

# **The Record Work Profile (RWP) to assess the effect of fatigue on the different intensity zones**

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## **Introduction:**

The Record Power Profile has been widely used to distinguish the rider levels [2] of fitness. Recently, this approach was pushed further by determining the power profile under fatigue state, discriminating more importantly the rider's category level [1]. However, this power profile doesn't traduce the ability to multiple efforts at different intensity levels to win races, as often seen during classics and grand tours. This makes it difficult to classify the rider skills within a World Tour team. Therefore, we developed a new methodology to quantify the rider's capacity to produce mechanical work in different intensity zones of exercise with the duration of the exercise. We hypothesised that this mechanical work production at different intensity zones would allow categorizing riders at the highest level.

## **Method:**

The riders of the team were visually classified into two categories according to their cycling skills. 16 of the riders were identified as CLIMBER/PUNCHER and 12 of the riders as SPRINTER/ROULEUR.

For all riders of the team, we determined the races during which they produced more mechanical work in 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, 6 hours, and 7 hours. For these record activities, we determined the amount of work produced in the 7 intensity zones of the Rate of Subjective Exercise Intensity (RSEI) scale [3]. This distribution of work production for each duration was called « Record Work Profile ». For further statistical analysis, we focused on the record for 5 hours since this duration is often reached during races.

## **Statistical Analysis:**

Two-way ANOVA (Category\*Intensity Zone) was performed to investigate the difference between CLIMBER/PUNCHER and SPRINTER/ROULEUR (Category) in mechanical work produced in 5 hours in each intensity zone (Intensity) of their Record Work Profile. Cohen's d classification of effect size was used, whereby  $d < 0.2$  = negligible effect;  $d = 0.2-0.49$  = moderate effect,  $d = 0.5-0.8$  = moderate effect, and  $d > 0.6$  = large effect

