

Module 4. Problem-Based Learning (PBL) in the sports analytics phenomenon (III)

Martí Casals, professor and investigator in Sport Performance Analysis Research Group (SPARG) of the Center for Studies in Sports and Physical Activity (CEEAF) at the University of Vic – Central University of Catalonia (UVic-UCC). Sports statistician and collaborator in Barça Innovation Hub – Universitat.

Introduction

In this module, we will address how to transfer knowledge from science to reality and, as far as possible, we will try to understand the importance of science applied to sports medicine as a help for a sports analyst.

Analysis of the Last Paragraphs of the Case

In the following paragraphs, the words that help consolidate some concepts indirectly related to sports analytics will be placed in bold. This is a practical example that will serve for a better application of the theme:

I've been in Floor 3 for about 3 hours now and I'm introduced to the analyst, with a scouting profile, who seems worried because lately the team's results are not the expected and he doesn't know what the **effect of coach change is on professional football teams**. Later, I am introduced to another analyst, with a more academic profile. As a proof of this, he gives me a sheet with the following **abstract** of a **scientific study** (Lago, C. [2007]). *Aplicación de la regresión lineal en el estudio del impacto del cambio de entrenador sobre el **rendimiento en el fútbol*** [Application of Linear Regression in the Study of the Impact of Coach Change on **Performance in Football**]. Motor Skills. *European Journal of Human Movement*, 19, 145-163. From the reading of the article, he invites me to comment on it while we have a coffee.

Abstract: In this paper, the impact of coach change on the results obtained by teams in the Spanish Soccer League is analyzed. The empirical analysis is based on data from the 1997-1998 to the 2006-2007 seasons of the First and Second Spanish Soccer League. From different analyses based on linear regression and a mean comparison test, it is

concluded that teams that change coaches get more points in competition compared to the results achieved by the dismissed coach. Moreover, it has been verified that the winning effect of the new coaches does not have a linear influence throughout the time. As the days go by, the positive effect of the coach's change on the teams' results diminishes progressively until it disappears. Finally, it has been verified that the effect of coach change on the results of teams is not different when comparing the First and the Second Division of the Spanish Soccer League. (Lago, 2007, <http://www.eurjhm.com/index.php/eurjhm/article/download/192/356>)

Based on the given article, we can ask ourselves the following questions:

- 1- How can you explain or communicate a scientific study or summary in your own words and generate a less scientific discussion so as to transfer the knowledge, its application or new ideas?
- 2- What is the effect of coach change on professional football?

Have you asked yourself similar questions? This activity helps you think about how to answer questions like these and learn more about it. The answers of these questions are provided below.

Currently, the data scientist is mistaken for the analyst or scientist. It is often important to have the critical ability to understand, read and interpret scientific literature. Furthermore, it is essential to increase critical thinking through data sciences, which lead us to what is called data literacy. Thus, in relation to the previous abstract, it is very useful to know science concepts and, above all, to have skills to communicate them effectively when we want to explain the effect of coach on football with our own words.

In this regard, Lago (2007) states that

Coach change allows teams to reach 20% more points than in the same time interval by the dismissed coach. Moreover, it has been confirmed that team performance under the authority of the new coach improves significantly compared with that under the dismissed coach in the short term; however, this impact is negligible in the long term. The results point out that the favorable short-term impact on team performance after a coach change should be explained by the psychological and motivational effect on players provided by the coach change. (Lago, 2007, <http://www.eurjhm.com/index.php/eurjhm/article/download/192/356>)

On the other hand, if we wanted to know what the effect of the coach change is in a sport like basketball, would it be the same? Not exactly. However, for example, the study by Martínez (2012) points out that, many times, the saying “change the coach; guarantee the win” is true (<http://cdeporte.rediris.es/revista/revista48/artentrenador331.pdf>), but “the majority of coach changes take place before a team's next home game and also in teams with low winning percentage (i.e. teams with poor performance)” (<http://cdeporte.rediris.es/revista/revista48/artentrenador331.pdf>).

