

Age-Related Changes in Neuromuscular Function in masters track and field athletes: Insight from Hopping Mechanography.



Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center

¹Denis Titov, ¹Dmitry Tsvetkov, ² Michael Arz, ²Jonas Boecker, ²Claudia Kaiser-Stolz, ²Petra Hermann, ²Dominik Pesta, ²Willi Pustowalow, ²Stefan Moestl, ²Lukas Kloesges, ²Jörn Rittweger, ³Daniel Arvidsson, ⁴Phil Chillbeck, ⁵ Scott Forbes, ⁶Eri Miyamoto-Mikami, ⁷ Hirofumi Tanaka, ⁸ Boyi Zhang, ¹Maik Gollasch, ²Jörn Rittweger

¹University Medicine Greifswald, Department of Internal Medicine and Geriatrics, Ferdinand Sauerbruch Street, Greifswald, Germany, ²German Aerospace Center (DLR) Department of Muscle and Bone Metabolism, Linder Höhe Street, Cologne, Germany, ³University of Gothenburg, Department of Food and Nutrition and Sport Science, Gotenburg, Sweden, ⁴University of Saskatchewan, College of Kinesiology, Saskatoon, Canada, ⁵ Brandon University, Department of Physical Education, Brandon, Canada, ⁶ Juntendo University, Tokio, Japan, ⁷The University of Texas at Austin, Department of Kinesiology and Health Education, Austin, USA, ⁸ Shanghai Jiao Tong University, Schangai, China

Introduction

Aging-related loss of muscle mass (sarcopenia) is an important risk factor for morbidity, mortality, and poor quality of life. In the general population, physical inactivity (hypodynamia) contributes to and exacerbates these conditions. In contrast, master athletes constitute a unique group that maintains high levels of physical activity into old age. Currently, there is very little information available on how neuromuscular function declines with aging, particularly in master athletes.

Hypothesis

We hypothesized that measured muscle stiffness would decline and duty cycle would increase oppositely with age. Additionally, we investigated the effect of hopping rate on the outcome variables.

1. Study design and methods of measurement

A total of 133 women (aged 35 to 86) and 148 men (aged 35 to 90) participated in the study. They performed a series of 20 hops at various frequencies: 1) 2.2 Hz, 2) 2.2 Hz with maximal hop height, and 3) 2.5 Hz with maximal hop height. The measurements were taken using a Leonardo Mechanography plate.



2. Data collection (multiple 2-leg Hopping 2.2 Hz and 2.5 Hz)

Image source: www.soreha.net

2.5

3 35 4

Average Delta h

0,16 m

F min

0,00 kN

F min rel

0,00 * Fg

av. Contact Time

0,163 s

male

2,5

1.5

Settling Time

14,32 s

3 3,5 4 4,5





pk.Stiffn./ kN/cm

286,53 kN/cm

Fmax SD Score

+5,84 SD

Force Reference Data:





eben und Gesundheit in Vornor

3.Results







Conclusions

Hopping performance declines in an accelerated fashion after the age of approximately 70 years, suggesting that the loss of neuromuscular function is a prominent feature of old age.