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Interview with Dr. Marco Cardinale (Team GB)

Team GB: Using Analytics (and Intuition) To Improve Performance

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Team GB: Using Analytics (and Intuition) To Improve Performance

It's not just about talent, skill and hard work. Elite sports are increasingly using analytics to hone competitive performance and training.

DR. MARCO CARDINALE (TEAM GB), INTERVIEWED BY RENEE BOUCHER FERGUSON

Becoming an elite athlete — or coaching a team of this rarified breed — has as much to do with talent and skill as it does with experience and intuition (not to mention some serious hard work).

And data is increasingly part of that mix at the highest echelon of sports: the Olympic Games.

At Team GB — the name used by the British Olympic Association (BOA) and British Paralympic Association for their Great Britain and Northern Ireland Olympic team — analytics are used to both monitor the performance of athletes and to predict how well a team will perform. But what could the future hold? Evidence-based coaching — and training — that is as much a factor of sports as evidence-based medicine is now a factor of healthcare.

That transition is easier said than done. The blending of the age-old art of intuition and experience and the newer practice of using analytics to guide strategy is a path beset with both successes and challenges (in sports and in business).

Dr. Marco Cardinale, Head of Sports Science and Research of the British Olympic Association, in conversation with *MIT Sloan Management Review* contributing editor Renee Boucher Ferguson, explains how data analytics are used within Team GB, the future of analytics within the team and the sporting world at large, and the cultural issues that need to be overcome to achieve the potential of analytics.

How does Team GB use analytics?

I have to say, we don't have big data as in incredible large data. Team GB is made of various national governing bodies. There are different sporting organizations in Great Britain responsible for funding decisions. So the use of data varies from performance reasons to funding decisions. At the BOA, we use data for two reasons. Some of the analytics work goes into monitoring the performance of Team GB athletes, so we access large databases to look at, for example, how many medals our athletes win around the world in their events and in their sports,

or how many athletes rank between fourth to tenth place and have medal potential. Pretty much we use analytics to predict how well the team is going to do at the Olympic Games, and also to have a look at how we are performing leading into the games, and if there are particular issues also to define qualifying standards.

We also use analytics for benchmarking. For example, now we're doing a lot of work looking at our winter sports programs to try to understand where the opportunities are in terms of medal potential.

What is the value of being able to predict the number of medals Team GB might win?

First of all, I don't believe in exact predictions. The beauty of sport resides in its uncertainty. However, with data you can understand how likely you are to win medals. The value is a bit of a health check of your sporting system. It tells you where you are compared to your competition. It's a bit like if you're selling mobile phones, you want to know how many phones you're selling, how well the others are doing, and how well you're doing comparatively. It helps you in building and managing expectations. It helps a lot.

Such data also helps in making investment in sports. U.K. Sport fund sports only on the basis of them producing medals at the Olympic Games. So sports are judged on what they do on a year-by-year basis, but also on the likelihood that they have to return a medal. It's a "no compromise" approach. That's the investment principle they use, because it's public money.

Does it matter that you're looking at a smaller data set, rather than "big data"?

The biggest problem we have in sport is the difficulty in collecting data. So while the medal potential analysis is relatively easy because it is possible to access competition data and results at every event the athletes are enrolled into — world championships, European championships, international competitions — and then these data are put into a database. It's official results that we can obtain from the international federations, and we can analyze them.

But the real analytics we are interested in is the ability to understand what athletes do on a daily basis to be able to affect their training programs, and that's where the difficulties occur. It's very sport specific. For example, in track cycling, it's relatively easy to obtain a lot of data because it is possible to instrument the bikes and instrument the human beings and measure a variety of things like speed, revolutions per minute, power output per each pedal stroke, heart rate, so the coaching team can have comprehensive data.

In other sports, sports scientists are very limited by what they can collect, simply because there are no sensors able to produce meaningful information. If you think about indoor sports like basketball, volleyball, water polo, handball, there are no sensors to measure and track the movement of players. So coaches have only limited information on what happens in training.

So the biggest technical issue for everyone working in elite sport is the ability to gather data, and that's where I think the difference lies compared to other industries.

Do you see anything on the horizon that might answer some of those technical issues?

Yeah, there is a lot of development that we are doing and that other countries are doing. Pretty soon there will be a technical solution to improve the ability to collect data. For example, we might have the ability to measure movement patterns in indoor sports soon without the use of expensive and fixed camera systems, which have large manpower requirements.

The other big limitation we have is the ability to measure what happens in the body. So we are able nowadays to measure what the body does, as in movement, but we don't know much about the biochemistry, how the metabolism changes — and these sensors are still too expensive or too bulky or

do not have the right resolution levels to really understand what is happening when people exercise at high intensity. So I think in the next 10 years, sport will need to be equipped to understand analytics a lot more than we do now.

How much is analytics part of the culture of sports and of Olympic sports particularly?

Analytics is part of the culture in some but not all sports. So some sports are very data driven, like sailing, cycling, and rowing, at least in the U.K. It is important to state that data do not win medals. In my view, the coach and the athlete are the main unit able to deliver success. Supporting an outstanding athlete and coach with relevant data can help them achieve success. Data alone are of no use.

Overall, there is an interest and a tendency to gravitate towards being more data driven, but I think that's the future in sports. Sports will definitely be data driven, and in the next few years we will talk about evidenced-based coaching just like we do about evidence-based medicine.

Sports seem to be an area where there is a lot of intuition, experience and skill that comes into play, over analytics. Is it a battle to infuse a data driven culture?

