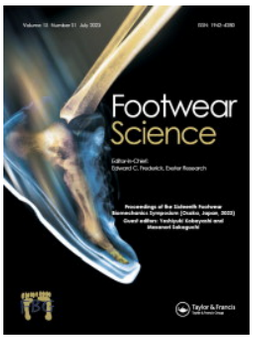

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The effect of footwear with a flexible ankle collar on function in individuals with chronic ankle instability

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KEYWORDS Chronic ankle instability; lateral ankle sprains; ankle joint angles; landing; biomechanics; ankle sprain

Individuals who develop chronic ankle instability (CAI) following a lateral ankle sprain (LAS) often experience diminished proprioception, reduced dynamic stability, and altered movement patterns during landing (e.g. increased plantar flexion and inversion angles) (Simpson et al., 2019).

Using external supports (e.g. ankle braces or taping) may reduce the risk of recurrent ankle sprains. However, disadvantages include discomfort, impaired athletic performance, and taping often requires application by a skilled practitioner and loosens over time (Koyama et al., 2014).

Soft ankle collars are increasingly popular in sporting footwear, but it is not currently known if these provide positive benefits in individuals with CAI. Complete contact between the collar and the skin over the ankle joint could improve known deficits and ankle motion in CAI (Burcal et al., 2017).

Purpose of the study

This preliminary study aims to examine the effect of a flexible ankle collar trainer compared with a standard trainer, on ankle motion during landing in individuals with CAI.

Methods

Five active individuals with CAI (age 20.6 ± 2.2 years, mass 79.2 ± 4.0 kg, height 182.2 ± 9.1 cm, CAIT 18.0 ± 6.3) volunteered. Two footwear conditions (1) a standard neutral trainer (control; C) and (2) a standard neutral trainer plus a flexible ankle collar (FC) were assessed in random order. Participants were asked to complete five single-leg drop landings (with hands on hips) from a 30 cm height.

Kinematic (12 Vicon MX cameras, Oxford, UK, 250 Hz) and kinetic (Kistler force plate, Alton, UK, 1000 Hz) data were collected. Retro-reflective markers were placed on the participant's affected lower limb. Rigid clusters with four markers (non-orthogonal) were attached to the thigh and shank. Kinematic and kinetic curves were calculated from a six-degree of freedom model in Visual3D (C-Motion, Inc., Germantown, USA). A 4th-order Butterworth filter with 15 Hz cut-off frequency was used to filter both kinetic and kinematic data. External joint moments were calculated and normalised to body mass. Joint kinematics and kinetics were assessed from 200 ms before to 300 ms after initial contact (IC). Descriptive data were calculated for sagittal and frontal ankle angles and moments pre-IC, at IC, and post-IC.

Table 1. Mean and standard deviations for ankle angles and moments.

	Control	Flexible ankle collar
Plantarflexion angle – pre (°)	−8.8 ± 5.9	−3.7 ± 4.5
Plantarflexion angle – IC (°)	−25.8 ± 4.3	−23.2 ± 3.0
Inversion angle – pre (°)	8.7 ± 4.8	6.3 ± 3.3
Inversion angle – IC (°)	4.4 ± 3.6	1.9 ± 2.1
Peak dorsiflexion moment (Nm/kg)	2.14 ± 0.36	2.15 ± 0.37
Peak inversion moment (Nm/kg)	−0.21 ± 0.18	−0.23 ± 0.15
Peak eversion moment (Nm/kg)	0.30 ± 0.29	0.18 ± 0.12

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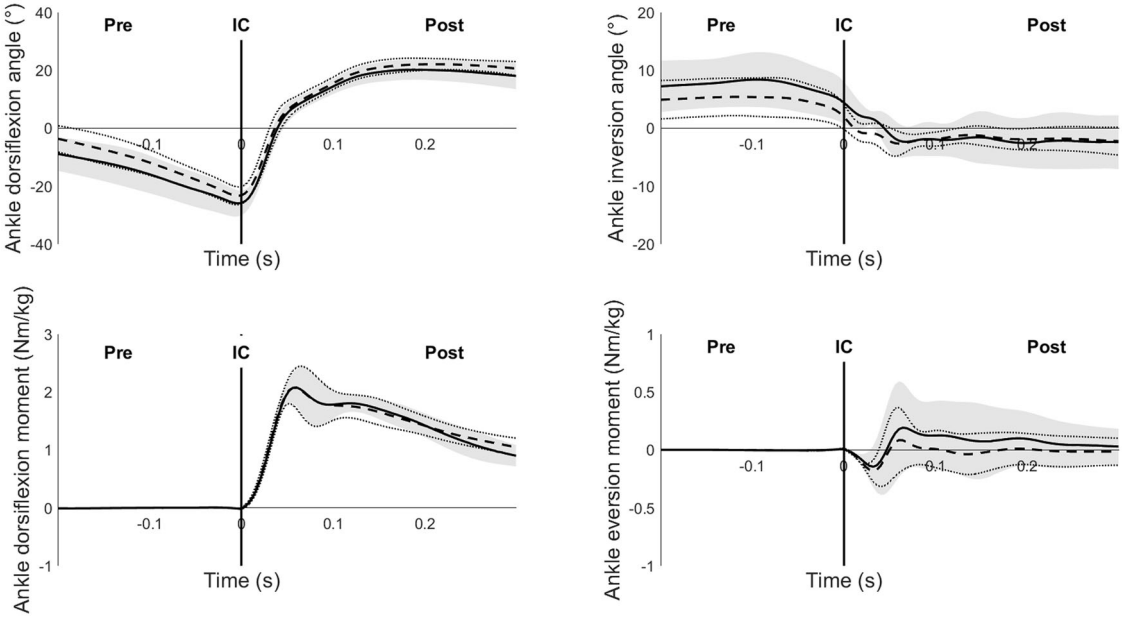

Figure 1. Ensemble averages for ankle angles and moments pre- and post-landing for the flexible ankle collar (dashed) and control (solid) condition.

Results

Table 1 presents means and standard deviations for ankle angles and moments pre, post, and at IC. Peak plantarflexion and inversion angles were lower in FC compared to C pre-IC. FC demonstrated lower ankle plantarflexion and inversion angles at IC. Figure 1 presents ensemble averages from 200 ms before to 300 ms after initial contact for both conditions.

Discussion and conclusion

Our findings provide an initial examination of ankle motion during a single-leg drop landing. Comparisons suggest that the flexible ankle collar may result in altered ankle motions that are favourable to reducing the risk of a LAS.

However, peak inversion moments during early weight acceptance (first 50 ms post-IC) were greater in the flexible ankle collar.

Further, data collection is underway to ensure sufficient sample size and allow for statistical comparison using Statistical parametric mapping (SPM). Analysis of additional data (e.g. muscle activity data) will enable a better understanding of the effect of a flexible ankle collar in individuals with CAI.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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