Neuromuscular Control and Strength Performance of Knee Extensors Following Downhill Walking–Induced Fatigue

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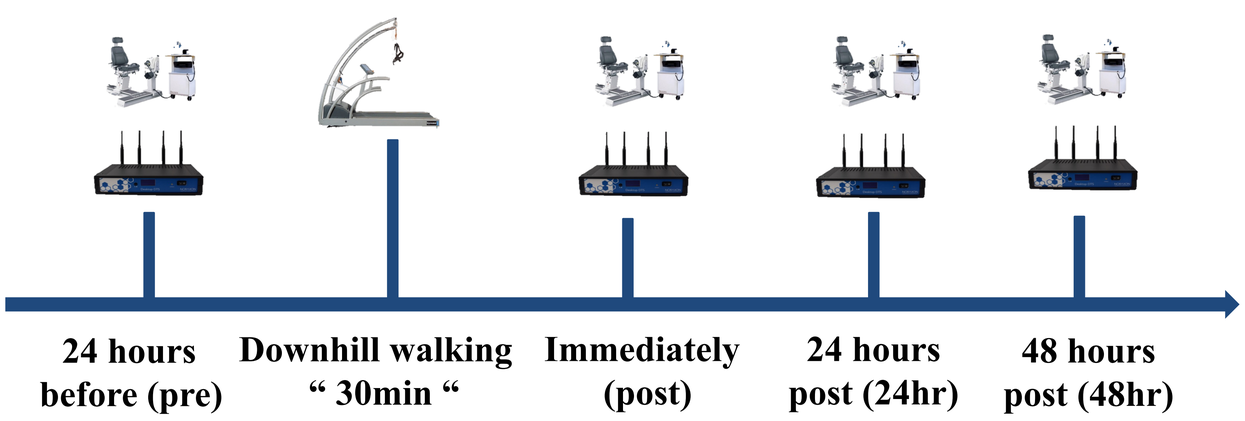
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Introduction

Downhill walking, characterized by repetitive eccentric muscle contractions, is commonly used to induce neuromuscular fatigue. This approach serves as a model for examining both central and peripheral fatigue mechanisms (Tornero-Aguilera et al., 2022).

The aim of this study was to explore time-dependent changes in maximal voluntary isometric contraction (MVIC) and neuromuscular control following a 30-minute downhill walking protocol. This research contributes to the understanding of short-term recovery profiles for monitoring lower-limb fatigue (Ye, X. et al., 2021).

Methods



Body mass : 70.25 ± 11.42 kg
Height : 175.81 ± 3.51 cm
Age : 24.13 ± 2.70 years
BMI : 22.68 ± 3.18



n = 8

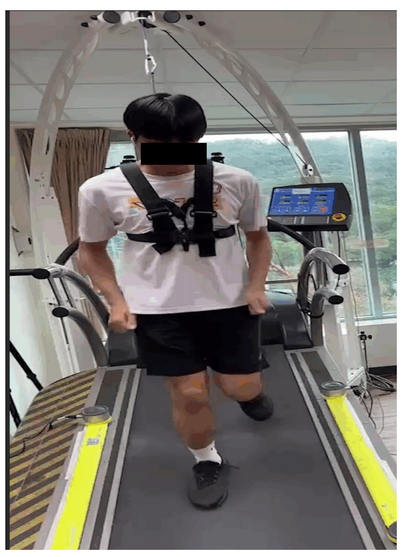
Downhill walking
h/p/cosmos (h/p/cosmos sports & medical, Germany)

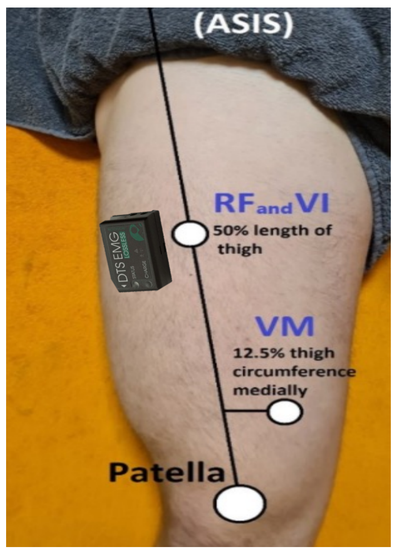


Maximal Voluntary Isometric Contraction (MVIC)
Biodex (Biodex Medical Systems, USA)



Surface Electromyography Signal (SEMG)
Noraxon Desktop DTS (Inc., Scottsdale, AZ, USA)







Results

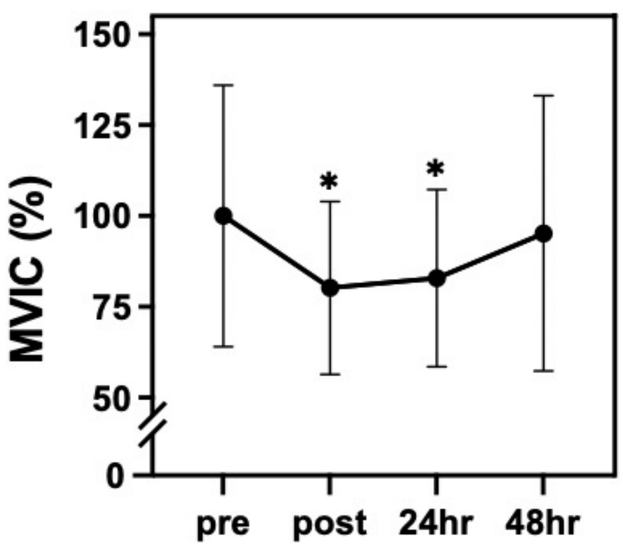


Figure 1.
Comparison of MVIC. There was a significant decrease in strength at post and 24 hr compared to baseline ($p < .05$).

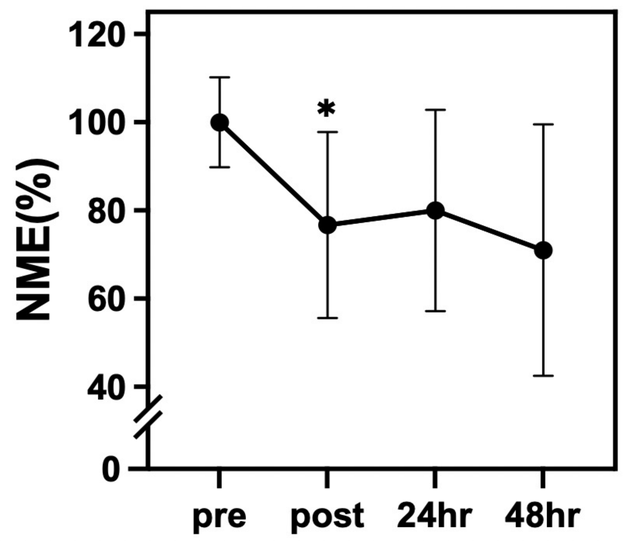


Figure 2.
Comparison of Neuromuscular efficiency. Significant effects were observed at 0 hr, but no significant effects were found at 24 hr and 48 hr ($p > .05$).

Conclusion

Downhill walking induces transient reductions in force-generating capacity, with impairments observed at 0 and 24 hours, followed by substantial recovery within 48 hours. Neuromuscular efficiency showed an acute response. These findings suggest predominantly peripheral fatigue and provide a time-course reference for short-term recovery monitoring, helping practitioners distinguish between peripheral and central fatigue and informing evidence-based load management in athletic settings.

Reference

1.Tornero-Aguilera et al., Int J Environ Res Public Health., 2022
2.Ye, X. et al., Sports Medicine and Health Science., 2021