Moreover, since the importance of playing a home game is mentioned: what happens with this variable in football? is the advantage of playing a home game equally important? In this sense, besides relying on the extensive scientific literature already studied, we should explain it in a natural way so that it reaches society.

Analysis of the Last Paragraph of the Case

When discussing performance, the medical head of Barça Innovation Hub and the club's data journalist join the interview and show the following picture about injuries in the English league, in order to make a brief final in-depth analysis.

Figure 1: Premier League Injuries 2015-16.



By looking at Figure 1, it could be said that Leicester City has the lowest number of injuries. It would be a priori the one that gets a better performance by preventing injuries. Nevertheless, those who are familiar with sports medicine and epidemiology must have a think about it:

1. If we look at the total number of injuries in a team, we are only paying attention to an absolute and not a relative frequency. For example, perhaps there are teams that have had more players available during the season.
2. We also don't look at the exposure hours of each team. This would help calculate injury incidence rates, so we could better understand which teams have a higher incidence.
3. It would also be helpful to know the injury burden rate (number of days of absence/hours of exposition) which allows us to understand the burden and the consequences of injuries.
4. We are not able to know if the injuries have occurred during training or game (nor are we able to see the calculation of the incidence rate according training or game).
5. We also don't know when they started looking at injuries (start of the season). We do not know exactly if some players were already injured in the summer or if they have had a follow-up by the team doctors or other alternative (welcome to the concept of **ensorship**, as it is known in statistics).
6. The average number of days missed is calculated. The question is whether the average is the mean or the median. If it were, for example, the average, would this be the only measure to use? If so, it would be optimal to also know a measure of dispersion, such as the standard deviation (SD).
7. In addition, it would be interesting to know if all medical teams have defined the same Return to play (RTP) (days off from an injury) to estimate an average of days missed.
8. Another question we could ask is whether most of these injuries are recurrent or they come from the same player. We should also consider other concepts related to epidemiology. In fact, one of the recent articles by Casals and Niensend (2019), which mentions the great evolution profiles of a staff and their communication, highlights the roles of the epidemiologist and the sports biostatistician.

In this sense, when designing a project, ideally a multidisciplinary team that includes the biostatistician and the sports epidemiologist, it is necessary to discuss important issues such as:

- (i) The justification for the study using etiological frameworks
- (ii) The formulation of the appropriate research question.
- (iii) The discussion of the type of data that is in front of us (e.g., dichotomous, categorical, or continuous) and which will be collected.



- (iv) The choice of the statistical model and the assumptions underlying it.
- (v) The writing the problem in statistical terms rather than just the running of computer software code (since statistical software provides tools to contribute to analyses, not to define them).

We can ask ourselves, together with Casals and Niensend (2019), what statistical models should we use? In this sense, we should be aware that we require considerations from a multidisciplinary team of professionals, who deal with sports injuries (as it can be seen in Figure 2).

Figure 2: The three steps to identify the best statistical model in sports injury research.



Source: Casals & Niensend, 2019, <https://www.apunts.org/en-who-what-can-contribute-improve-articulo-1886658119300271>

The role of the sports biostatistician is briefly explained below.

Sports Biostatistician: a New Profession that Contributes to Injury Prevention

"The new professional specialty of sports biostatistician can help optimize data on injuries to quantify them, understand their possible causes and thus be able to prevent them" (Casals and Finch in imMedico, 2017, <https://www.immedicohospitalario.es/noticia/10183/la-biestadistica-deportiva-pide-cancha-para-evitar-lesiones>).

