Spraino reduces impact coefficient of friction and inversion moment

mechanical simulations of a lateral ankle sprain injury in Badminton

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INTRODUCTION

- The lateral ankle sprain is the most common injury in Badminton[1]
- Spraino is a new protective equipment with 53% preventive effectiveness against severe ankle sprains[2]
- Spraino is designed to minimize lateral edge shoe surface friction[2,3]
- Reduce inversion moment by bringing GRF vector closer to ankle joint centre in case of landing with initially inverted foot[2,3]

PURPOSE

- Design custom-build pendulum to replicate initial shoe-surface contact angles and velocities from televised ankle injuries
- Reproduce ankle sprain injury scenario filmed during the 2020 All England Badminton semi-finals
- **Evaluate Spraino's protective effect in reducing ankle inversion moment** in a replicated injury scenario

METHODS

Video of test

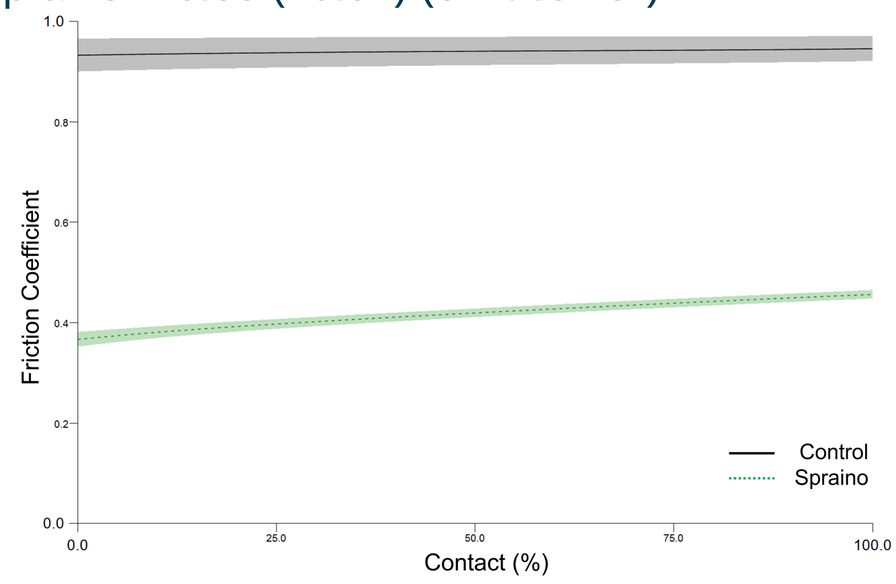
- **Yonex badminton shoe** (SHB 65 Z2, Yonex Co., Japan)
- **Taraflex Sport M Evolution** badminton floor (Gerflor, France)
- **Custom-build British pendulum** with artificial foot and ankle joint
- **Artificial ankle joint** positioned to **replicate** shoe-floor contact angle from 2020 All England **injury**
- **10 trials** with- and without **Spraino low-friction patches** attached
- Impact velocity of the shoe against force platform: **4.0 m/s** (±0.1) (within 2.5-5% of the televised injury case)
- Kinematics recorded at **500 Hz** (Oqus 300+, Qualisys AB, Sweden), Kinetics recorded at **1000 Hz** (OR6-7-1000; AMTI, USA)
- Both kinematics and kinetics filtered at **35 Hz** 4th-order low-pass Butterworth filter.
- **Friction coefficient** and mechanical **joint kinetics** analysed in Visual 3D v6 (C-Motion Inc., USA).

RESULTS

Initial contact coefficient of friction

Control: 0.93 (±0.03)

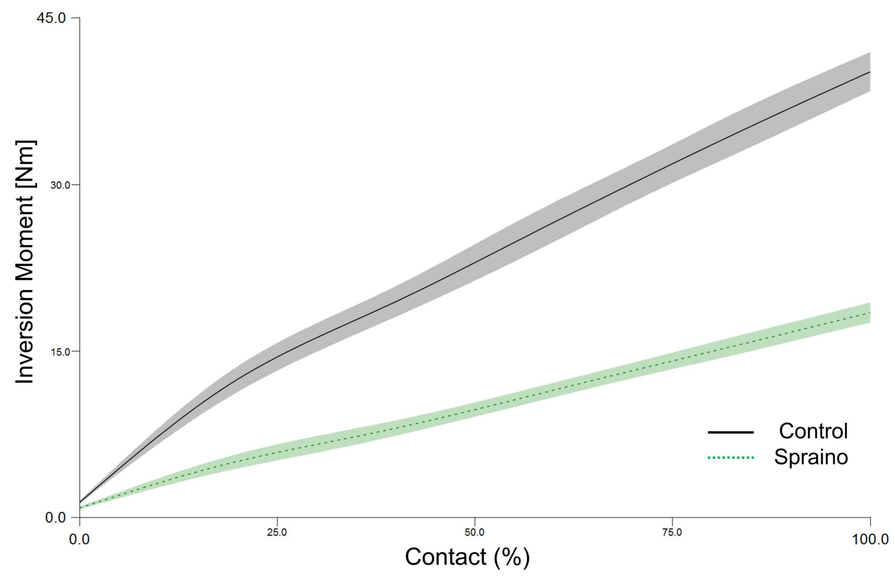
Spraino: 0.35 (±0.01) (**62% lower**)



Mechanical inversion moment

Control: 40.2 (±1.7)

Spraino: 18.5 (±0.9) (**54% lower**)



CONCLUSIONS

- The **62% reduction in initial contact coefficient of friction** is similar to a previous ISO13287 mechanical testing[3]
- The **54% reduction in inversion moment** is a further testament to the preventive potential of reducing lateral edge friction

REFERENCES & CONTACT INFO

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