Ancient Puebloan people used yucca plants in minimalist designs for sandals, yet little is known about gait biomechanics in this population. This gap is an opportunity to gain new knowledge about ancient minimalist footwear and running biomechanics.

We evaluated, for the first time, gait biomechanics of minimalist runners wearing replicate ancient Puebloan yucca sandals compared to modern running shoes and a barefoot condition.

Participants
- 4 minimalist runners
  - 3 females, 1 male
  - Ages 34.5±5.4 years
  - Body mass 62.9±6.7kg
  - Height 161.3±7.9cm

Footwear conditions
- Barefoot
- Modern running shoe
- Yucca sandal

Slope conditions
- Uphill (7.5 degrees)
- Flat (0 degrees)
- Downhill (-7.5 degrees)

Mode
- Walking
- Running

Speed
- Determined by overground trials.

Systems
- Bertec instrumented treadmill
- VICON motion capture system

Statistics
- One-way ANOVA (α = 0.05)
- Tukey HSD test
- ns - indicates ‘not significant’

Results/Significance
These results add to our understanding of how yucca sandals compare to a modern running shoe and a barefoot condition.

The barefoot condition is always different than the modern shoe.

The sandal acts similarly to either the modern shoe or the barefoot condition depending on the variable of interest.

Discussion

The barefoot condition is different than both the modern running shoe and the sandal for maximum vertical force at foot off for downhill walking trials, but not modern running shoe and sandal.

The barefoot condition is only different than the modern running shoe for vertical ground reaction force at foot contact for uphill walking trials.

The barefoot condition is only different than the modern running shoe for maximum vertical ground reaction force at foot contact for flat walking trials.

The modern running shoe is different than both the sandal and the barefoot condition for ankle angle at foot contact for both the flat walking and uphill running trials, but the sandal is not different than the barefoot condition.

The modern running shoe is only different than the barefoot condition during uphill running for ankle angle at foot off.

Larger ankle angles produced by the modern running shoe may increase the risk of injury and reduce the economy of running compared to other conditions. Higher forces at foot strike and foot off produced by the barefoot condition may also increase the risk of injury and reduce the running economy compared to the other condition.

More participants must be recruited to increase the sample size. This will further help with our understanding of the effects ancient sandals have on loading rate and impulse during gait.

References and Support


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