SPEED AND TERRAIN IMPACT GROUND REACTION FORCES DURING LOAD CARRIAGE

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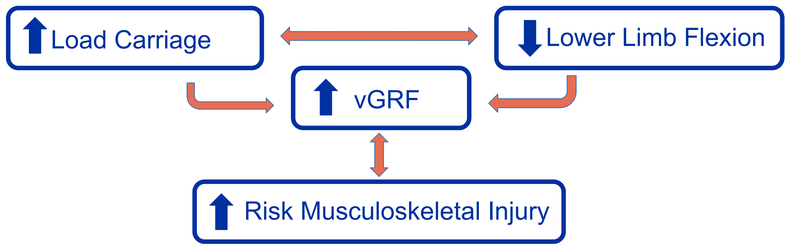
INTRODUCTION

Load Carriage increase vertical GRF and high ground reaction forces (vGRF) are connected to increase in risk of musculoskeletal injuries.

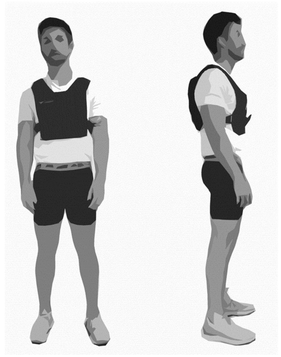


Gap in knowledge: It is unknown how speed and terrain alters lower limb biomechanics.

PURPOSE: Determine the effect of speed and terrain on lower limb biomechanics during load carriage.

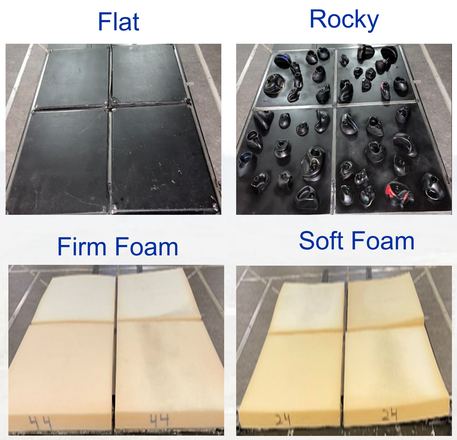
METHODS

Participants: 12 (6M, 6 F) physically active participants.



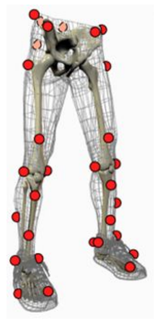
With a **15 kg body borne load**, participants walked (1.3 m/s), jogged (3.0 m/s), and ran (4.5 m/s).

Surfaces consisted of either particle board (flat and rocky) or foam (firm and soft).
Each surface was secured atop the force platform with a metal frame.



METHODS

Biomechanical Analysis:



Each participant had ankle and hip range of motion analysed along with their vertical ground reaction forces during each condition. These variables were submitted for further processing.

Statistical Analysis:

Ankle Range of Motion
Knee Range of Motion
Peak vGRF

→ ANOVA

* α = 0.05

RESULTS

Surface impacted peak vertical GRF (p<0.001) (**Fig. 1**).

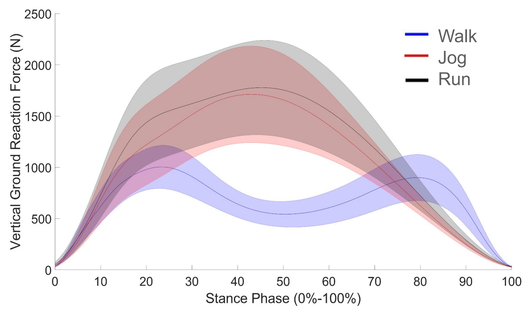


Fig. 1: Mean ± SD stance phase (0%-100%) for vGRF over the four surface per walk, jog, and run speeds.

Speed impacted peak vertical GRF, (p<0.001), where GRF were larger during the run (**Fig. 2**).

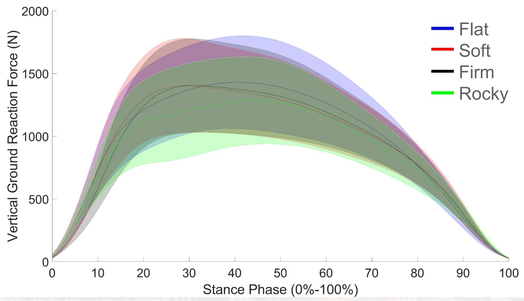
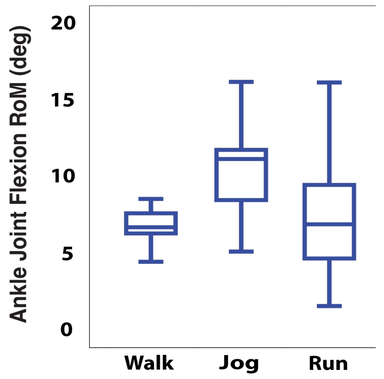
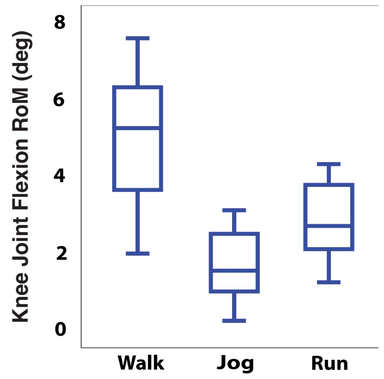


Fig. 2: Mean ± SD stance phase (0%-100%) for vGRF during the three speeds categorized surface per walk, jog, and run speeds.

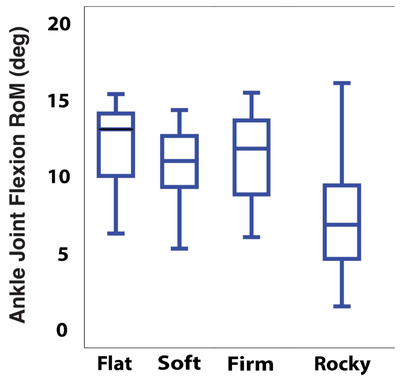
Significant speed by surface interactions were evident for peak vertical GRF (p<0.001)

RESULTS

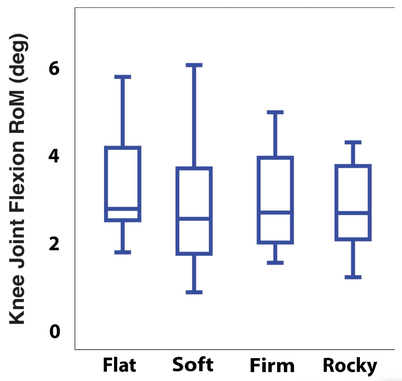




Speed impacted ankle and knee ROM (all: p<0.001), where ankle were larger, but knee motion smaller during the run.



Surface impacted ankle ROM (p=0.008).



Significant speed by surface interactions were evident for ankle and knee ROM (p=0.030 and p<0.001).

CONCLUSION

As speed increase, ankle range of motion increased, but knee range of motion decreased. Unexpectedly, vGRF decreased over rocky surfaces.

IMPACT: Understanding how speed and terrain impact ROM as well as vGRFs will help injury prevention programs better reduce risk of injury for specific conditions.