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Article

Position for the Sprint: A performance analysis of intermediate sprints in the Men's Elite Omnium Points Race

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1. Introduction

In the Omnium Points Race, points are awarded to the first 4 race participants (sprint ranks) to cross the finish line at the end of every tenth lap (intermediate sprint). Five points are given to first place, three to second, two to third, and one awarded to fourth. The winner of the overall race is the race participant with the most points at the end, as such there is an advantage to maximizing points scored. However, there is no research exploring the determinants of performance within the Omnium Points Race. This study identifies determinants of sprint rank during the intermediate sprints during the fourth event of the Men's Elite Omnium – the Points Race. The study explores the relationship between the speed demands, pacing, and positioning of points scorers.

2. Methods

Seven Union Cycliste Internationale (UCI) elite Omnium Points Race competitions were video recorded in the 2019/2020 season. Using video analysis software (Dartfish Live, 2019, Fribourg Switzerland), a record of time elapsed was created. A tag was placed in the video recording each time the researcher observed the front axle of a points scoring sprint rank crossed the Pursuit Line and thus completed a half lap. The data was used to calculate the time taken (seconds) to complete each half lap, average speed (km/hr) to complete each half lap, and the relative position of sprint ranks within the bunch at the end of each half lap during the 10 laps in the lead up to each sprint ($subsection_{tenlap}$). The speed demands were calculated as the peak average half lap, 1 lap, 2 lap and 5 lap speeds. The pacing of points scoring sprint ranks was assessed as the difference in time taken to complete each half lap. The positioning order of sprint ranks was calculated by the order of elapsed time at the end of each half lap.

A One-way ANOVA was used to compare the average speed of points scoring sprint ranks between half lap, 1 lap, 2 lap and 5 lap durations. Further One-way ANOVAs were used to compare average speeds between each of the sprint ranks for each duration.

Smallest Worthwhile Change (SWC) was calculated as the standard deviation of the difference between time taken to complete the last half lap of the $subsection_{TenLap}$ between all sprint ranks multiplied by 0.2 (Hopkins., 2004). SWC was then used to compare the time taken to complete each half lap during the $subsection_{tenlap}$ between points scoring sprint ranks.

Kruskal Wallis Tests with Dunn's Multiple Comparisons of position order at the end of each half lap were used to compare the positioning of points scoring sprint ranks.

3. Results

A One-way ANOVA demonstrated no significant differences (P>.05) in the peak half lap, 1 lap, 2 lap or 5 lap average speeds between 1st to 4th place sprint ranks. Figure 1 demonstrates that points scoring sprint ranks were able to achieve higher peak speeds for shorter durations.

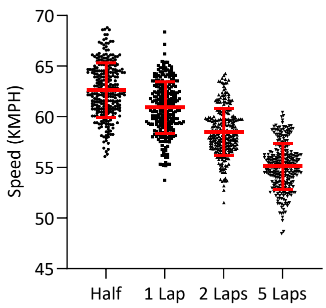

Figure 1. The average peak speeds (km/hr) for points scoring sprint ranks during each corresponding subsection$_{tenlap}$ for half lap, 1 lap, 2 lap and 5 lap durations. Mean and standard deviations are represented in red.

The (SWC) in difference of time taken to complete each half lap between points scoring sprint ranks was calculated as -0.15s. As represented in Figure 2, The median difference between 1st sprint rank and the other points scoring sprint ranks was greater (faster) than the SWC for half laps: 4 and 6 from 2nd sprint rank, 2, 5.5 and 6 from 3rd sprint rank and 4, 4.5, 5.5, 6 and 6.5 from 4th sprint rank. Conversely, there were only 3 differences greater than SWC for the other sprint ranks: half laps 1.5 and 2 for 2nd sprint rank from 3rd and half lap 6 for 4th place from 3rd.

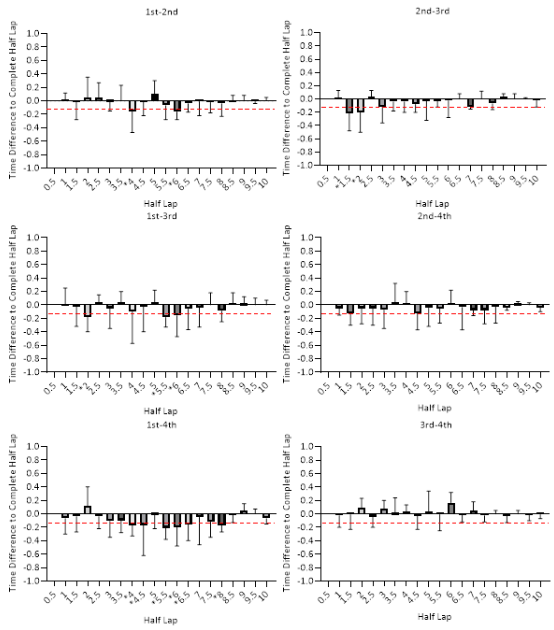

Figure 2. Bar graphs depicting the difference in time taken to complete each half lap between each of the points scoring sprint ranks. Bars represent the median difference, and the error bar represents the 95% confidence interval. The red dotted line represents the Smallest Worthwhile Change.

