Age-related differences in drop jump performance are eliminated when triceps surae mechanical properties are matched

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Introduction

Age-related declines in locomotion have been related to declines in the triceps surae muscle-tendon unit (MTU) capacities[1]. We aimed to determine if drop jump height or motor task execution strategy differences existed between young and middle-aged adults, when triceps surae MTU capacities (muscle strength and tendon stiffness) were matched.

Methods

The triceps surae MTU mechanical properties of 26 younger (20 to 30 years) and 29 middle-aged (50 to 65 years) adults were assessed during isometric voluntary ankle plantarflexion contractions using dynamometry and ultrasonography simultaneously. The 12 young adults with the lowest and the 12 middle-aged adults with the greatest triceps surae muscle strength then completed a series of drop jumps from different heights. Ground contact time, average vertical ground reaction force, average mechanical power and jumping height were determined.

Results

Younger and middle-aged adults achieved similar jumping heights, independent of the drop jump starting height. Significant age effects were found for ground contact time ($p < 0.01$) and average vertical ground reaction force during ground contact ($p < 0.01$), with the middle-aged group showing higher ground contact times but lower forces, reflected in a significant age effect on mechanical power ($p < 0.05$). Significant ($p < 0.05$) correlations were found between triceps surae MTU capacities and drop jump height ($0.41 \leq r \leq 0.81$; $p < 0.05$).

Conclusions

The results of the current study demonstrate that when triceps surae MTU capacities are matched, young and middle-aged adults show comparable performance of a jumping task, despite different motor strategies. Countering the degeneration of the triceps surae MTU capacities may help to prevent the decline in locomotor function. Finally, the results suggest that neuromuscular factors other than maximum isometric strength and tendon stiffness may influence motor task execution strategy during jumping.

References

1. Kulmala et al. (2014) *J R Soc Interface, 11*, 20140858.