

## Predictive modeling for injury risk and performance analysis in collegiate and female basketball players

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This paper examines a machine-learning model of injury prediction and performance assessment on female and collegiate-level basketball players through interpretable workload-based models. The dataset was gathered among the players in the university and district teams based on training logs, sprint tests (20 m, 30 m, 50 m), records of each weekly session, player survey, and team performance databases, including variables of ACWR (Acute-toChronic Workload Ratio is a metric that compares short-term training load to longer-term load), fatigue rating, minutes played, points per game, history of previous injuries, and environmental conditions. The data consisted of 180 player-weeks of data in two training cycles. The exploratory analysis revealed obvious changes in workloads and increased ACWR spikes in female athletes. Logistic regression was used to predict injuries and it was found that fatigue scores and ACWR were significant predictors with 78 percent accuracy and 0.74 recall. Performance prediction using linear regression revealed that training intensity, sprint performance and minutes played were a combination of variables that could explain 62 percent of the variance in player output. Transparency of the research was achieved by the interpretation methods that could be used in practical coaching. The results have shown that ACWR with the use of playerspecific factors can offer valuable information on the concept of workload management, injury probability downplay and inform evidencebased decisions on behalf of the underrepresented athletic groups. This study can be used in the creation of non-discriminatory and understandable sports analytics to match the digital performance tools of the next generation.

**Keywords:** *Predictive Modeling; ACWR; Basketball Analytics; Injury Prediction; Interpretable Models*