



Dynamics of neuromuscular adjustments to the progressive reduction in external forces

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1 Introduction

- Runners are confronted with changing external forces [1]
- Only one study focused on the **neuromuscular adjustments to progressive reduction in external forces** [2]
- It reported **positive correlations during the braking phase**

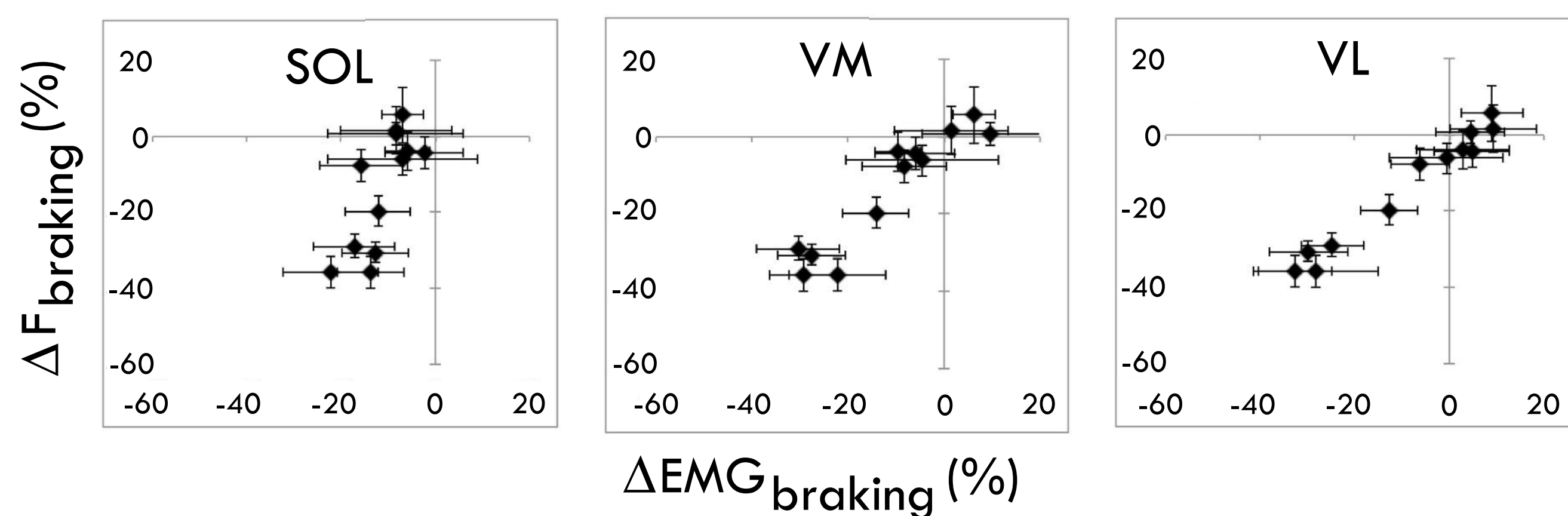


Fig. 1 Correlations between changes in mean force and mean muscle activity

- ...but **did not analyse them for each participant separately**

This study investigated the **dynamics of neuromuscular adjustments to the progressive reduction in external forces, using an individualised analysis**

2 Methods

- 40 male recreational runners (19 ± 1 yr) ran on a **Lower Body Positive Pressure treadmill** (AlterG®, 3.0 ± 0.2 m/s)

