

It takes a special kind of cyclist to win the Tour de France

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The 2015 Tour de France ranges across a wide variety of terrain.
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The Tour de France is the world's most famous cycling competition, and

not just for its sheer length or stunningly picturesque vistas. The Tour captures our attention because the diversity among its 21 gruelling stages pushes its participants to their very limits in ways that other cycling competitions do not.

To win the Tour, the competitor has to be a rare breed indeed: a cyclist who can excel in multiple areas, not just a specialist in straight line speed or climbing hills.

This year's Tour starts in Utrecht, Netherlands, on Saturday July 4 and rolls to an end three weeks later in Paris, on the Champs-Élysées. In between are 21 stages, including nine flat, three hilly and seven mountainous, with five summit finishes. Each competitor also takes part in two time trials: an individual and a team time trial.

Lifting that bike

The physical demands placed on athletes during the Tour are extremely complicated and influenced by many factors beyond just the average race speed. One crucial factor that influences race tactics, and the likelihood of a particular [cyclists](#) performing well in a stage of the Tour, is the change in elevation during the race.

It's important to note that elevation gain simply describes the distance travelled in a vertical plane. It is not related to the steepness or length of the climbs. This is important because, when considering climbing, the most important use of energy is used moving the rider's mass (and that of their bike) vertically against gravity.

The stages				
STAGE	TYPE	DATE	START AND FINISH	DISTANCE
1	Individual time trial	Saturday, July 4th	Utrecht / Utrecht	13.8 km
2	On-line	Sunday, July 5th	Utrecht / Zélande	166 km
3	On-line	Monday, July 6th	Anvers / Huy	159.5 km
4	Hilly	Tuesday, July 7th	Seraing / Cambrai	223.5 km
5	On-line	Wednesday, July 8th	Arras Communauté Urbaine / Amiens Métropole	189.5 km
6	On-line	Thursday, July 9th	Abbeville / Le Havre	191.5 km
7	On-line	Friday, July 10th	Livarot / Fougères	190.5 km
8	On-line	Saturday, July 11th	Rennes / Mûr-de-Bretagne	181.5 km
9	Team time trial	Sunday, July 12th	Vannes / Plumelec	28 km
-	Rest day	Monday, July 13th	Pau	-
10	Mountain	Tuesday, July 14th	Tarbes / La Pierre-Saint-Martin	167 km
11	Mountain	Wednesday, July 15th	Pau / Cauterets - Vallée de Saint-Savin	188 km
12	Mountain	Thursday, July 16th	Lannemezan / Plateau de Beille	195 km
13	Hilly	Friday, July 17th	Muret / Rodez	198.5 km
14	Hilly	Saturday, July 18th	Rodez / Mende	178.5 km
15	Hilly	Sunday, July 19th	Mende / Valence	183 km
16	Hilly	Monday, July 20th	Bourg-de-Péage / Gap	201 km
-	Rest day	Tuesday, July 21st	Gap	-
17	Mountain	Wednesday, July 22nd	Digne-les-Bains / Pra Loup	161 km
18	Mountain	Thursday, July 23rd	Gap / Saint-Jean-de-Maurienne	186.5 km
19	Mountain	Friday, July 24th	Saint-Jean-de-Maurienne / La Toussuire - Les Sybelles	138 km
20	Mountain	Saturday, July 25th	Modane Valfréjus / Alpe d'Huez	110.5 km
21	On-line	Sunday, July 26th	Sèvres - Grand Paris Seine Ouest / Paris Champs-Élysées	109.5 km

We recently [conducted a study](#) that found the amount of uphill climbing within a stage influences the number of cyclists reaching the finish line in a group. Flatter stages, with a change in elevation of less than 1 km, often end with more than 100 cyclists in final group of the stage. Meanwhile, a change in elevation of more than 2 km typically results in only 15 to 20 cyclists together at the finish line.

This may seem intuitive, yet it is important to outline the precise elevation changes that begin to influence race outcomes. This is especially the case when you consider that a change in elevation of 1 km is equivalent to moving the mass of the cyclist and bike up the Eiffel Tower approximately three times.

Stages with more than 3 km of elevation almost always see only one or two cyclists approaching the finish line together. Some stages in Tour races have an elevation change greater than 5 km, which is the equivalent of going from sea level to the base camp of Mt Everest.

This research could help riders and teams choose the best possible strategy for success during each individual stage of the Tour.

Green and red polka dots

Due to the differing demands of each of these races, cyclists can be categorised into different specialisations. Interestingly, we have shown that cyclists specialise into these groups early in their career, even [while still teenagers](#).

There are generally conceived to be five speciality groups among cyclists. Sprinters and flat terrain cyclists usually achieve their best results in flat stages, and may be able to compete for the sprinter's green jersey. But they are unlikely to win the overall event.

Time trialists are often slightly heavier than all terrain and climbers, who perform best in mountainous stages. Time trial specialists are able to produce high power output for prolonged periods, requiring high aerobic fitness. However, there are few stages within the Tour de France specifically designed for such riders.

Climbers also have extremely high cardiovascular fitness and compete for the red polka dot jersey. Yet, these climbers are generally lighter than other specialties, given they have to excel in mountainous stages.

Overall there are four possible jerseys in the Tour de France. The green jersey is given to the cyclist who wins the most points for the various sprints in the tour. The red polka dot jersey is given to the best climber, while the white jersey is given to the best placed cyclists under 25 year old in the overall standings. The the important and iconic yellow jersey is given to the cyclists leading the overall event.

So every stage of the Tour de France has its own winner and classification. However, it takes a rare athlete to be able to win the Tour de France as they are required to excel in each and every different stage type.

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