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A novel hamstring strain injury prevention system: post-match strength testing for secondary prevention in football

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INTRODUCTION

Despite the resources applied to the prevention of hamstring injuries in sport, between 2001 and 2014 the hamstring injury incidence and burden did not decline in male professional football.^{1,2} Consideration of alternative and complementary prevention strategies are needed.³ One-time only preseason screening for hamstring injury risk factors has limited value for preventing hamstring injuries.⁴ In-season monitoring of hamstring function has been advocated as a secondary prevention strategy.³ Since a player's isometric knee flexion strength may decrease before suffering a hamstring strain (HS) injury,⁵ regular hamstring strength monitoring may be valuable. In-season monitoring can ensure players have restored hamstring muscle strength after the demands of a match and prior to undertaking high workloads in training or playing another match. Identifying a post-match impairment ('subclinical stage of injury'),^{6,7} allows for early intervention and may be a practical way to lower susceptibility of hamstring injury (online supplementary material figure 1).

In this letter, we report our proof-of-concept hamstring injury prevention system that incorporated secondary prevention for hamstring injury in football. We also compared the occurrence

and burden of hamstring injury in a cohort where secondary prevention was implemented in addition to standard practice (primary and tertiary prevention).

Methods

The sample in this cohort study consisted of male U17 football players who commenced training at the Australian football association's centre of excellence programme. Fifty-two players from the programme during April 2014 to August 2017 formed the intervention group and undertook regular in-season hamstring strength monitoring. Data from a further 22 players in the immediately preceding cohort (December 2012 to March 2014), during their final month in year 1 and all of their second year in the programme, were included as a control group. Further details of the methods are available in the supplementary (online supplementary appendix).

Players completed standardised self-reported records of past injury, training history and measurement of anthropometric and hamstring strength data were taken. All HS injuries were recorded prospectively and clinically diagnosed by a sports physician and/or sports physiotherapist. Secondary prevention strategies during the study period included 115 matches that incorporated regular post-match hamstring strength monitoring with resultant individual player interventions (figure 1 in the letter). Hamstring strength was tested on the morning of the first regular training day back after a rest day (≥ 40 hours postmatch) to facilitate early detection of hamstring strength impairment. Testing was performed in accordance with previous reports to reliably capture isometric peak hamstring force.⁸ Players identified with strength impairments greater than the minimal detectable change (14%) of the test⁸ since the previous result, returned for retesting in the afternoon and proceeded as outlined in figure 1.

RESULTS

The occurrence of HS injury was significantly lower in the intervention ($n=1$) group ($z=-2.976$, $p=0.003$, effect size (ES)=0.35) compared with control ($n=5$). The HS injury incidence (number of HS injuries/1000-hour exposure) was lower for intervention (0.05/1000 hours) compared with control (0.8/1000 hours) with resultant burdens (time-loss

Figure 1 In-season secondary prevention and clinical process.

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days/1000-hour exposure) of 1.3/1000 versus 14.2/1000 hours of total exposure, respectively. No significant differences in weekly training sessions and matches, number of players with a previous history of HS injury or number of previous HS injuries existed between groups (online supplementary table 1). The control group were significantly older, taller and heavier compared with the intervention cohort (as first year players) who entered the study in the first year of the programme cycle. Only body weight remained significantly higher in the control compared with the intervention group in their second year. There was no significant difference between the groups in terms of which quarter of the year players were born ($z = -1.755$, $p = 0.079$, $ES = 0.20$) to explain this difference. The Poisson regression analysis demonstrate that differences in HS injury (dependent variable) between groups were not affected by potential confounding variables age ($p = 0.93$), height ($p = 0.59$), body weight ($p = 0.23$) and previous HS injury ($p = 0.07$).

DISCUSSION

This study demonstrated that complementing standard practice with a secondary prevention strategy shows potential for reducing the number and impact of HS injuries in male professional development football. In our study, there was a significantly higher occurrence and burden of HS injury in the standard practice group. No differences existed between groups in

terms of previous hamstring injury history, weekly training volume, coaching staff or competition levels to explain the group differences. Male professional development players can be expected to restore hamstring strength 48 hours postmatch when using the test in this study.⁷ These novel results suggest that identifying individual players with hamstring strength impairments beyond this time-point is a promising secondary prevention strategy.

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REFERENCES

- 1 Bahr R, Clarsen B, Ekstrand J. Why we should focus on the burden of injuries and illnesses, not just their incidence. *Br J Sports Med* 2018;52:1018–21.
- 2 Ekstrand J, Waldén M, Häggglund M. Hamstring injuries have increased by 4% annually in men's professional football, since 2001: a 13-year longitudinal analysis of the UEFA Elite Club injury study. *Br J Sports Med* 2016;50:731–7.
- 3 Wollin M, Thorborg K, Pizzari T. Monitoring the effect of football match congestion on hamstring strength and lower limb flexibility: potential for secondary injury prevention? *Phys Ther Sport* 2018;29:14–18.
- 4 Bahr R. Why screening tests to predict injury do not work-and probably never will. ... a critical review. *Br J Sports Med* 2016;50:776–80.
- 5 Schache AG, Crossley KM, Macindoe IG, *et al.* Can a clinical test of hamstring strength identify football players at risk of hamstring strain? *Knee Surg Sports Traumatol Arthrosc* 2011;19:38–41.
- 6 Silva JR, Rumpf MC, Hertzog M, *et al.* Acute and residual soccer match-related fatigue: a systematic review and meta-analysis. *Sports Med* 2018;48:539–83.
- 7 Wollin M, Thorborg K, Pizzari T. The acute effect of match play on hamstring strength and lower limb flexibility in elite youth football players. *Scand J Med Sci Sports* 2017;27:282–8.
- 8 Wollin M, Purdam C, Drew MK. Reliability of externally fixed dynamometry hamstring strength testing in elite youth football players. *J Sci Med Sport* 2016;19:93–6.