

Conference Abstract

Are the First Hours of Stages a Determining Aspect in Cyclists' Performance? Analysis of Power Output in Pro Team vs. World Tour Riders

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Abstract

Introduction: Grand Tour road cycling races consist of multiple stage types that place varying physiological demands on riders. Teams are classified by the UCI as either World Tour (WT), the highest professional level, or ProTeam (PT) who require wildcard invitations. Previous research has found WT riders outperform PT riders, but no studies have directly compared internal and external load between categories. As fatigue influences subsequent performance, the aims were to describe and compare load during the initial hours of competition between WT and PT riders.

Materials and Methods: Power output data from 16 WT and 16 PT cyclists competing in the 2020 Vuelta a España were analyzed. Functional threshold power (FTP) was determined as the 95% of the best 20-minute mean power. Intensity factor (IF), normalized power (NP), training stress score (TSS) and time spent in low (Z1), mid (Z2) and high (Z3) intensity zones were calculated. Data from the first 3 hours of 16 stages (2 flat, 9 semi-mountain, 5 mountain) were compared between categories using statistical analysis.

Table 1. Physical Demands and Performance Indicators in a Professional WT and PT During La Vuelta 2020

	WT (n = 16)	PT (n = 16)	P-value	Cohen d
Age, y	28.8 ± 5.2	27.3 ± 4.0	.340	0.32
Height, cm	183 ± 8	176 ± 5	.006 *	1.05
Weight, kg	66.5 ± 5.7	65.5 ± 4.9	.577	0.19
BMI, kg·m ²	19.8 ± 1.2	21.0 ± 1.1	.003 *	1.04
Final position (individual ranking out of 142 cyclists)	34.6 ± 28.9	82.5 ± 24.8	<0.001 *	1.78
Best position on stage	10.1 ± 11.7	24.4 ± 13.0	.002 *	1.16
Seasons in professional category	8.6 ± 5.1	7.3 ± 3.9	.388	0.29
Functional threshold power, W	386 ± 25	351 ± 19	<0.001 *	1.58
Functional threshold power, W·kg ⁻¹	5.8 ± 0.4	5.4 ± 0.2	<0.001 *	1.26
Maximum HR, ppm	186 ± 6	190 ± 6	.106	0.66

Abbreviations: AU, arbitrary units; y, years; MBI, body mass index; HR, heart rate; PT, ProTeam; WT, WorldTour.

Note: Data are shown as mean (SD).

Significant P values are in bold font.

Significant differences between categories: *P <.05



Results: WT riders had a higher FTP ($386 \pm 25\text{W}$ vs $351 \pm 19\text{W}$, $p < 0.001$). Intensity factors and training stress scores were higher for PT riders over time ($p = 0.021$). Normalized power was higher for WT riders ($p = 0.049$). WT riders spent more time in zone 1 ($p = 0.022$) while PT riders spent more in zone 3 ($p = 0.001$). No differences were found for internal loads.

Practical applications: PT riders expend more energy than WT counterparts early in stages, indicated by higher intensity scores over time. This early fatigue may influence subsequent performance. Coaches should consider pacing strategies to optimize energy use for PT riders competing against better-trained WT opponents. Tapering fitness testing could help identify optimal FTP-based training zones.

Conclusions: Higher early stage intensity leads to greater fatigue accumulation for PT versus WT riders, as evidenced by internal and external load metrics. While differences are small, marginal gains approach suggests they may influence final classification. Future research should consider stage profiles and individual rider characteristics.

Keywords: Cycling, Power Output, World Tour, Pro Team, Fatigue, Pacing Strategy

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