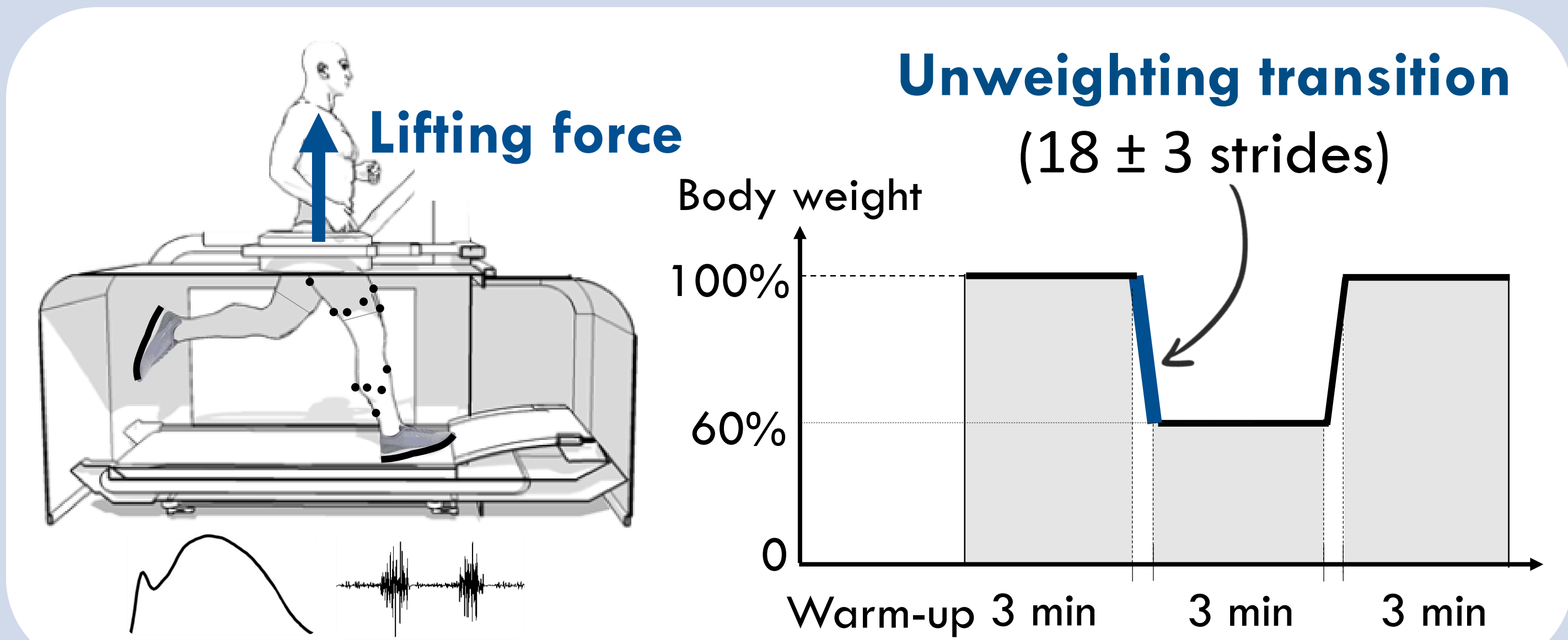


Fig. 2 Experimental design

- Spearman's correlation tests to quantify **the relationship between braking force and braking muscle activity**