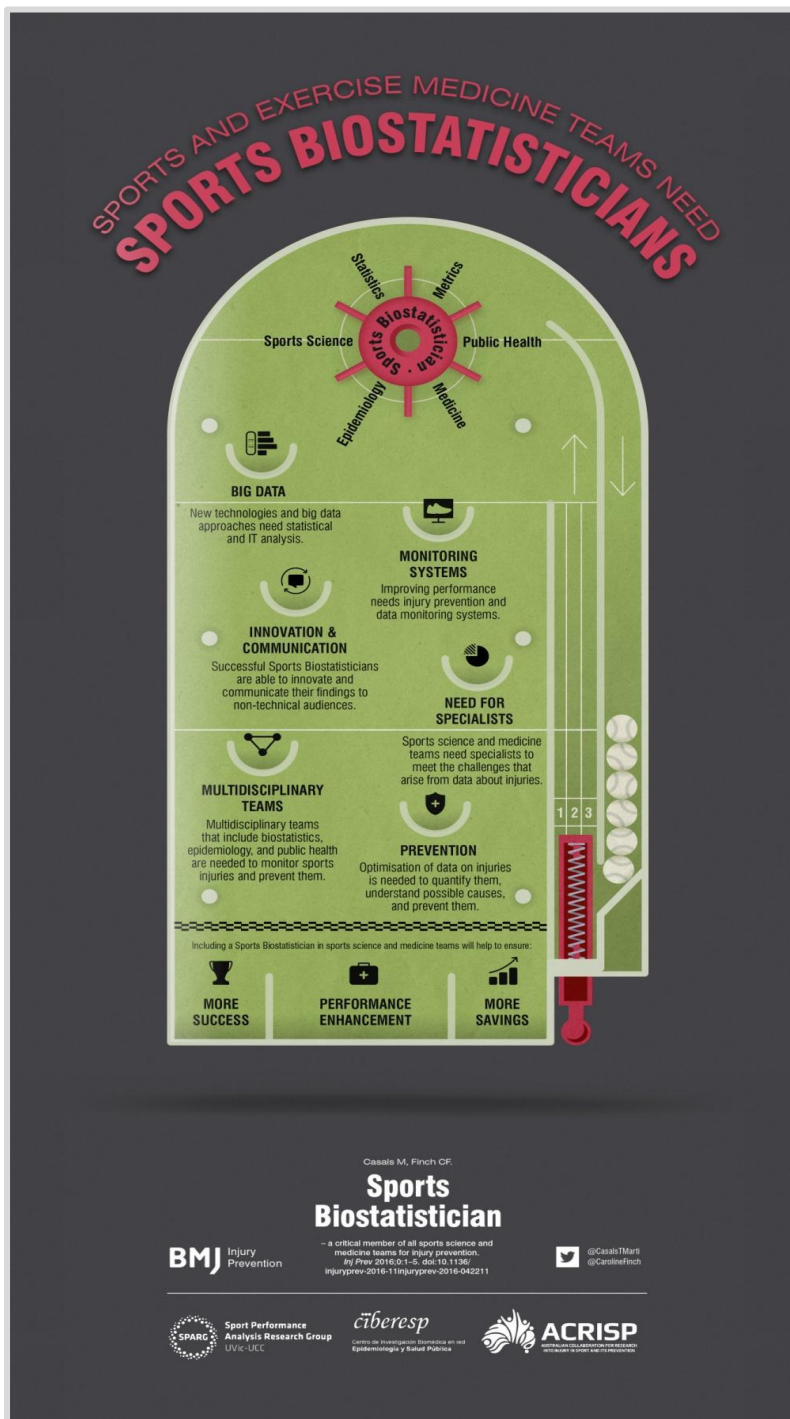
According to the research carried out by Casals (professor and investigator in Sport Performance Analysis Research Group [SPARG] at the University of Vic-Central University of Catalonia [UVic-UCC], and current FC Barcelona biostatistician, with experience in this field in an NBA team) and Finch (from the Australian Collaboration for Research into Sports and its Prevention [Federation University Australia], one of the nine research centers recognized by the IOC for injury prevention and protection of athletes' health), sports biostatistics is an emerging field.

