

# Sprinting: a potential vaccine for hamstring injury?

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**G**ood athletes run fast. Running fast puts athletes at risk of hamstring muscle injuries (HMIs). Therefore, good athletes should avoid running fast, to avoid hamstring injuries. This apparently nonsensical syllogism is unfortunately the basis of a widespread avoidance of sprinting in many sports training environments.

Indeed, HMI is the main injury in sports requiring sprint acceleration, such as football(1) or athletics,(2) and thus a crucial issue for athletes and their supporting coaching and medical staffs. Due to the clear link between sprinting (i.e. sprinting constitutes the main HMI mechanism in those sports) and HMI occurrence,(3,4) sprinting is often blamed as the “foe”, which leads to HMI. Consequently, a widespread HMI prevention (and let us be honest, staff protection) measure, especially in training (games demands can hardly be altered), is to avoid sprint practice and monitoring up to maximal speed (≈20 to 60-m depending on the sport and level of practice). This approach is paradoxical since sprint acceleration performance can be considered one of the key performance indicators, justifying that sprinting should be the mean and the goal of any effective prevention strategy.

HMI prevention strategies have been developed and evaluated mainly based on isolated risk factors screening (strength evaluations)(5) or strengthening programmes without considering multiple risk factors and their interaction, and relationship with sprint action.(6) However, despite specific experimental contexts, real practice revealed that HMI still represents the most prevalent injury in sports involving sprinting.(1,2) This could be explained by the fact that (i) screening procedures are mainly focused on only one isolated risk factor (i.e. strength), (ii) hamstring muscle strength evaluations are mainly based on isolated, single joint, low-velocity, non-sprint-specific range of motion and torque evaluations,(7) and (iii) are not reliable enough in predicting HMIs,(5) (iv) prevention programmes were implemented at a group level without taking into account the individual characteristics and deficiencies, (v) showed low compliance,(6) and (vi) were mainly focused only on hamstring muscles strengthening using exercises which inevitably fall short in stimulating all the demands placed on the muscle group in sprinting cyclic.(7,8) These features of the current literature do not consider hamstring muscles as a constitutive element of the motor chain and the corresponding individual characteristics.(9) This emphasizes the need for a more global approach in HMI management (including prevention and rehabilitation),(9,10) in which we suggest that the complex and unique sprinting movement (leg interaction, elastic energy transfer, reflexes, kinematics, kinetics...) should be placed at the center of the approach.

In the risk of sounding redundant, sprinting is the only exercise that induces a sprint-specific hamstring muscles activation (both in terms of amount and timing): impossible to replicate by usual strengthening exercises that can reach only 18 to 75% of the electromyographic activity reached by hamstrings during sprinting.(8) It is thus irreplaceable as a component of a highly effective HMI rehabilitation programme, to reduce the risk of HMI re-injury in addition to improve sprint performance.(9) Contrary to rehabilitation programs only including strength and lengthening exercises, sprinting very likely induced tissue healing and repair, and helped athletes return to their sports including sprinting activities, in a combined “repair and prepare” strategy.(9) In addition, athletes who sprinted at high intensity (>95% of their maximal velocity) during sport practice showed a lower risk of lower limb injuries than those who produced lower maximal velocity (<85%).(11) Exposures to this activity was also important since an optimal maximal running velocity exposure was associated with a lower risk of lower limb injury,(11) and an acute increase in sprinting load was associated with large increased risk of HMI.(4) Therefore, adequate exposure to sprinting may be an effective “vaccine” against HMI. Like for a vaccine, the activity must be task-specific and should be adapted to the tissue and athletes’ capacity, in order to promote positive adaptation and a protective effect against the task-related risk, while having no side effect (such as HMI). Sprinting should be viewed by athletes and coaches as a mithridatization process.

Finally, we think that sprinting should be considered in the HMI prevention process, not only as a part of the problem but also, and more importantly, as a part of the solution. For the reason detailed above, we think that sprinting is irreplaceable as one of the HMI prevention measures (in primary and secondary prevention) in a global approach.(7,9,10) We also think that sprint performance improvement and HMI prevention are the same “fight”, with quite similar associated strategies. We think that sprint-oriented HMI prevention strategies can decrease injuries while also playing a “win-win” role in improving sprint performance. This approach could have a higher impact on athletes and coaches’ agreement, leading to likely higher compliance than methods previously proposed.(6) In this context, technical and medical staffs collaboration in a win-win performance-prevention strategy is highly relevant, since HMI affects all sports and stakeholders.

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