

Effect of walking speed on the intersegmental coordination of lower-limb segments in elderly adults.

Dewolf AH¹, Meurisse GM¹, Schepens B¹, Willems PA².

Author information

- 1 Laboratory of Biomechanics and Physiology of Locomotion, Institute of NeuroScience, Université catholique de Louvain, Louvain-la-Neuve, Belgium.
- 2 Laboratory of Biomechanics and Physiology of Locomotion, Institute of NeuroScience, Université catholique de Louvain, Louvain-la-Neuve, Belgium. Electronic address: patrick.willems@uclouvain.be.

Abstract

BACKGROUND: Ageing brings profound changes in walking gait. For example, older adults reduce the modification of pelvic and lower-limb kinematics with walking speed. However, the modification of the coordination between lower-limb segments with age has never been investigated across various controlled speeds.

RESEARCH QUESTION: Is the effect of speed on the intersegmental coordination different between elderly and young adults?

METHODS: Nineteen senior and eight young adults walked on a treadmill at speeds ranging from 0.56 to 1.94 m s⁻¹. The motion of lower-limb segments in the sagittal plane was recorded by cinematography. When the angles of the thigh, shank and foot during a stride are plotted one versus the other, they describe loops constraint on a plane. The coordination between lower-limb segments was thus evaluated by performing a principal component analysis between the thigh, shank and foot elevation angles. The effect of speed and age on the intersegmental coordination was examined using a two-level linear mixed model ANOVA.

RESULTS: In both age groups the orientation of the plane changes with speed, due to a more in-phase shank and foot motion. However, the effect of speed on the covariation plane is lessened with age.

SIGNIFICANCE: Our results demonstrate that there is an age-related specific adjustment of the intersegmental coordination to speed. In particular, older adults restrict their repertoire of angular segment motion. These differences in coordination are mainly related to the foot-shank coordination.

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KEYWORDS: Ageing; Coplanar variation; Lower limb coordination

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