In-Situ PFv Profiling in Sub-Elite Gaelic Football: Validation, Comparison with Isolated Sprints, Minimum Data Load Requirements, and Exploring "Real-Time" Monitoring Potential

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Abstract:
In-game performance monitoring is of growing interest to sports science practitioners. This study presents a proof-of-concept methodology capable of tracking, on average, a 6.4% reduction in ballistic power (PB) during competitive matches. The study investigated the linearity of in-situ PFv profiles in 34 sub-elite Gaelic footballers (aged 26.08 ± 6.84 years), compared in-situ profiles to isolated sprint-derived profiles, determined minimum data requirements for reliable profiling, and explored the utility of in-game monitoring. Linearity was comparable to previous studies, with Fv profile R^2 values of 0.929 ± 0.110 for match data and 0.949 ± 0.105 for training data. Consistent, systematic differences were observed between in-situ and isolated profiles using Cohen's d. Acceleration (A0; $1.00 \leq d \leq 1.93$) was significantly higher in-situ, while maximum power (Pmax; $-1.02 \leq d \leq -1.36$) and the Fv offset (dFv; $-0.90 \leq d \leq -1.09$) were significantly lower, highlighting that the two profiles are not interchangeable. Maximum speeds (S0) exhibited context-dependent variance, being larger in matches than in isolated sprints (8.56 ± 0.31 m/s versus 8.33 ± 0.34 m/s; d = +0.74), but lower in training (8.04 ± 0.25 m/s; d = -1.29, $p < 0.001$). Minimum data load was determined using two methods: the time required for R^2 to reach 0.9 (12 minutes) and the geometric knee of the R^2 versus data load curve (7 minutes). Using these sliding windows, PB showed average reductions of 6.4% and 4.9%, respectively, across a full game. These findings suggest that PFv profiling may offer a practical, scalable method for in-situ performance monitoring in team sports.

Keywords:
Fatigue, proof-of-concept, in-situ, real-time monitoring, PFv profiling.