Age-related Differences in Muscle Coactivation during Treadmill Locomotion

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Introduction

Increased coactivation of antagonist muscles is one of the neuromuscular adaptations associated with aging. This adaptation occurs in arm and leg muscles during voluntary movements such as elbow flexion, downward stepping, and overground walking (1, 2). Treadmill restricts the degrees of freedom in terms of muscle recruitment during locomotion. The possibility exists that such a restricting environment modifies muscle activation patterns compared with the activation patterns present in unrestricted, overground locomotion. It is important to determine if the age-related differences in antagonist coactivation are also present during treadmill locomotion because the treadmill is used extensively in research and rehabilitation. The purpose of this study was to test the hypothesis that agonist and antagonist coactivation of leg muscles, despite the restricting nature of the treadmill, will be higher in old adults during treadmill locomotion and to compare the level of coactivation between different treadmill tasks.

Methods

Six young (Y) and 6 old (O) participants (n = 12) were outfitted with electrodes. Electromyographic (EMG) recordings were taken from the biceps femoris (BF) and vastus lateralis (VL) during four tasks: Level Slow (1.0 m/s), Level Fast, Uphill 6.0 %, and Downhill 6.0 % (all 1.5 m/s Y, 1.2 m/s O). From the amplitude of the signals, the percentage of BF to VL activation was computed.

Results

These data suggest that old compared with young adults walk with heightened antagonist muscle coactivation on the treadmill when walking on a level surface. When task demand increased (ascent, descent), the magnitude of antagonist activation patterns were similar in the two age groups. These data suggest that antagonist muscle coactivation varies with task and age. Compared with data from the literature (1) the current data also suggest that there may be task-related differences in antagonist muscle coactivation during overground vs treadmill locomotion.

Conclusions

References


Acknowledgments

Supported in part by NIH AG024161