3 Results & Discussion

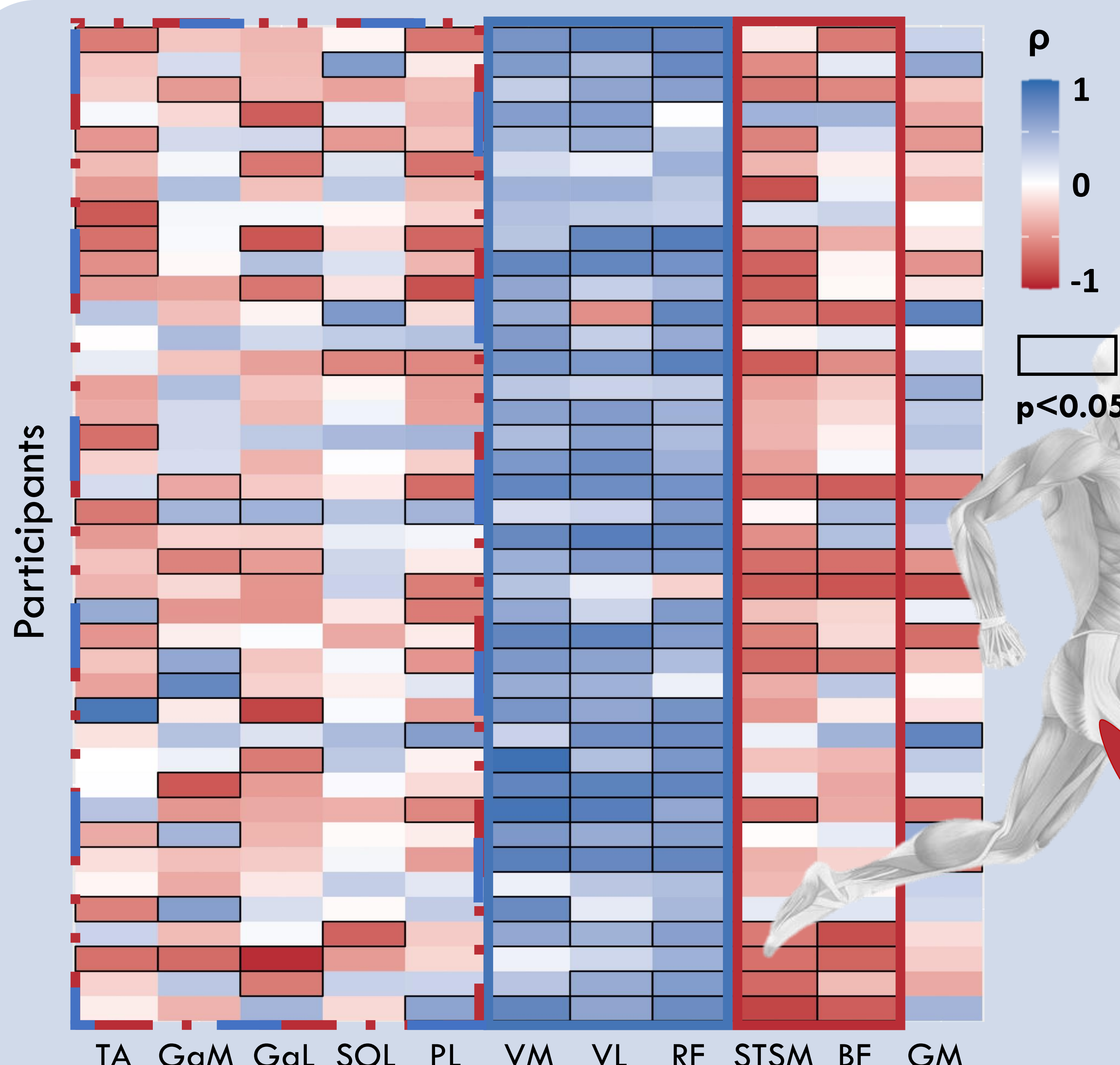


Fig. 3 Spearman's rank correlations coefficients (ρ) between mean braking force and muscle activity

During the **braking phase**, the **progressive reduction in external forces** was associated with:

- Similar proximal neuromuscular adjustments**
 - Quadriceps activity
 - Hamstring activity
 - Reduces peak knee flexion during stance [3]
 - Accelerates the return of the free-leg [4]
- Varied distal neuromuscular adjustments**
 - Shank muscle activity in some participants
 - Shank muscle activity in others
 - Ensures ankle stabilisation when shifting toward a forefoot strike [3]
 - No longer observed after 3 minutes of unweighted running [4]

4 Conclusion

- Neuromuscular adjustments differed between lower limb muscles
- They were **similar between participants for the proximal muscles, but varied for the distal muscles**
- They were not completed at the end of the unweighting transition

»»» **Further analysis should consider the transition and unweighted running phases as a continuum**

[1] Daley, in Understanding Mammalian Locomotion, 2016

[2] Sainton et al., PlosOne, 2016

[3] Fazzari et al., Front Physiol, 2023

[4] Neal et al., J Orthop Sports Phys Ther, 2016