

EDITORIAL

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



Marti Casals^{a,b,c,*,1}, Rasmus Oestergaard Nielsen^d

^a Sport and Physical Activity Studies Centre (CEEAF), University of Vic-Central University of Catalonia (UVic-UCC), Barcelona, Spain

^b Sport Performance Analysis Research Group, University of Vic-Central University of Catalonia (UVic-UCC), Barcelona, Spain

^c Medical Department, Futbol Club Barcelona, Barça Innovation Hub, Barcelona, Spain

^d Department of Public Health, Section for Sports Science, Aarhus University, Aarhus, Denmark

Received 30 August 2019; accepted 10 September 2019

Most sports injury prevention students, researchers and practitioners ask themselves “Which statistical models should we use?” This is an important and relevant question, which requires careful consideration. Although there are different scientific references in the literature about how to select the best model,^{1,2} it is also important to consider who and what can contribute to identification of the most appropriate statistical model.

Our work intends to highlight the importance of a multidisciplinary team, and the topics that need to be discussed before a statistical model is selected. In this endeavour, athletes, coaches and clinicians play an important role as they possess subject-matter knowledge. To fuel the selection of an appropriate statistical model it is our experience

that the athletes, coaches and clinicians need to understand the enrichment/enhancement of multidisciplinary team discussions starting with extremely simple and easy-to-grasp messages. All the above can bring closer the gap between field practitioner staff and researchers.³

Although it is known that players and coaches contribute more than support staff, staff members and researchers try to help maximise / optimise health and performance.⁴ Thus, in this editorial we want to show an analogy between basketball players on the court and members of the multidisciplinary research team. In basketball, as in other team sports, the basketball teamwork is very important and essential to be successful. Every “player/position” needs to be considered (get the ball) prior to shooting in an attempt to score the basket (select a statistical model). The same occurs in the multidisciplinary research team. For this reason, below, we have tried to establish an analogy between the functions/skills of different positions and the multidisciplinary research team (Figure 1).

Guard/Physician: The guard is the leader on the court and the one who starts the game. A point guard’s primary job is to facilitate scoring opportunities for his/her team. Point

* Corresponding author. Sport and Physical Activity Studies Centre (CEEAF), University of Vic-Central University of Catalonia (UVic-UCC)

E-mail addresses: marticasals@gmail.com (M. Casals), marti.casals1@umedicina.cat (R.O. Nielsen).

¹ Twitter @CasalsTMarti, @RUNSAFE_Rasmus.



Figure 1 The three steps to identify the best statistical model in sports injury research.

guards should be smart, and they must be the coach on the court. In the same way, sports medicine physicians work with athletes and sports teams for some years at all levels to help heal athletic injuries. Their clinical expertise and guideline can lead the "game".

Shooting Guard/Physiotherapist: A shooting guard's main objective is to score points and his/her main ability is to move without the ball. This means moving around the court and working off screens to get open. In the same way, most people think the physiotherapist only uses his/her hands to

avoid the pain. However, it is through intuition and experience that most physiotherapists develop the skills necessary to aid their understanding of the behaviour and responses of patients. Modern game shooting guards could lean towards point guard skills, and this position is known as combo guard (a player who combines the attributes of a guard and a shooting guard). These players are more skilled with the ball and better at organizing offense. In this way, the physiotherapist/shooting guard should, together with the physician/guard, be able to identify appropriate research

questions and formulate important hypothesis based in their clinical experiences.

Small Forward/Sports Scientist: The small forward is considered the most versatile of the five main basketball positions. The styles with which small forwards amass their points vary widely. In the same way, the sports scientists will perform research into sport and exercise analysing key performance indicators, profiling and monitoring athletes/players, developing and/or optimizing performance, as well as giving support to coaching staff. Given that sports science is multidisciplinary, sports scientists have to excel in biomechanics, physiology, psychology and even coaching/skills acquisition. One of the values of the small forwards is also to get on with paint positions such as power forwards and centers. The value of adaptability and curiosity of the sports scientists will be important to be able to understand the models of data analysis in order to contextualize the information from them.

Power Forward/Sports Epidemiologist: The power forward is often one of the most physical players on the court, they play close to the basket, but they should be flexible to move and help perimeter players. In the same way, the sports epidemiologist help the other researchers align the goal of their research with the research question and analytical approach. This allow for reasoned interpretations of study results with respect for potential bias.

Center/Sports Biostatistician: The center is a strong and skilled rebounder. The center will play the closest to the basket and usually must be the defensive leader, always talking to his/her teammates. In the same way, the Sports Biostatisticians not only help to describe variability, and to model the situation they want to analyse, but they also want to get involved in study design and c-speak (a common language between statisticians and sports professionals).

