INTRODUCTION
The unstable Masai Barefoot Technology (MBT) shoe has been designed to introduce small instabilities while walking and there is anecdotal and scientific evidence to suggest that using these shoes can lead to a reduction in back and knee joint pain in some individuals [1,2]. A more comprehensive biomechanical gait analysis on these shoes is needed to better understand the mechanisms for symptom relief and what the long term implications of wearing these shoes might be on the body. Therefore the purpose of this study was to use the multivariate statistical technique of principal component analysis (PCA) to comprehensively compare joint angles and moments at the hip, knee and ankle between walking in an unstable MBT shoe and a stable control shoe before and after a six week accommodation period of wearing the unstable shoe.

METHODS
Three dimensional joint angles and resultant internal joint moments at the hip, knee and ankle were computed in Kintrak (Human Performance Laboratory, University of Calgary) on 23 healthy individuals while walking in an unstable MBT shoe and a stable control shoe, both before and after a six week accommodation period of wearing the unstable shoe at their workplace. Force data was captured at 240 Hz using a force platform (Kistler Instrumente AG) and motion data was captured at 2400 Hz using an eight camera motion capture system (Motion Analysis Corporation). PCA was used on the stance phase waveforms to identify biomechanical features that were then tested statistically for differences between the two shoes and two testing sessions using a 2 x 2 two-way repeated measures ANOVA (PASW Statistics 18, SPSS Inc.)

RESULTS
PCA was effective in discriminating between the two shoes, with the greatest number of differences occurring at the ankle. Kinematic changes included reduced hip flexion-extension and ankle abduction-adduction range of motion, increased early stance dorsiflexion and increased knee internal rotation for unstable shoe walking. Ankle moments tended to be greater for the unstable shoe compared to the stable control shoe for both testing sessions. For example, ankle abduction moments were greater for the unstable shoe throughout the majority of stance (Figure 1A). During the first half of stance, the unstable shoe produced more of a plantarflexion moment compared to the stable control shoe which generated more of a dorsiflexion moment (Figure 1B). Between 50-90% of stance, walking in unstable shoe also led to small but statistically significant magnitude reductions in peak abduction and peak adduction moments during the first 25% of stance (Figure 1D).

DISCUSSION & CONCLUSIONS
While many of the identified changes agree with previous studies on these unstable shoes, this is the first study to report of increases in some internal joint moments during unstable MBT shoe walking. It is thought that reductions in joint moments could be providing pain relief in some individuals through reduced joint contact forces. The implications of the increased moments remain less clear and therefore it is important that future long term follow-up studies be carried out on these shoes to better understand the long term implications of these unstable MBT shoes on the body.

REFERENCES

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