Absolutely, and there are a variety of reasons for that. The first one is: most of the current elite coaches — that's around the world, not only in Britain — are relying on a limited amount of information. I gave you the example of the stopwatch and the whistle. It's not that bad, but if you were studying to become a coach 20 years ago, that's what you learned, and then you developed your career basing your decision-making onto the data that you've always seen.

So we have coaches that are incredibly good in predicting how fast the boat is going to be, and all they need is a stopwatch. And because they have data for the last 20 years on how fast the boats go, they can tell you. They can tell you how their athletes respond, or they base their decision on one of two particular sets of data, simply because that's what they experienced. What nobody knows is what benefits they can gather from having more data and using analytical approaches to understand them. So sometimes the barrier to develop analytics in sport comes from a combination of the experiences of the coaches and their terms of reference when planning training and the lack of information on how robust new data are when it comes to decision making.

Also, in some sports we have coaches that don't use computers at all. They're not interested in technology. They don't come from technology. They have all the information in their heads. They don't write much down. They don't use spreadsheets. There's no record of what they've done the last two, three, four years. So in such cases, you have a major blockage.

The other stoppage is this thing about IP [intellectual property]. People think, quite rightly to a certain extent, if I am a coach and I write all these programs, that is my IP. But my argument is always, if a national governing body employs a number of coaches for 40 years and then these people walk away, there are no data on what these people have done in the 40 years.

We should look at it like any other industry, in the way that if we invest in a group of people that deal with a group of human beings, we should have data to understand what works, but most of all what doesn't work, in order to strive for improvement and also understand what support athletes need in their quest for Olympic success.

Analytics could also make a massive difference with our ability to understand injuries, because many athletes do fail to perform at the Olympic Games simply because they are injured, and in many sports there isn't good information about injury occurrence, rates, seasonality, sites, etc. We don't have good information about when they occurred and why they occurred. So a good example of having analytical approaches and data gathering would be to try to understand what's the extent of the problem (if there is one!) and how to best solve it, even in terms of resources. Having data analytics

on this information would tell you if you need more doctors, or more physical therapists, or if you need any other expertise, equipment, or approach.

I would imagine not having a lot of data down on paper would amount to some bit of job security. How do you counter those types of arguments?

Well, we don't, because it's not our responsibility to employ coaches. But I totally understand them. It's the same for me. If I'm a scientist and I devise a strength training program as well as a training monitoring tool — it could be a spreadsheet, it could be a way of reporting data — and then it gets circulated and becomes public domain, yes, you might get upset. On the other side, famous chefs put their recipes out there, but they are still in business with their restaurants.

I think there needs to be a change in mentality in sports. I have to say that lots of people are very defensive of their IP. I think because some like to portray coaching as a black magic art rather than something that is a bit based more on evidence. Coaching is an art supported by science, so leaving the data behind should not diminish employability, in my belief.

How much have things changed in terms of analytics usage, from the London games to the previous summer Olympics, and how much further has that four years brought you along?

I think a lot more sports understand the need to collect and analyze data. A lot of sport coaching in the past was mostly experience-based rather than data-driven. And the example I always give, because I talk a lot about these issues, is that it's pretty much like the banks were run probably 20 years ago by people that had a bit of a nose and a bit of an eye to understand where the stock options in the markets were going. Now they are run by people that understand data and make evidence-based decisions, and the same is happening in sport. I hope that sport uses data better than banks have done!

We are moving from a situation whereby the coach 10, 20 years ago was the guy with a stopwatch and a whistle. Now we have coaches that start to understand the importance of gathering more data and analyzing it. Furthermore, at the elite level we have plenty of specialists working with coaches generating large datasets to help the coaching staff in making decisions on what to do in training and competitions.

Based on your experience, where do you see the ability for teams or even for individual athletes to get a competitive advantage from analytics?

I think the biggest edge will be if they understand themselves better. In too many sports, athletes train either too much or not too much, and it's because they have to gauge what they do on a daily basis against their feelings or what the coach sees. I think if they have more data about themselves, they can have an edge because they can be smarter in the way they train. That's the first edge.

The second edge is to try to understand the opposition a bit more. So in sports, the more you know about the opposition, the more you're likely to beat them.

And the last one is, I think if you understand a bit more about yourself, and you understand a bit more about the others, then you can do some modeling. You can do some simulation of performances in some sports and actually predict what likelihood do you have to succeed. So again, information is power. If you know more than someone else, you've got an edge.

What needs to happen to get to the potential of analytics in sport?

I think what needs to happen is there is a need of someone investing in analytics, because it's a bit of an experiment at the moment. *Moneyball* is a popular book, and everyone has watched the movie now, and people seem to be excited about it. But it only tells part of the story or part of the potential that is

possible. There is a need of someone investing in it properly, and there needs to be a success story, and as a consequence, then it becomes an aspirational thing that everyone wants to have. You need people to talk about it, but then you need people that are willing to invest in it and take the time.

One of the biggest things I see is that now a lot of people are starting to talk about data and analytics, but no one really understands the power of analytics in long-term data gathering. So if you collect data for two weeks, it isn't going to tell you anything; it won't happen in the next two years. You need to have probably four or five years of data gathering, and then at some point you might be able to understand where you're going. It's not a short journey. It's a long journey, which means a club or an institution really need to invest in a project for at least a good three to four years. The power of data resides in good longitudinal information rather than snapshots.

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