

## *Elderly*

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### **EFFECT OF EXERCISE-INDUCED CHANGES OF THE INTRINSIC TRICEPS SURAE MUSCLE-TENDON UNIT PROPERTIES ON MAXIMAL WALKING VELOCITY IN THE ELDERLY**

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**Introduction and Objectives:** It has previously been reported that deterioration in contractile strength and tendon stiffness in the elderly is associated with altered motor task execution and reduced performance while walking [1,2], and that resistance training improves muscle function, resulting in more effective and safer gait characteristics in the older population [3]. In particular, triceps surae (TS) muscle-tendon unit (MTU) properties seem to be an important determinant for walk-to-run transition speed [4], emphasizing the relevant role intrinsic MTU properties play in gait performance. The objective of this empirical study was to examine the hypothesis that maximal walking velocity is related to TS MTU mechanical and morphological properties and their enhanced capacities would improve gait velocity in the elderly.

**Methods:** Thirty four older female adults (66±7 yrs.) took part in the study. Nineteen of them were recruited for the experimental group, who underwent a 14-week TS MTU physical exercise intervention which has been previously established to increase muscle strength and tendon stiffness [5]. The remaining 15 subjects formed the control group (no physical exercise intervention). The experimental group performed three times per week five sets of four repetitive (3·s loading, 3·s relaxation) isometric plantar flexion contractions in order to induce high cyclic strain magnitudes on the TS tendon and aponeurosis. Maximal walking velocity, defined as walking with a double support phase, was determined by using two force plates (60 x 40 cm, 1080 Hz; Kistler, Winterthur, CH) and a motion capture system (Vicon Motion Systems, Oxford, UK) with 12 infrared cameras operating at a frequency of 120 Hz. TS MTU properties were assessed using simultaneous dynamometry and ultrasonography (Esaote MyLab Five; Esaote Biomedica, Genoa, IT).

**Results:** A significant correlation was found between the TS MTU mechanical and morphological properties and maximal gait velocity ( $0.40 < r < 0.64$ ;  $P < 0.05$ ;  $n = 34$ ). The experimental group showed higher TS contractile strength, tendon stiffness, and higher gastrocnemius medialis muscle thickness post- compared to pre-intervention ( $P < 0.05$ ). However, calculated maximal gait velocity did not differ between pre and post-intervention measurements ( $2.39 \pm 0.41$  vs.  $2.44 \pm 0.45$  m·s<sup>-1</sup>). Control subjects showed no statistically significant differences in maximal gait velocity or TS MTU mechanical and morphological properties.

**Conclusion:** This empirical study confirms previous forward simulation models [4] proposing that intrinsic TS MTU properties are significant determinants of gait performance. However, older adults may not be capable of fully utilizing improvements of the MTU capacities while walking at maximal velocities following a 14 week physical exercise intervention. Therefore, the benefits of a long term physical exercise intervention (1.5 years) will be discussed.

**References:** [1] Beijersbergen et al., Ageing Res Rev, 12: 618-627, 2013.

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**Disclosure of Interest:** None Declared