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US OLYMPIC WOMEN'S CYCLING TEAM

How Big Data Analytics Is Used To Optimize Athletes' Performance

Background

As we'll see at various points in this book, sports and data analytics are becoming fast friends. In this chapter, we look at how the US women's cycling team went from underdogs to silver medallists at the 2012 London Olympics – thanks, in part, to the power of data analytics.

The team were struggling when they turned to their friends, family and community for help. A diverse group of volunteers were formed, made up of individuals in the sports and digital health communities, led by Sky Christopherson. Christopherson was an Olympic cyclist and the world record holder for the 200m velodrome sprint in the 35+ age category. He had achieved this using a training regime he designed himself, based on data analytics and originally inspired by the work of cardiologist Dr Eric Topol.

What Problem Is Big Data Helping To Solve?

Christopherson formed his OAthlete project (as in, Optimized Athlete) after becoming disillusioned with doping in the sport. This was in the wake of the Lance Armstrong drug scandal, dubbed "the greatest fraud in American sports". The idea behind OAthlete was to help

athletes optimize their performance and health in a sustainable way, without the use of performance-enhancing drugs. As a result, the philosophy "data not drugs" was born.

How Is Big Data Used In Practice?

Working with the women's cycling team, Christopherson put together a set of sophisticated data-capture and monitoring techniques to record every aspect affecting the athletes' performance, including diet, sleep patterns, environment and training intensity. These were monitored to spot patterns related to the athletes' performance, so that changes could be made to their training programmes.

What Were The Results?

As Christopherson says, by measuring the various aspects (such as sleep and diet) and understanding how they're related, you can create "breakthroughs in performance".

In this case, the depth of the analytics meant that Christopherson was able to drill right down to what he calls "individual optimal zones". With this information, tailored programmes could be tweaked for each athlete to get the best out of every team member. For example, one insight which came up was that the cyclist Jenny Reed performed much better in training if she had slept at a lower temperature the night before. So she was provided with a water-cooled mattress to keep her body at an exact temperature throughout the night. "This had the effect of giving her better deep sleep, which is when the body releases human growth hormone and testosterone naturally," says Christopherson. In the case of Sarah Hammer, the data revealed a vitamin D deficiency, so they made changes to her diet and daily routine (including getting more sunshine). This resulted in a measurable difference in her performance.

There's another benefit: helping athletes avoid injury. In Christopherson's opinion, the leading temptation for athletes to use the performance-enhancing drugs that have blighted cycling is the need to train hard while avoiding the dangers of injury and illness. Big Data enables high-performance sports teams to quantify the many factors that influence performance, such as training load, recovery and how the human body regenerates. This means teams can finally measure all these elements and establish early-warning signals that, for example, stop them from pushing athletes into overtraining, which often results in injury and illness. According to Christopherson, the key is finding balance during training: "It's manipulating the training based on the data you have recorded so that you are never pushing into that danger zone, but also never backing off and under-utilizing your talent. It's a very fine line and that's what Big Data is enabling us to finally do." When used accurately and efficiently, it is thought Big Data could vastly extend the careers of professional athletes and sportsmen and -women well beyond the typical retirement age of 30, with the right balance of diet and exercise and avoiding injury through overexertion.

Christopherson's system has not been put through rigorous scientific testing but it's worked well in terms of his personal success and the US women's cycling team – as demonstrated by that incredible silver medal win.

What Data Was Used?

Christopherson worked with internal and external and structured and unstructured data; for example, time series data – like measurements of physical parameters of blood sugar, skin parameters and pulse – was captured using sensors attached to the body. These also captured noise and sunlight exposure data. Environmental data – such as temperature, time of day and weather – was also considered, using publicly available information. Video analysis was also carried out, and athletes' sleeping patterns were measured using direct EEG.

What Are The Technical Details?

To implement the programme, Christopherson partnered with San Francisco-based data analytics and visualization specialist Datameer. The data was stored in the cloud in a Hadoop environment (HDFS), with Datameer analysing the data. Datameer's infographic widgets visualized the results.

Any Challenges That Had To Be Overcome?

The challenge with data exploration is that it often lacks specific hypotheses. But, as Olympic athletes, the team were able to draw upon their experience and constant self-experimentation to guide the data exploration. This experience, combined with Datameer's spreadsheet approach, helped the team cope with the vast amount of data involved. Datameer's spreadsheet approach easily integrated the different types, sizes and sources of data, making it much easier to extract insights.

What Are The Key Learning Points And Takeaways?

For me, this case study highlights the importance of finding a partner that understands the unique challenges related to your field. In this case, Datameer's CEO, Stefan Groschupf, was a former competitive swimmer at a national level in Germany. With this background and prior knowledge, Groschupf immediately saw the potential of the project. Christopherson was delighted with their input: "They came back with some really exciting results – some connections that we hadn't seen before. How diet, training and environment all influence each other. Everything is interconnected and you can really see that in the data."

It also highlights the importance of spotting patterns in the data. So, it's not just about the amount of data you collect or how you analyse it; it's about looking for patterns across different datasets and combining

that knowledge to improve performance – this applies to sports teams and businesses alike.

REFERENCES AND FURTHER READING

Find out more about OAthlete's work at:

http://www.oathlete.com/#intro and https://vimeo.com/48833290

And the amazing story of the US women's cycling team's transformation is covered in the documentary *Personal Gold*. There's more information at:

http://www.personal-gold.com/