

MEETING ABSTRACT

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# Effects of ankle and knee braces on leg stiffness during hopping

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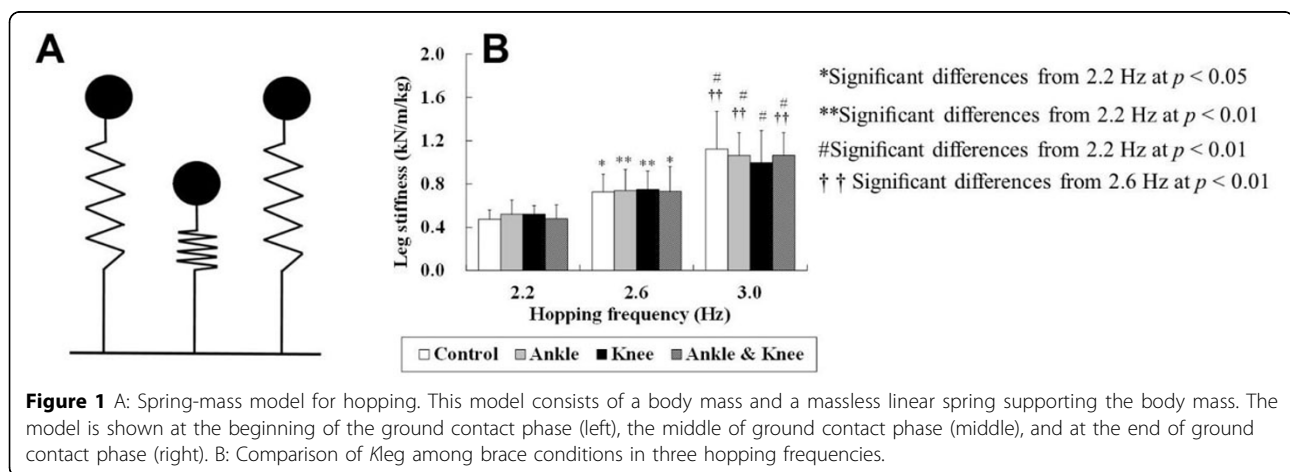
From 4th Congress of the International Foot and Ankle Biomechanics (i-FAB) Community Busan, Korea. 8-11 April 2014

In a spring-mass model (Figure 1-A), the stiffness of the leg spring (leg stiffness;  $K_{leg}$ ) is thought to be an important factor in musculoskeletal performance in hopping, running and jumping [1]. Despite the fact that many athletic activities are performed with joint stabilizers, little is known about the  $K_{leg}$  with ankle and/or knee braces. A previous study demonstrated that neither ankle taping nor bracing affected the  $K_{leg}$  during hopping at 3.0 Hz [2]. However, it remains unclear if this constant  $K_{leg}$  exists or changes at other hopping frequencies. The purpose of this study was to more extensively investigate the effect of ankle and knee braces on the  $K_{leg}$  over a range of hopping frequencies.

Ten male participants performed one-legged hopping in place, matching metronome beats at 2.2, 2.6, and 3.0 Hz.

Based on a spring-mass model, we calculated  $K_{leg}$  using an inertial sensor (Myotest<sup>®</sup>, Myotest SA, Switzerland). Commercially-available ankle and knee braces (Ankle Guard-soft and Knee Guard-Ligament3, ALCARE, Japan) were used to constrain these joints, respectively.

Statistical analysis revealed the existence of a significant main effect of hopping frequency ( $F(1.22, 10.97) = 48.16, p < 0.01$ ; Figure 1-B) on  $K_{leg}$  but no significant main effect of brace conditions ( $F(3.00, 27.00) = 0.15, p = 0.926$ ), nor a significant interaction between hopping frequency and brace conditions ( $F(6.00, 54.00) = 0.94, p = 0.472$ ) on  $K_{leg}$ . These results indicate that neither ankle nor knee bracing affects the  $K_{leg}$  in a range of hopping frequency.



**Figure 1** A: Spring-mass model for hopping. This model consists of a body mass and a massless linear spring supporting the body mass. The model is shown at the beginning of the ground contact phase (left), the middle of ground contact phase (middle), and at the end of ground contact phase (right). B: Comparison of  $K_{leg}$  among brace conditions in three hopping frequencies.

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Published: 8 April 2014

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doi:10.1186/1757-1146-7-S1-A108

**Cite this article as:** Hobara *et al*: **Effects of ankle and knee braces on leg stiffness during hopping.** *Journal of Foot and Ankle Research* 2014 **7**(Suppl 1):A108.

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