0.178 | 158 | 4.5 | 0.000 |
| Watt | 0.010 | 0.001 | 291 | 15.7 | 0.000 |
| Vikt | 0.013 | 0.003 | 225 | 4.2 | 0.000 |
| Man | 0.436 | 0.074 | 113 | 5.9 | 0.000 |
| N. of observations | 311 | | | | |
| N. of groups (athletes) | 83 | | | | |
| Marginal $R^2$: | 0.91 | | | | |

Table 1: Mixed effects model estimates on $VO_2$ consumption. The reference category for gender are women.

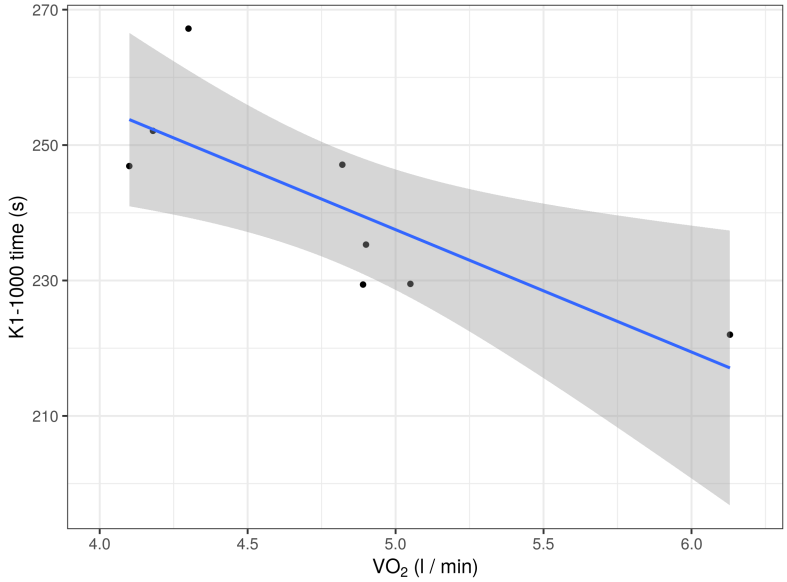


Figure 2: $VO_2$ vs time in the K1 1000 m race. Time is measured in seconds.

I don't reports anything here about the K1 500 m results because there are only 5 valid observations. However, at a first glance the trend seems to be similar.