## Results:

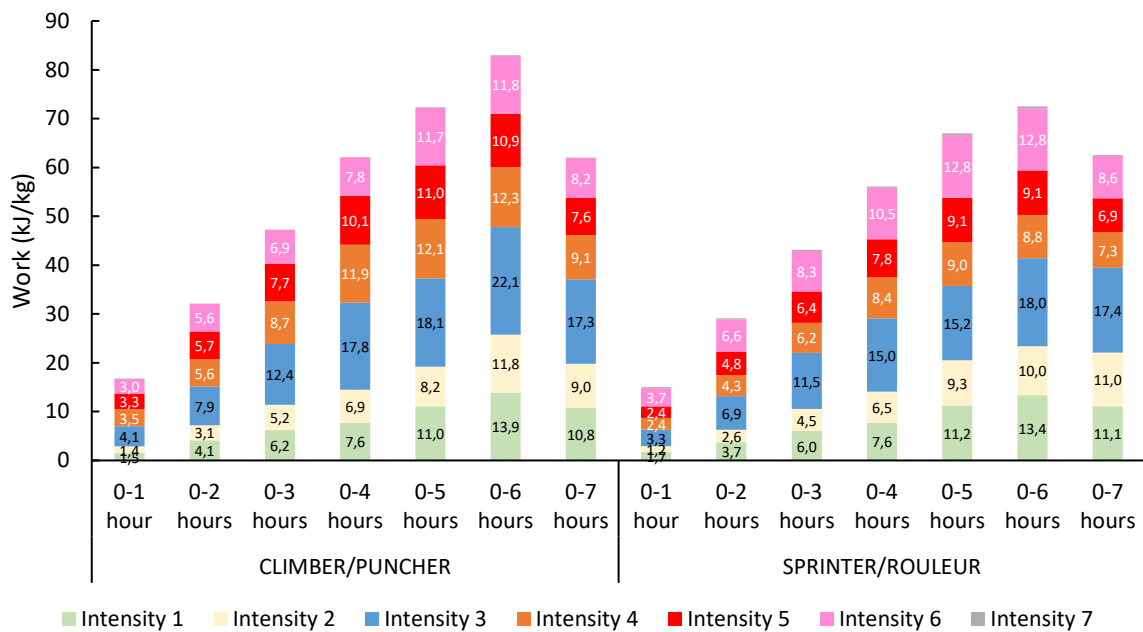


Figure 1 2022 Record Work Profile of the CLIMBER/PUNCHER and SPINTER/ROULEUR

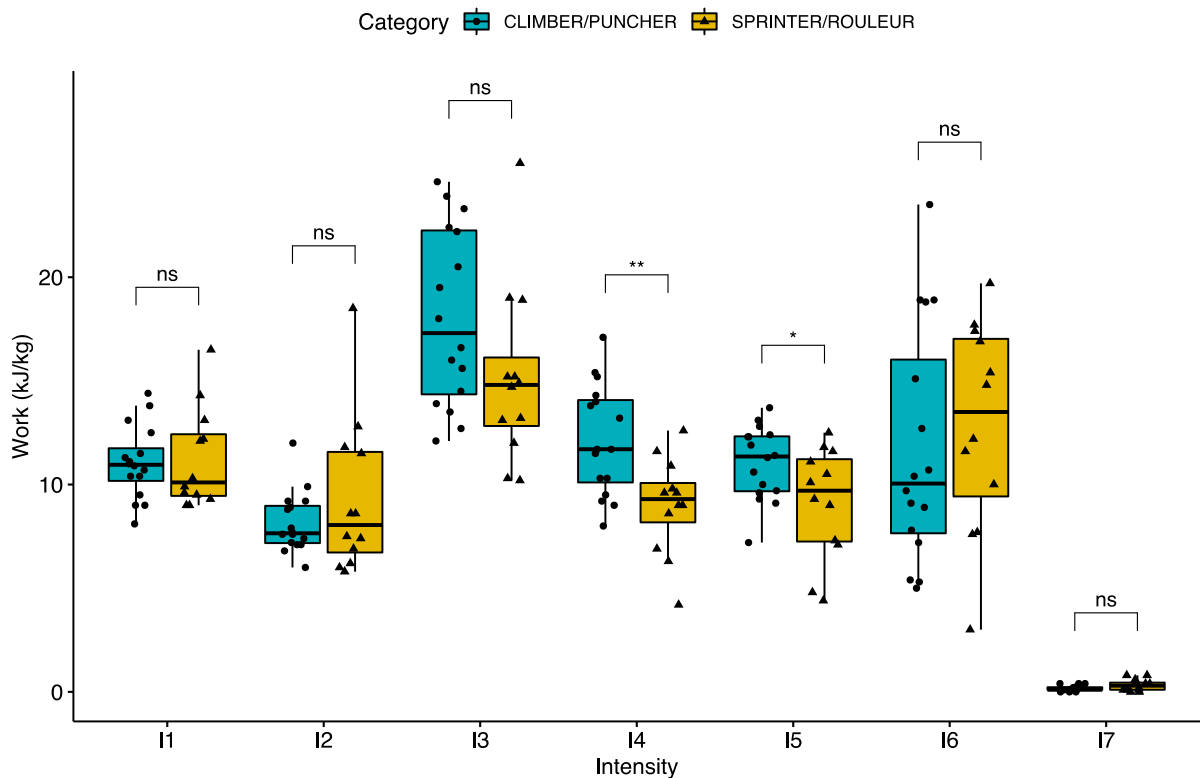


Figure 2: Boxplot and individual representation of the 2022 record work profile of the CLIMBER/PUNCHER and SPINTER/ROULEUR for 5 hours. \*\*  $p < 0,005$ ; \*  $p < 0,05$ ; ns: not significant

Two-way ANOVA revealed that the CLIMBER/PUNCHER produced 35% more work in intensity 4 ( $p < 0,005$ ,  $d > 0,8$ ) and 21% ( $P < 0,05$ ,  $d > 0,8$ ) more work in intensity 5 than

SPRINTER/ROULEUR. Work in intensity 7 tends to be higher for SPRINTER/ROULER than CLIMBER/PUNCHER (+56%,  $d=0.7$ ) .

### **Conclusion:**

The record work profile would be a relevant signature of the rider category at the highest level. CLIMBER/PUNCHER can produce more work at intensities 4 and 5, which corresponds to intensity near anaerobic threshold and maximal aerobic power. Such work would be produced during short or long climbs sections.

Further investigation should be carried out to differentiate a stage races leader from a partner or puncher, or a sprinter from a rouler.

### **References:**

1. Mateo-March M, Valenzuela PL, Muriel X, Gandía A, Zabala M, Lucia A, Pallares JG, Barranco-Gil D (2021) The Record Power Profile of Male Professional Cyclists: Fatigue Matters. *International Journal of Sports Physiology and Performance* 7
2. Pinot J, Grappe F (2011) The Record Power Profile to Assess Performance in Elite Cyclists. *Int J Sports Med* 32:839–844. doi: 10.1055/s-0031-1279773
3. Scholler V, Gros Lambert A, Pirlot T, Grappe F (2023) Opposite effects of a time-trial and endurance cycling exercise on the neural efficiency of competitive cyclists. *European Journal of Applied Physiology*