To talk about performance is also to talk about preventing injuries and surveillance systems to prevent them (...). Sports science and sports medicine need specialists to solve the challenges that arise with data on injuries. One of the professions that can help carry out these functions would be the specialty of sports biostatistician, which is better known in the United States or Australia. (Casals, Sinc, 2017, <https://www.agenciasinc.es/Noticias/La-estadistica-tambien-ayuda-a-prevenir-lesiones>)

This new profile requires knowledge of the etiology of injuries, great skills in statistics, epidemiology and computer programming with the data. Sports biostatisticians should also have great communication skills, since they must transmit their conclusions to different people who are part of the sports community, from parents to coaches, players, sports doctors, clinicians, physical trainers, physiotherapists, sports scientists, epidemiologists and managers who make the decisions in the clubs. (Pichel Andrés, 2017, <http://www.bez.es/882750780/bioestadistica-big-data-para-prevenir-lesiones.html>).

The big clubs of the most important sports of our environment are beginning to take into account sports biostatisticians (besides sports analysts). The following infographic published in the *British Journal of Sports Medicine* shows a summary of the characteristics of this specialty (Casals, Bekker, and Finch, 2017).

Figure 3: Sports biostatisticians.



Source: Casals, Bekker & Finch, 2017, <http://bjsm.bmj.com/content/early/2017/07/12/bjsports-2017-097753>



References

Casals, M., Bekker, S. & Finch, C. F. (2017). *Infographic: Sports Biostatisticians as a critical member of all sports science and medical teams for injury prevention*. Retrieved from <http://bjsm.bmj.com/content/early/2017/07/12/bjsports-2017-097753>

Casals, M. & Nielsend, R. (2019). *Who and what can contribute to improve the statistical thinking in sports injury research? A humorous analogy between basketball and members of the multidisciplinary research team*. Retrieved from <https://www.apunts.org/en-who-what-can-contribute-improve-articulo-S1886658119300271>.

Casals, M. & Finch, C. F. (2016). Sports Biostatisticians – a critical member of all sports science and medicine teams for injury prevention. *Injury Prevention*, 23(6), 423-427.

Ciberesp (2017). *Nueva infografía sobre la profesión de bioestadístico deportivo* [New Infographics on the Profession of Sports Biostatistician]. Retrieved from <https://www.ciberesp.es/noticias/nueva-infografia-sobre-la-profesion-de-bioestadistico-deportivo>

imMédico (2017). *La Bioestadística Deportiva pide cancha para evitar lesiones* [Sports Biostatistics Asks for Increased Attention regarding Injury Prevention]. Retrieved from <https://www.immedicohospitalario.es/noticia/10183/la-biestadistica-deportiva-pide-cancha-para-evitar-lesiones>

Lago, C. (2007). *Aplicación de la regresión lineal en el estudio del impacto del cambio de entrenador sobre el rendimiento en el fútbol* [Application of Linear Regression in the Study of the Impact of Coach Change on Performance in Football]. Retrieved from <http://www.eurjhm.com/index.php/eurjhm/article/download/192/356>

Martínez, J. A. (2012). *Entrenador nuevo, ¿victoria segura?* [Changing a Coach, Guarantee the Win? Evidence in Basketball]. Retrieved from <http://cdeporte.rediris.es/revista/revista48/artentrenador331.pdf>

Pichel Andrés, J. (2017). *Bioestadística y big data para prevenir las lesiones deportivas* [Biostatistics and Big Data to Prevent Sports Injuries]. Retrieved from <http://www.bez.es/882750780/bioestadistica-big-data-para-prevenir-lesiones.html>

Premier Injuries (2016). *Interview: Head of Sports Science at Swansea City AFC – Jonny Northeast*. Retrieved from <http://sportsdiscovery.net/journal/2016/08/05/interview-head-of-sports-science-at-swansea-city-afc-jonny-northeast/>

Sinc (2017). *La estadística también ayuda a prevenir lesiones* [Statistics also help prevent injuries]. Retrieved from <https://www.agenciasinc.es/Noticias/La-estadistica-tambien-ayuda-a-prevenir-lesiones>