How do past training exposures affect injury risk in football?

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The study of training load and its influence on the risk of sports injuries is one of the hot topics in sports injury research, including in the specific field of football. Gaining more insights into the area of training load empowers coaches, physiotherapists, sports physicians, and other professionals involved in a football club to make the most of this knowledge, such as: developing effective training plan strategies that will enhance players' performance while also lowering their risk to injury.

To model the effects of past training exposures on the risk of sports injuries, the time-varying nature of both, exposure and the outcome variable, should be considered. Besides, the effects of past exposures may cumulate over time and may present complex forms of association. And as a player may sustain more than one injury, dependencies induced by these subsequent injuries should also be taken into account. In this regard, we propose the use of piece-wise exponential additive mixed models for modelling such data. In this work in particular, we study time-varying exposures as weighted cumulative effects, i.e. assigning weights to past training exposures based on the time elapsed since the exposure occurred.

We conduct a simulation study to evaluate the performance of the proposed model, under different true weight functions and different levels of heterogeneity between recurrent events. Finally, we illustrate this recurrent events flexible modelling approach with the application of a case study of an elite male football team participating in LaLiga. The cohort includes time-loss injuries as well as external training load (e.g. training and competition time, power output, distance, sprints, speed etc.) tracked by Global Positioning System devices, during the seasons 2017-2018 and 2018-2019.

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