Minimising drag to maximise results

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The researchers analysed the aerodynamic force variation of the athletes subject to interference and the change in forces, particularly drag, allowed them to model and predict the effect on performance.

One of the most exciting parts of the Tour de France for spectators is the tactical vying for spots in the breakaway group at the front of the pack.

In trying to better understand the aerodynamic interactions between cyclists, researchers from Monash University and the Australian Institute of Sport studied how riders' drag was affected by the relative position of multiple cyclists (in a formation).

Nathan Barry, a PhD student from the Department of Mechanical and Aerospace Engineering, said the research, undertaken by the Monash Wind Tunnel Sports Group, was designed to optimize the aerodynamics of elite riders when in a drafting or slipstreaming configuration.

Drafting or slipstreaming happens when two or more cyclists align in a close group. Taking advantage of the lead rider's slipstream reduces the effect of drag, or air resistance. Drafting can significantly reduce the average energy expenditure required to maintain a certain speed and can also slightly reduce the energy expenditure of the lead rider.

"Typical racing speeds seen in professional cycling are 45km/h and getting up to 65-plus in a sprint, and over 90 per cent of an athlete's power is expended overcoming drag," Mr Barry said.

"If cyclists can reduce that drag, it will significantly improve their performance."

The researchers found that two riders drafting the trailing rider could experience up to a 49 per cent drop in drag and the lead rider up to 5 per cent. When riders were travelling closely side by side or overtaking, the drag could increase by up to 6 per cent above that for a rider travelling alone.

"With the time being a critical factor in winning a stage or even the whole tour, it is important that teams understand how drag works when they are in a pace line such as a small breakaway group, overtaking or travelling side by side with another rider," Mr Barry said.

Given the many complex interactions taking place in road cycling, the research could help fine-tune team tactics as well as potential interference tactics.

"Small reductions in drag leading to gains in speed across the duration of an event can mean the difference between crossing the finishing line first or second," Mr Barry said.

Provided by Monash University