How does vertical loading rate and landing pattern alter in adult habitual shod runners when acutely trialling barefoot running? A literature review

Connor Hutchison
Footstrike Pattern

Rearfoot Strike  >

Midfoot Strike

Forefoot Strike  >

10k run organized by sporlab in 2015 (Sporlab 2019)

Human machines (Chris B 2016)

(Hamill and Gruber 2017; Lieberman et al. 2010; Hojjati Zidashti et al. 2017)
Vertical Loading Rate (VLR)

Greater VLR associated with running-related injuries

Lower VLR associated with a Forefoot strike landing


Vertical GRF forefoot (Larson 2011).
Barefoot running promotes a forefoot strike which reduces vertical loading rate

Cushioned running trainers reduce the vertical loading rate during a rearfoot strike landing

(Lieberman et al. 2010; Hashish et al. 2016: Davis et al. 2016)
What Did I Want to Discover?

How does vertical loading rate and landing pattern alter in adult habitual shod runners when acutely trialling barefoot running?
What Did I Find?

During Barefoot Running:

Across all runners: (average)

VLR: ↑

Runners with a forefoot strike/more plantar-flexed ankle at ground contact:

VLR: ↓

Foot Strike Patterns: Mixed

Plantar-Flexion Angle at IGC: ↑

(Lieberman et al. 2010)
Further Considerations

- Prolonged habituation yields similar results  
  (Hollander et al. 2017; Hollander et al. 2019; Tam et al. 2016)

- Instruction to FFS decreases VLR (barefoot and in trainers)  
  (Samaan et al. 2014; Shih et al. 2013; Futrell et al. 2019)

**Barefoot Running:**

- Reduces knee stress and increases stress at the Achilles tendon and ankle  
  (Hashish et al. 2016; Sinclair 2014; Bonacci et al. 2014; Altman and Davis 2016)

- Reduces hip internal rotation and adduction (lead leg) which alters knee motion  
  (Monaldi et al. 2019; McCarthy et al. 2015; Meira and Brumitt 2011)
Thankyou for Listening

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Articles Included Within My Literature Review


Shih, Y., Lin, K-L., Shiang, T-Y., 2013. Is the foot striking pattern more important than barefoot or shod conditions in running? *Gait & posture* [online], 38 (3), 490-494.


van der Worp, H., Vrielink, J. W., Bredeweg, S. W., 2016. Do runners who suffer injuries have higher vertical ground reaction forces than those who remain injury-free? A systematic review and meta-analysis. *British journal of sports medicine* [online], 50, 450-457.


