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The burden of injuries according to maturity status and timing: A two-decade study with 110 growth curves in an elite football academy

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Injuries have a negative impact on the development of football players. Maturation is a potential risk factor for football injuries but available data on this topic provide limited evidence due to methodological shortcomings. The aim of this study was to describe the injury burden of male academy football players according to growth curve-derived maturity status and timing. Injury and growth data were collected from 2000 to 2020. Longitudinal height records for 110 individual players were fitted with the Super-Imposition by Translation and Rotation model to estimate age at peak height velocity (PHV). Players were clustered according to maturity status (pre-, circa-, post-PHV, or adults) and timing (early, on-time, late maturers). Overall and specific injury burdens (days lost/player-season) and rate ratios for comparisons between groups were calculated. Overall injury burden increased with advanced maturity status; pre-PHV players had 3.2-, 3.7-, and 5.5-times lower burden compared with circa-PHV, post-PHV, and adult players, respectively. Growth-related injuries were more burdensome circa-PHV, while muscle and joint/ligament injuries had a higher impact post-PHV and in adults.

Further, in the pre-PHV period, late maturers showed lower burden of overall, growth-related, anterior inferior iliac spine osteochondrosis, and knee joint/ligament injuries compared with on-time maturers. In adult players, however, injuries were less burdensome for early maturers than on-time and late maturers. In addition, joint/ligament injuries of adult late maturers were 4.5-times more burdensome than those of early maturers. Therefore, monitoring maturity seems crucial to define each player's maturation profile and facilitate design of targeted injury prevention programs.

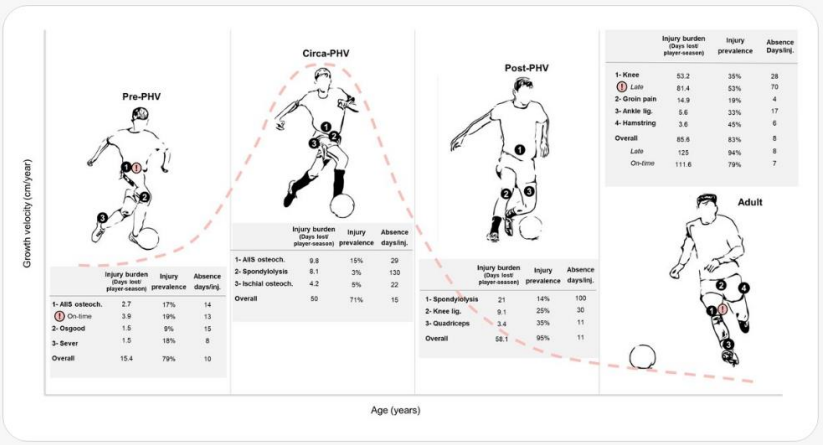
- **Highlights**

- Injury burden is significantly lower in football players at pre-peak height velocity (PHV). Growth-related injuries are most burdensome circa-PHV, while muscle and joint/ligament injuries are more burdensome post-PHV and especially in adults.

- Before PHV, growth-related and knee joint/ligament injuries have lower burden in players who mature late than those who mature on-time. Adult late maturers have greater burden of overall and joint/ligament injuries than early maturers.

- Football academies should regularly assess the maturity status and timing of young football players, as the impact of injuries varies with maturation status and timing.

- Management of the maturity-related injury risk profile, in combination with other relevant factors (training load, neuromuscular and biomechanical factors, physiotherapy, coaching, communication, psychosocial factors …), might help improve the success of player development programs and protect the health of young football players.



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