Abstract

Workload characteristics and race performance of U23 and elite cyclists during an UCI 2. Pro multistage race (Tour of the Alps)

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1. Background

Professional multistage cycle racing is characterised by complex team tactics and race strategies, but the primary predictor of race success is still a rider's individual physical capacity [1,2]. In their development towards elite cycling, U23 cyclists are required to progressively improve their physical qualities and adapt to the elite race formats, which in itself is a selection process. Increasing the workloads in training and racing for better performance outcome requires a well conceptualized training load quantification system [3,4] as well as a carefully managed training intensity distribution [5]. The aim of this study was to compare workload parameters and racing performance in U23 and elite cyclists across two editions of a UCI 2. Pro multistage; Tour of the Alps. In this mountainous five-day stage race the riders complete an average total distance of >700 km and climb ~13000 m. Methods: Fourteen U23 cyclists from an UCI continental team (mean ± SD age 20.8 ± 0.9 years; body mass 69.3 ± 6.2 kg; height 181.6 ± 5.6 cm; BMI 20.9 ± 1.2 kg.m-2) and 11 elite cyclists from a UCI pro continental and a world tour team (mean ± SD age 28.9 ± 4.0 years; body mass 62.2 ± 4.4 kg; height 177.1 ± 4.9 cm; BMI 19.8 ± 0.9 kg.m-2) participated in this study. All riders completed the same UCI 2. Pro multistage race in either 2018 or 2019, except two riders who raced in both years. (add how many completed both). Relative Maximum aerobic power (MAP)[6], 20min mean maximum power (MMP), 20min MMP after 2000 kilojoules (kJ), average power (AP) and normalized power (NP) were recorded in all stages. Workload was quantified via total work, total training stress score [7] (TSS), Lucia's training impulse [8] (TRIMP) and the ratio of TSS/km as well as kJ/km [3]. Metcalfe's relative power distribution method [9] was used to classify percentage of overall race time at; <1.9 W.kg-1, 2.0-4.9 W.kg-1, 5.0–7.9 W.kg-1 and >8.0 W.kg-1. Race performance was expressed as final general classification (GC) position, absolute time difference to the winner, and percentage time difference to the winner. Independent-samples t-tests were conducted to compare U23 and elite categories. In addition, multiple regression analyses were performed to assess the influence of anthropometrics, relative power output,

power output distribution, and workload parameters on race performance in each group.

2. Results

Anthropometric data including body mass, BMI, and body surface area (BSA) were lower in elite riders compared to U23 ($p<0.05$). MAP, 20min MMP, 20min MMP after 2000 kJ, AP, and NP between the two groups indicated higher peak values in elite riders ($p<0.05$). Percentage of overall race time at 2.0-4.9 W.kg^{-1}, 5.0–7.9 W.kg^{-1} and >8.0 W.kg^{-1} was higher in the elite group ($p<0.05$), while the U23 group performed a higher percentage of total race time at <1.9 W.kg^{-1}. Workload parameters including TSS, TRIMP, total work, TSS/km and kJ/km were not significantly different between the two groups. A multiple regression analysis compared the influence of MAP, 20min MMP, 20min MMP after 2000 kJ, AP, and NP on GC position and found MAP to be the strongest predictor ($F(1,14)=26.534$, $p≤0.001$). Furthermore, multiple regression analyses were performed for anthropometrics, relative power distribution, and workloads, on final GC position. BSA ($F(1,16)=5.978$, $p = 0.026$) for anthropometrics, percentage of overall race time at 5.0–7.9 W.kg^{-1} ($F(1,14)=13.595$, $p = 0.002$) and TRIMP and kJ/km ($F(2,10)=11.397$, $p = 0.003$) for workloads, were the strongest determinants of GC (see figure 1).

3. Conclusion

Differences in MAP, BSA, percentage of overall race time at 5.0–7.9 W.kg^{-1}, TRIMP, and kJ/km were the best predictors of GC. In addition, these results suggest that U23 cyclists need to improve in several areas; body composition, physical conditioning, and race tactics during their maturation to the elite level. Further research is recommended to better understand the complex mechanisms that underpin performance in professional road cycling.

Keywords: cycling, racing, workload, performance

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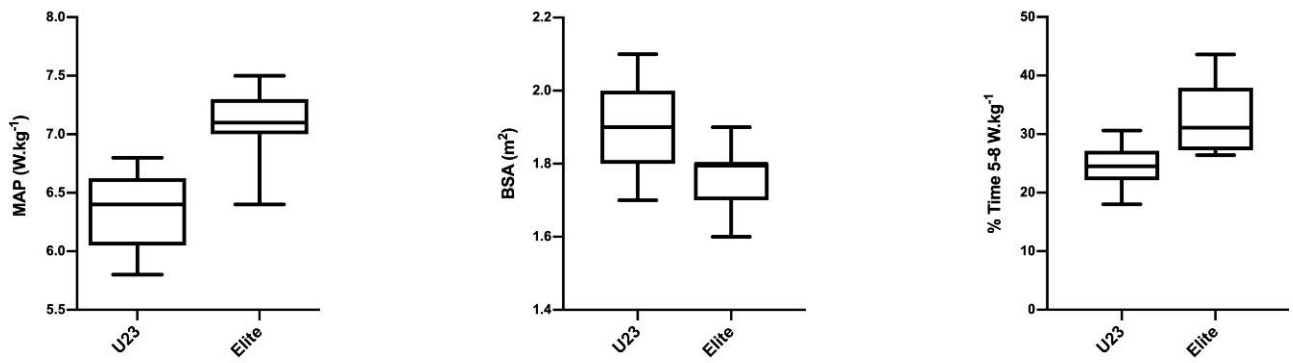
Figure 1. Differences in MAP, BSA and percentage of overall race time at 5.0-7.9 W.kg-1 between U23 and elite cyclists.