Ankle Prophylactic Devices Prevent Excessive Inversion

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INTRODUCTION
Ankle sprain is the most common recreation injury [1]. The ankle injuries commonly occur from a sudden inversion of the foot beyond 30°. To prevent excessive inversion and reduce risk of injury, athletes commonly wear a prophylactic product. These products, such as external brace or athletic tape, provide mechanical ankle stability during performance, but are limited by a high rate of re-injury [2].

METHODS
Four (two male and two female) recreationally active participants (ht: 1.7±0.1m, wt: 73.3±9.8kg) had ankle inversion quantified during a sudden inversion event. For the inversion event, participants stood with feet shoulder width apart on a wooden platform that contained a trap door under each foot. Then, a researcher randomly dropped one of the trap doors, causing the ankle to invert 30°. Participants performed five sudden inversion trials with each of the four conditions (Control, ARG, External Brace, and Athletic Tape) tested.

During each trial, participants had ankle inversion quantified from the 3D trajectories of 32 reflective markers recorded by eight high-speed (240 fps) optical cameras (Vicon, Oxford, UK). The marker trajectories were low pass filtered with a fourth-order Butterworth filter (12 Hz) before being processed by Visual 3D (C-Motion, Rockville, MD) to calculate ankle kinematics.

For analysis, peak ankle inversion angle, range of ankle inversion, and time to peak ankle inversion were calculated during the sudden inversion event. Each variable was submitted to a one-way RM ANOVA to test the effect of each ankle brace (ARG, external brace (Medspec ASO Ankle Stabilizer), athletic tape (closed basket weave) and no brace control). Alpha level was set at 0.05.

RESULTS AND DISCUSSION
Contrary to previous experimental evidence, ankle brace had no significant effect on peak ankle inversion angle (p = 0.368), range of ankle inversion (p = 0.125) or time to peak ankle inversion (p = 0.396) during the sudden inversion event (Table 1 and Fig. 1) [3]. The ARG did not currently reduce ankle inversion compared to the chosen external brace, athletic tape or unbraced control condition. This research is ongoing, but we anticipate with more participants all braced conditions (ARG, external brace and athletic tape) will exhibit a significant reduction in peak ankle inversion, range of ankle inversion and time to peak ankle inversion compared to the control condition. The ARG, however, will not exhibited a greater reduction in any ankle inversion parameter compared to the external brace or athletic tape conditions.

CONCLUSIONS
This research is currently ongoing, but to date, none of the chosen ankle braces exhibited a greater reduction in ankle inversion compared to the control condition. We anticipate with more participants that a significant difference in ankle inversion will be evident between the ankle prophylactic products and the control condition. The ARG, however, will not exhibited a significant reduction in ankle inversion compared to the other braced conditions.

REFERENCES

ACKNOWLEDGEMENTS
We would like to thank the Idaho Global Entrepreneurial Mission for providing funding for this work.

| Table 1: Mean (± SD) ankle kinematics during the sudden inversion event for each bracing condition. |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Peak Ankle Inv. (deg)           | ARG    | Brace | Control | Tape    |
| Ankle Inv. RoM (deg)            | 36.27 ± 2.42 | 34.00 ± 2.45 | 38.39 ± 6.68 | 37.47 ± 5.24 |
| Time to Peak (s)                | 0.184 ± 0.04 | 0.226 ± 0.06 | 0.204 ± 0.03 | 0.217 ± 0.03 |

Figure 1: Ankle inversion (deg) exhibited by one participant during the sudden inversion event with each condition.