Live hamstring muscle injury during curve sprinting: a case report

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Introduction & Aims

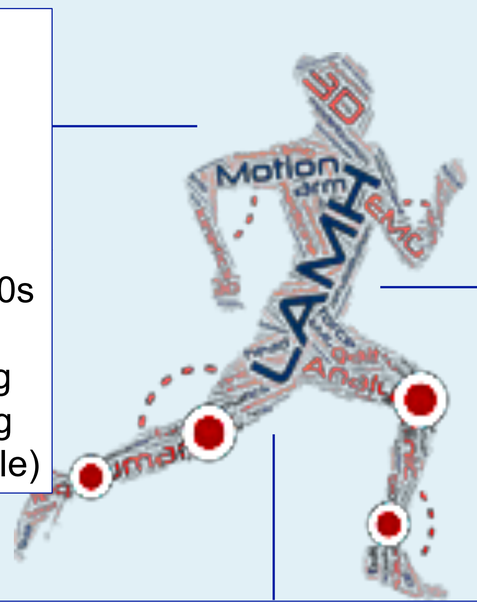
- Hamstring (HM) muscles have a **high rate of injury** especially on the track-field where they can represent as much as 50% of all injuries. It is generally accepted that HS injuries have a **multifactorial origin** (2), highlighting the need to individualize the evaluation process in a multidimensional manner. Although many studies have been conducted on the kinematic characteristics of sprinting (e.g., HM activation), only few studies have observed the electromyographic activity captured during a live HM injury, nor reported the relationship with the athlete's cognitive, behavioural and psychological context such as thoughts, intentions and emotions prior to the onset of injury (1).
- We here describe the case of a male sprinter that sustained a **biceps femoris long head (BFlh) muscle injury during a curve sprinting** protocol to underline the potential impact of its very high BFlh electromyographic activity captured during the injury. Additionally, we reported the athlete's psychological and behavioural state as potential crucial elements that may have contributed to the onset of the injury.

Methods

- A male amateur sprinter was recruited to participate in a study analysing curved sprinting.

PATIENT CHARACTERISTICS

Male amateur sprinter
28 years old, left handed
1.76m, 83kg
Best 100m race time : 11.40s
No previous injury
Regular track-field training
Recent satisfactory testing
(isokinetic /Sprint FVP-profile)