Figure 3 shows that 1st place sprint rank is, on average, positioned further forwards amongst the bunch than the other sprint ranks from the mid-point of the subsection$_{tenlap}$. Kruskal Wallis Tests with Dunn's Multiple Comparisons of position order at the end of each half lap show 1st place sprint rank is more likely to be in a more advanced position than the 3rd place sprint rank at: lap 6 (P=.048) lap 7 (P=.016) and laps 8, to 10 (P≤.01), than the 4th place sprint rank from laps 8 to 10 (P≤.01) and from 2nd place sprint ranks at laps 9.5 and 10 (P=.03, <.01). Second place sprint rank was likely to be in a more advanced position from 4th place sprint rank for laps 9, 9.5 and 10 (P=.04, <.01, <.01) and from 3rd place sprint rank for laps 9.5 and 10 (P=<.01, <.01). The third-place sprint rank was only likely to be in a more advanced position from 4th place sprint rank at the last half lap (P=<.01).

Half Lap	Sprint Rank 1st	2nd	3rd	4th
0.5	6.7	5.7	6.8	6.3
1.0	6.4	5.8	6.4	6.1
1.5	5.9	5.4	6.1	5.9
2.0	6.1	5.4	6.5	6.1
2.5	6.0	5.2	6.2	6.0
3.0	6.0	4.7	6.3	6.2
3.5	5.9	5.2	5.9	6.2
4.0	5.2	5.7	5.9	6.2
4.5	5.2	5.6	5.9	6.5
5.0	5.0	4.9	5.9	6.3
5.5	4.4	4.8	5.6	6.3
6.0	3.9	5.1	6.0	6.3
6.5	3.9	5.1	5.9	5.8
7.0	3.4	4.7	5.6	5.6
7.5	3.1	4.4	5.3	5.1
8.0	2.7	3.9	4.6	4.9
8.5	2.2	3.2	3.7	4.2
9.0	1.9	2.8	3.2	3.7
9.5	1.5	2.3	3.1	3.8
10.0	1.0	2.0	3.0	4.0

Figure 3. Mean average rank (out of top 12 overall ranks) for points scoring sprint ranks in 10 subsection$_{TenLap}$ before corresponding intermediatte sprint.

4. Discussion

The goal of this research was to provide novel insight into the determinants of performance of intermediate sprints during Elite Men's Omnium Points Races. The research has shown all point scoring sprint ranks achieved similar peak speeds (km/hr) over half lap to 5 lap durations. A difference between earning maximal points and not could be observed in the pacing of the subsection$_{tenlap}$ and the relationship between pacing and the positioning relative to opponents. Race participants finishing in 1st place sprint rank were more likely to travel faster throughout the middle section of the subsection$_{tenlap}$ which concurs with the observation of the 1st place sprint rank being more likely to move to a more advanced position at the midway point in the subsection$_{tenlap}$.

The range of peak speeds for all durations represented in figure 1 suggests that the speed demand to score points in an intermediate sprint differs between intermediate sprints. Despite the differences, a race participant with a greater ability to achieve the higher speeds observed had a greater potential to score points in more intermediate sprints than a race participant who was unable to achieve the higher speed demands. This may be because the race participants with the ability to achieve higher speeds could choose how they distributed and paced their effort in relation to their relative position on the velodrome compared to their opponents. A rider with a lesser ability would not be able to achieve the required speeds to pace themselves into the position to be successful in the intermediate sprint.

The observed differences in pacing and positioning between the sprint ranks offer an insight as to how riders maximised points scored in intermediate sprints by pacing and positioning themselves further forwards during the 3rd quarter of the subsection$_{tenlap}$. Whilst this data provides useful insights of the speed demands, pacing and positioning strategies during the 2019/20, the insights described here may not be representative of future races as the tactics and context of the races develop. However, the methodologies presented in this research could be used to gather greater datasets over multiple seasons to further understand pacing and positioning patterns, provide a greater representation of more race scenarios and develop the understanding of the relationship between a rider's ability to achieve the speed demands, their pacing and their positioning within the bunch to help future athletes and coaches.

5. Practical Applications.

Coaches and athletes may use this research to inform future training and racing decisions. The speed demands presented in this research represent performance standards which could be used to inform training and selection. The pacing and positioning data from this research may also inform the tactics of future Omnium race participants. However, a more widely applicable application of this research would be to use the performance analysis methodology presented to monitor changing pacing and positioning patterns within the Omnium, and possibly also within other track cycling events.

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Conflicts of Interest: The authors declare no conflict of interest.

6. References

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