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Science applied to the 1-hour-record attempt: let's keep on working… together!

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The past and present of the 1-hour-record attempt

Ever since the best-known riders such as Fausto Coppi, Jaques Anquetil, Eddy Mercx, Francesco Moser, and Miguel Indurain first attempted it, the 1-hour-record has been part of the history of cycling (Péronnet et al. 1989). The 1-hour record originally started with the French cyclist Henri Desgrange in 1893, where he achieved a distance of 35,325m. Over the following decades Desgrange's distance was progressively increasing until 1972 when Eddy Mercx reached 49,432m. Then came a new era of sophisticated bike development with rapid increases in the distance achieved by Moser, Obree, Boardman, Indurain, and Rominger. The hour record particularly seemed to capture the interest of the British public with several battles between Graeme Obree and Chris Boardman, until in 2000 Boardman rode the furthest distance ever achieved in a velodrome (56,375m). However, the International Cycling Union (UCI) then changed the rules, and decided that the records achieved after 1972 were "non-official". The UCI decided that the record attempt had become less about the abilities of the riders, and more about the technology associated with bike and equipment design/engineering. It was only as recently as 2005 when Mercx's record "officially" fell to Andrej Sonsenka, by just 269m.

The 2014 UCI regulation changes, and relaxation of the stringent technological rules, have renewed interest in the hour record. Such was the interest of the teams, riders, and sponsors that we have seen 8 official attempts in less than one year. Some attempts were unsuccessful (Bobridge, Dekker, or Larsson), but most did result in a furthering of the record (Voigt, Brandle, Dennis, Dowsett), with the distance of 54,526m being set by Bradley Wiggins in London, 7th June 2015. After recent years in cycling wilderness, the 1-hour-record attempt is once again proving to be an attractive proposition.

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Science as the essence of the 1-hour-record attempt

The common point between all record attempts is that the preparation is scientific and meticulous (Bassett et al. 1999). Many different variables need to be taken into account in trying to gain the maximum level of performance and the furthest possible distance. Physical fitness, psychological state, nutritional strategies, engineering and biomechanics, environmental conditions, and marketing of the event, need to be combined with the purpose of achieving the record and significant media impact.

So, what are the main points to consider when planning an hour attempt?

-The theoretical and practical (on track) assessment of the possibility to beat the hour record with the appropriate athlete (skills, power, and motivation). It is important to use the best theoretical mathematical models to calculate the furthest distance that could be achieved in different environmental conditions (pressure, temperature humidity…), drag coefficients, rolling resistances etc.

-Communication with the sponsors to gauge their interest in a possible attempt, and check the financial possibilities to cover the associated costs.

-Development of an "on track" practical assessment to test different speeds and the impact on physiological, biomechanical, nutritional, and psychological variables.

-The study of the different velodromes to analyze the pros and cons of each, and decide which is best for the attempt. This step includes the analysis of the velodrome characteristics (length, surface, cover and heating, size, location, altitude, weather forecast…), and also the performances achieved in each facility in previous similar events.

-The decision of the date of the event, taking into account the chosen rider's training schedule, other events in their calendar, and availability of the velodrome.

-The development of a specific training program including visits to the wind tunnel to test different positions and technological possibilities (tyres, wheels, helmets, skinsuits…), skills in the velodrome, feedback and pacing strategies, and psychological training.

-Planning of the last specific training sessions, tests, and taper to afford supercompensation of all the previous work.

It is critical to put together all the developed aspects so that there is an integration of factors, not just an addition of them. Further, to this point, the pacing strategy needs to be carefully adjusted to take into account the rider's previous experiences, as well as the type of pre-event warm-up, music, and velodrome temperature.

The key role of sponsors and scientists

Different kinds of sponsors are keen to take part in this event, especially if they have an interest in cycle sport, for example, manufacturers of bikes, cycling wear, helmets, technical components (e.g. powermeters, cranks, tyres, pedals…), or nutritional supplements. Normally these companies have their own engineers and scientists, so the event director of performance needs to coordinate their input such contributions are sequentially integrated. Sponsor support is essential, not just to cover the costs associated with the attempt, but also for the resultant development, innovation and exclusive data generation, which is priceless for both the rider and team. This research, innovation and development should be used to feedback to all those associated with the event: the athlete, the team and the sponsors. For example, manufacturers should use the data generated by the preparation for the hour record to improve the design and engineering of equipment such as helmets, skinsuits, bikes, wheels etc.

Apart from the "technical" sponsors involved, other agents or sport scientists can help both in preparation for, and during the event. Specific examples might include analyzing data, calculating the effects of changing certain variables, advising on specialist areas related to performance in different temperature environments, nutrition and ergogenic aids, aerodynamics and power analysis… However, it is of upmost importance that all of them work closely together, coordinated by the director of the event, to enable an integrated and effective input.

It is extremely difficult, nigh on impossible nowadays for an elite rider to achieve their best performances without input from an integrated team, possessing a variety of skills. It is no longer just a matter of one cyclist pedaling as fast as possible in a velodrome, but about team-work following the principles set out by Zabala and Atkinson (2012):

- The need to be better
- Curiosity, learning and teaching as a constant attitude
- Collaborative team work
- Multidirectional communication
- Participation on the training plan and process where the athlete is the main character
- Awareness of the latest advances and technologies in the field, trust in real science
- Knowing and understanding of what is being done, being aware of what is going on and why
- Systematic, controlled, and regular work
- Fair play, clean practices without doping

So, let's keep on empowering the best use of applied research within elite sport. Sport, specifically cycling, needs science, and you make science: professors, lecturers, researchers, laboratory technicians, and PhD students that work with passion and ethics.

Conflict of interest

The author declare that there is no conflict of interest.

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