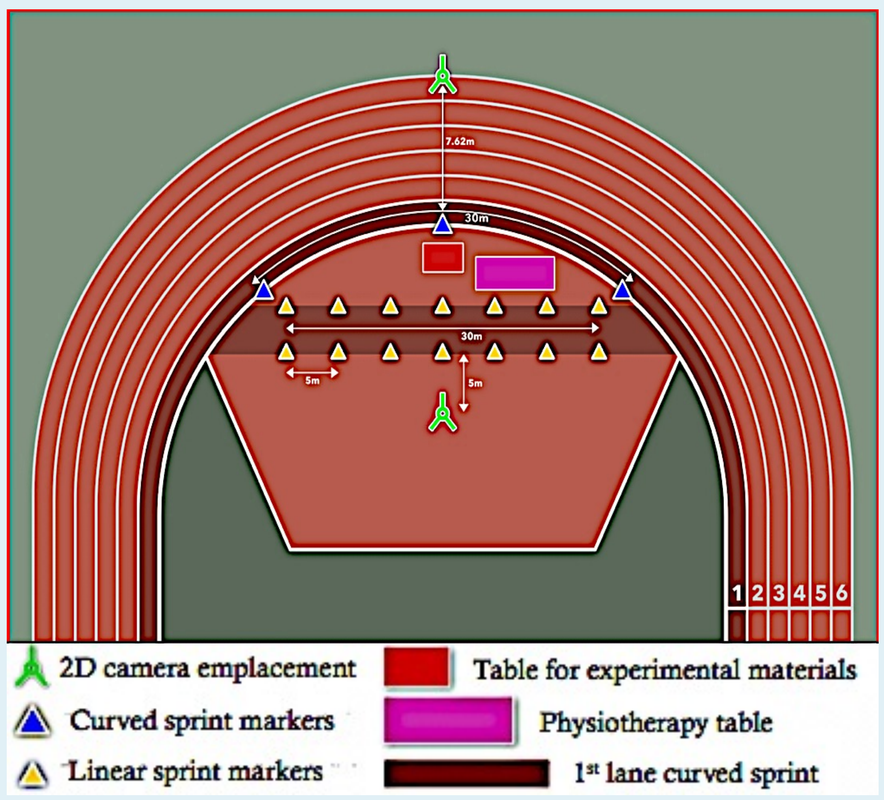
SPRINT PROTOCOL

Two sessions of 3 consecutive 30m fly sprints at maximal speed, each sprint separated by a 5 to 6 min break interval and 8 to 10 min rest between sessions (Figure A).

MATERIALS

1)Surface electromyography (sEMG) activities of BFlh and semitendinosus (ST) were recorded using Delsys Trigno Sensors with silver-contact wireless bipolar bar electrodes and 10 mm fixed inter-electrode spacing (Delsys Inc, Natick, MA, USA).
2)Maximal sEMG activity for each muscle during linear sprint (LS) was used in order to express each sprint as a percentage of their maximal activation during LS.

Figure A. Graphic representation of the methodology.



Results

- **Brutal pain** experienced by the athlete in his left HM during the 3rd sprint of the first session. Protocol was stopped.
- Admitted at hospital within 72 hours of his injury.
- **Grade 2 intra-muscular injury of his left BFlh** (British Athletics Muscle Injury Classification) confirmed after clinical examination and ultrasound imaging.
- sEMG results recorded during the injury showed **very high mean and peak activation** in comparison with the previous sprints and other muscles (Table A).
- Prior to the injury, the athlete reported different elements:
  - **Intention to surpass himself** by maintaining a maximal speed (trying to "**push horizontally harder**" against the track-field),
  - **Emotional stress** in the competitive context,
  - "**Denial" of his BFlh focal pain** appearing after the 2nd sprint.

Table A. Mean and peak sEMG activation values of BFlh and ST muscles during the first (linear), second (clockwise) and third sprint (counter clockwise), expressed as a percentage of their maximal activation during linear sprinting.

Sprint	Muscle activity (%)							
	Mean				Peak			
	LL ST	LL BFlh	RL ST	RL BFlh	LL ST	LL BFlh	RL ST	RL BFlh
1st LS	50.6	64.8	67.7	51.0	100.0	100.0	100.0	100.0
2nd CS	52.8	62.7	67.4	56.7	109.5	111.3	98.7	109.7
3rd CCS*	64.4	**115.5**	74.4	45.6	111.8	**179.2**	111.3	93.6

RL = right leg; LL = left leg; LS = linear sprint; CCS = counter clockwise sprint; CS = clockwise sprint.
** Third sprint during which the injury occurred.*

Conclusion

(1) The sprinter presented a **very high peak** and **mean BFlh activation** during the injury that **coincided with a distinctive psychological state** (emotional stress, denial of the focal pain after the previous sprint and an intention to surpass himself and push horizontally harder) that together may have contributed to the athlete's injury.
(2) Further studies are warranted to **improve the analysis of the relationship between sprinting kinematic patterns and these cognitive, behavioural and psychological factors** that may contribute to the onset of an injury in order to better prevent their occurrence.

1) *L. Teillol, A. Ruffault, et al. Les intentions du sportif durant son effort au moment de la survenue d'une lésion musculaire des ischiojambiers : étude qualitative, 2021, Volume 7232, Issue 4, 12/2021, Pages 191-254, http://dx.doi.org/10.1016/j.jts.2021.04.005*

2) *M. Buckthorpe, S. Wright, S. Bruce-Low, et al. Recommendations for hamstring injury prevention in elite football: translating research into practice. BJSM, 2019;53:449-456*

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