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Hamstring, and hip and groin injury in football; you won't go wrong remaining strong

Dr Dale Forsdyke and Jamie Salter discuss the burden of hamstring, and hip and groin injuries in football, why maintaining hamstring and hip and groin muscle strength is important, and strategies the multidisciplinary sport science and medicine team can adopt to reduce the incidence and burden of injury.

What is the problem?

Among football populations the incidence and burden of injury is high. Injury to the hamstring group and hip and groin are common, accounting for around a third of the overall burden of injury and are a major cause of absence from football activities (~ 5-19 days' time-loss; Ekstrand *et al.*, 2020). When non-time-loss injuries are considered the incidence of hamstring and hip and groin injury may be significantly higher (Whalan *et al.*, 2020). Eventually, when players return to full training and competition following hamstring and hip and groin injury, they do so with an increased risk of re-injury within two months (~ 7-32%; Ekstrand *et al.*, 2020). Therefore, within football, managing the negative impact of hamstring and hip and groin injury presents a significant challenge for the multidisciplinary sport science and medicine team.

Why do we have this problem?

Understanding the cause of injury is a foundational step in systematically addressing the negative impact of injury (Van Tiggelen *et al.*, 2008). Hamstring, and the hip and groin injury are likely caused by complex interactions between intrinsic and extrinsic risk factors and inciting situations (Bahr & Krosshaug, 2005). As such, several modifiable and non-modifiable predictive risk factors have been identified including: muscle strength, age, previous injury, load and fatigue status, muscle endurance, muscle fascicle length and range of motion (e.g., Whittaker *et al.*, 2015). Of these factors it is muscle strength (e.g., isometric,

eccentric, within and between limb symmetry) that is more reliably associated with the risk of hamstring, and hip and groin injury (Timmins *et al.*, 2016; Wollin *et al.*, 2018). As muscle strength is a dynamic physical quality it is prone to change due to neuromuscular, biochemical and endocrine response to physiological and biomechanics loading of football training and competition (e.g., acceleration, deceleration, landing, change of direction). Therefore, maintaining hamstring and hip and groin muscle strength during hectic schedules of regular training and competition is important to limit to risk of injury.

The negative effect of within match and congested football activity

The risk of hamstring and hip and groin injury significantly increases with overly regular football activity with limited recovery period of ≤ 72 hours (Carling *et al.*, 2016). It is likely that muscle strength will negatively change within a game (i.e., from kick off to half time, half time to full time) and during periods of congested football activity (i.e., tournament play, in-season). Therefore, a loss of hamstring and hip and groin muscle strength may be a precursor to the onset of injury. Several studies have suggested that a loss of isometric and eccentric hamstring and hip and groin muscle strength elevates the risk of injury (e.g., Timmins *et al.*, 2016; Wollin *et al.*, 2018). In one study of elite football players, Timmins and colleagues (2016) found that the risk of hamstring injury increases $\sim 9\%$ for every 10 N decrease in eccentric muscle strength, whereas Wollin *et al.* (2018) found a reduction in isometric hip and groin strength of $> 15\%$ was associated with the onset of hip and groin injury. Football players may develop clinically meaningful hamstring and hip and groin muscle strength deficits during a game and for several days afterwards which, in the absence of adequate recovery, may predispose them to hamstring and hip and groin injury (Beuno *et al.*, 2021; Salter *et al.*, 2021).

What can the multidisciplinary sport science and medicine team do?

Although the sport science and medicine team are frequently limited by the context they are working in, there are a range of strategies which together may reduce the incidence and burden of hamstring, and hip and groin injury. First, in recognition of the deleterious effect of football training and competition on hamstring, and hip and groin strength which may take several days to become restored, practitioners should routinely monitor the isometric and eccentric muscle strength of players using reliable and time-efficient devices such as the NordBord and ForceFrame strength testing systems, and hand-held dynamometers to track recovery. This data could also be triangulated with performance metrics (e.g., through GPS, video analysis) and self-report measures (e.g., perceived lower limb recovery) to make well-rounded decisions to inform a player's availability and/or individual modifications to their exposure to load (Salter *et al.*, 2021). As individual variability in recovery of muscle strength is likely, this approach may also help develop individualised physical performance and recovery programmes (e.g., players can be stratified into those that experience greatest strength deficits or take a greater amount of time to recover strength).

Second, considering the burden of hamstring and hip and groin injury on players and on team success, practitioners should aim to maximise the hamstring, and hip and groin strength during the off-season and pre-season, and regularly micro-dose hamstring and hip and groin strength exercises into training with the aim of maintaining strength within the competitive season (e.g., Nordic hamstring exercise, Copenhagen hip adductor exercise). Performing these exercises in a fatigued state may help develop a resistance to fatigued so muscle strength can be maintained within and between exposures.

Finally, to effectively manage the risk of hamstring and hip and groin injury there would need to be a change in culture in some football populations which expects players to perform well on a regular basis and remain injury-free despite having limited time to fully recover their muscle strength. At a local level, this may include educating coaches and

players on their knowledge and beliefs around the risk of playing with strength deficits and how to modify load for player with strength deficits in technical and tactical practices. Ultimately though, a broader paradigm shift in football that values the individual above the performance may need to occur, to effectively limit the burden of hamstring and hip and groin injury in football.

In summary, managing hamstring and hip and groin injuries is a challenge for sport science and medical teams working in football environments. One key internal and modifiable risk factor of hamstring and hip and groin injury is muscle strength. Football players tend to be susceptible to hamstring and hip and groin injury when muscle strength is reduced due to regular training and competition together with insufficient recovery. Practitioners should routinely monitor muscle strength changes and modify load accordingly and implement conditioning programmes with the aim of improving and maintaining hamstring and hip and groin strength. However, a broader culture changes maybe required to effectively reduce the incidence and burden of hamstring and hip and groin injury in football.

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