AGE-RELATED DEFICIT IN DYNAMIC STABILITY CONTROL AFTER FORWARD FALLS IS AFFECTED BY MUSCLE STRENGTH AND TENDON STIFFNESS
Karamanidis Kiros, Mademli Lida, Arampatzis Adamantios
(German Sport University of Cologne, Germany)

The purpose of this work was to determine whether the age-related muscle weakness [1] diminishes older adults’ ability to use mechanisms responsible for maintaining dynamic stability after forward falls. Nine older (aged 60-69 years) and nine younger adults (aged 21-32 years) participated in the study. To analyse the capacities of the leg-extensor muscle-tendon units, all subjects performed isometric maximal voluntary ankle plantarflexion and knee extension contractions on a dynamometer (Biodex Medical Systems). The elongation of the gastrocnemius medialis and the vastus lateralis tendon and aponeuroses during isometric contraction was examined by ultrasonography (Aloka SSD 4000, 43 Hz). Recovery behaviour of the participants was determined after a sudden induced forward fall from two fixed forward inclined body lean angles (19.7 ± 2.4° vs. 26.0 ± 2.7°). The margin of stability was quantified by the position of the extrapolated centre of mass (determined by the position and velocity of the centre of mass) in relation to the base of support according to Hof et al. [2]. Regarding the leg-extensor muscle-tendon unit capacities, younger adults had higher muscle strength and tendon stiffness than the examined older adults (P < 0.05). After a sudden induced forward fall, younger adults created a higher margin of stability compared to older adults, independent of perturbation intensity (P < 0.05). The main mechanism improving the margin of dynamic stability was the increase of the base of support during the swing phase of the recovery limb. The results, further, demonstrated that the locomotion strategy employed before touchdown affects the stability of the stance phase and that muscle strength and tendon stiffness contributed significantly to stability control (P < 0.05; about 38% explanation). We concluded that, to reduce the risk of falls, older individuals may benefit from muscle-tendon unit strengthening programs as well as from interventions exercising the mechanisms responsible for dynamic stability.

References

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