Comparison of Hamstring Muscle Activation and Coordination Between Injured and Uninjured Limbs in individuals with a History of Hamstring Strain Injury History During Repeated Submaximal Sprint Performance on a Treadmill

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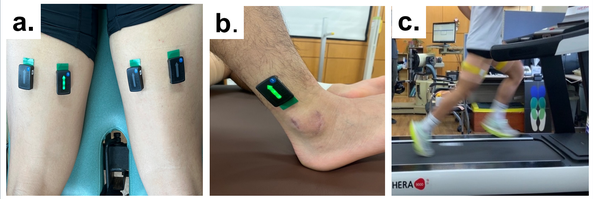
INTRODUCTION

- Hamstring injuries frequently occur during high-speed sprinting[1] and Over 50% occur in the final 15 minutes of play[2].
- Despite various prevention and rehab strategies, incidence has more than doubled over the past two decades[1].
- Most studies focus on uninjured athletes and overlook neuromuscular responses during repeated sprint[3].
- The purpose of this study was to examine differences in hamstring activation and coordination between injured and uninjured limbs during repeated submaximal treadmill sprints.

METHODOLOGY



- Eight male and female athletes (age: 22.7 ± 3.5 yrs) with a return-to-play duration of 3.9 ± 2.9 weeks participated.
- Participants completed five repeated sprints at 90% max speed (22.7–25 km/h) on a treadmill. (Figure c.)
- EMG was recorded from BFlh and ST at 2000 Hz during repeated sprints. (Figure a.)
- Shank angular velocity was used to identify stance, early-swing, and late-swing phase. (Figure b.)
- EMG data were normalized to peak MVC from an isometric contraction.
- Custom Python code was used to calculate peak and mean RMS values of BFlh and ST by phase.

RESULT

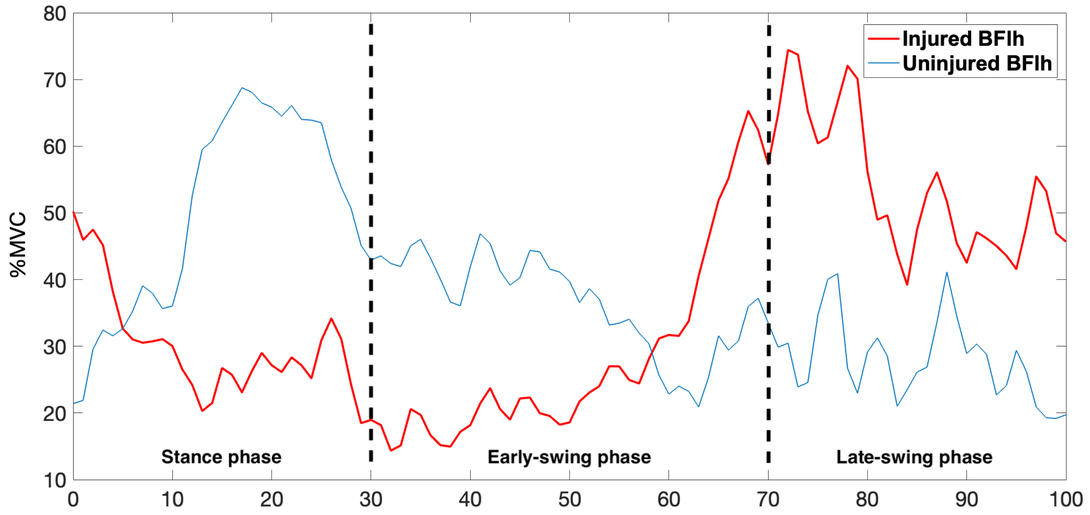


Figure 1. Comparison of BFlh muscle activation between injured and uninjured limbs during the late-swing phase of sprinting

		Injured (Mean ±SD)	Uninjured (Mean ±SD)	p-value
Stance	BFlh (%MVC)	41.23 ± 49.95	23.28 ± 22.4	.376
	ST (%MVC)	47.29 ± 52.81	35.66 ± 31.27	.790
	BFlh/ST coordination	0.87 ± 0.44	0.65 ± 0.38	.039*
Early-swing	BFlh (%MVC)	38.66 ± 13.89	25.57 ± 13.22	.609
	ST (%MVC)	44.26 ± 34.56	47.31 ± 32.36	.858
	BFlh/ST coordination	0.87 ± 1.28	0.54 ± 0.65	.037*
Late-swing	BFlh (%MVC)	67.43 ± 33.47	42.84 ± 24.27	.006**
	ST (%MVC)	47.43 ± 36.67	52.33 ± 32.14	.400
	BFlh/ST coordination	1.42 ± 1.13	0.82 ± 0.47	.015*

*p<.05, **p<.01, BFLH = Biceps Femoris Long Head, MVC = Maximum Voluntary Contraction, RMS = Root Eean Square

During the late-swing phase, the injured limb showed significantly greater BFlh activation (p = 0.006) and higher BFlh/ST coordination ratio (p = 0.015) compared to the uninjured limb.

DISCUSSION

- During the late-swing phase, the injured limb exhibited relatively greater activation of the BFlh compared to the ST than the uninjured limb.
- This finding suggests a shift in the muscle recruitment strategy following injury.

CONCLUSION

- The previously injured limb exhibited altered hamstring muscle coordination patterns compared to the uninjured limb during repeated-sprint performance.

PRACTICALAPPLICATIONS

- Current hamstring injury prevention and rehabilitation strategies primarily focus on enhancing eccentric strength (e.g., Nordic Curls) and flexibility.
- However, neuromuscular control changes following injury are commonly observed, and should be considered in prevention and rehabilitation strategies to reduce re-injury.

REFERENCES

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