The sports injury research is growing and for this reason we have included in our “bench” other different professionals who also can help in the court (e.g: sports nutritionist, sports analyst, strength and conditioning coach, coach, other). In basketball, it’s very important to consider all the members of the team given that they all contribute in one way or another to the team’s results.

To successfully score the basket (reach agreement of statistical model), all topics need to be discussed by the different professionals (e.g: coach, physician, physiotherapist, analyst, S&C coach, sports scientist, sports biostatistician, sports epidemiologist, other) that are involved in managing injury. The multidisciplinary team of people have different perspectives of this injury. For example, the physician may ask physiological questions and focus on treatment and future prevention, whereas the sports epidemiologist⁵ may seek information with implications for choice of the statistical model, and the sports biostatistician⁶⁻⁷ may ask for the specification and assumptions of the model and what kind of software/packages to use (Figure 1).

Communication between different members of the team will be important to answer these questions. A multidisciplinary team can combine the expertise of experts in their field with input from other fields leading to more creativity and impactful research.⁸ Moreover, the communication will imply for instance that sports scientists pay more attention to possible biases if they discuss with sports

epidemiologists, or that some physicians improve assumptions of the design study if they discuss with sports biostatisticians. However, it’s not a quick process because a common challenge of working in a multidisciplinary team is a lack of a “common language.” Additionally, within a team there can be several interests and aims (academic, business, services...).

When designing a project, ideally a multidisciplinary team, which includes the sports biostatistician^{6,7} and the sports epidemiologist,⁵ needs to discuss important topics such as (i) the rationale behind the study using etiological frameworks, (ii) formulating the appropriate research question, (iii) discuss the type of data (e.g. dichotomous, categorical or continuous data), which will be collected, (iv) choice of statistical model and the assumptions underpinning it, and (v) write the problem in statistical terms instead of only running a computational software code (as statistical software provides tools to assist analyses, not define them, the research team needs to) (Figure 1).⁹

Responding to the question “Which statistical models should we use?” require careful considerations from a multidisciplinary team of persons dealing with sports injuries as can be seen in the Figure 1. First step is to gather a multidisciplinary team. Second step is to initiate team-based discussions which leads to the final step; agreeing on a model after discussion various topics. Based on this, the importance of communication and information exchange among the professionals of the multidisciplinary teams can not be underestimated.

Disclaimer

This editorial tries to explain a humorous analogy for education in sport and exercise medicine trying to notice that the evolution of team science in sports implies communication between them to answer research questions. Although we have tried to define the different roles in a research team through different basketball positions, we understand that these positions are not strictly associated with a given role or skill. Anyone in the team can contribute equally to the game or to the research.

References

1. Harrell FE. *Regression modeling strategies: With applications to linear models, logistic regression, and survival analysis*. New York: Springer-Verlag; 2001.
2. Sauerbrei W, Abrahamowicz M, Altman DG, et al. Strengthening analytical thinking for observational studies: The STRATOS initiative. *Statistics in Medicine*. 2014;33:5413–32.
3. Nassis GP. Leadership in science and medicine: can you see the gap? *Sci Med Football*. 2017;1:195–6.
4. Fullagar HH, McCall A, Impellizzeri FM, et al. The Translation of Sport Science Research to the Field: A Current Opinion and Overview on the Perceptions of Practitioners, Researchers and Coaches. *Sports Medicine*. 2019:1–8.
5. Blog BJSM. No, my first name ain’t ‘Biostatistician’. It’s ‘Epidemiologist’ (Dr. Kerr, if you’re nasty). https://blogs.bmj.com/bjism/2019/01/08/no-my-first-name-aint-biostatistician-its-epidemiologist-dr-kerr-if-youre-nasty/?utm_source=hootsuite&utm_medium=social&utm_term=&utm_content=&utm_campaign= (accessed 6 August 2020).

6. Casals M, Finch CF. Sports Biostatistician: a critical member of all sports science and medicine teams for injury prevention. *Br J Sports Med.* 2018;52:1457–61.
7. Casals M, Bekker S, Finch CF. Infographic: Sports Biostatisticians as a critical member of all sports science and medical teams for injury prevention. *Br J Sports Med.* 2017;0:1–2.
8. Blogs Nature. Multidisciplinary research: pros and cons. <http://blogs.nature.com/naturejobs/2017/09/11/multidisciplinary-research-pros-and-cons/>. (accessed 6 August 2020).
9. Kass RE, Caffo BS, Davidian M, et al. Ten simple rules for effective statistical practice. *PLoS computational biology.* 2016;12, e1004961.