

## Electromyography Analysis during Walking and Seated Stepping in the Elderly

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**Abstract :** The number of the elderly in the world population and the rate of falls in this increasing numbers of older people are increasing. Decreasing muscle strength and an increasing risk of falling are associated with the ageing process. Because the effects of seated stepping training on the walking performance in the elderly remain unclear, the main purpose of the proposed study is to perform electromyography analysis during walking and seated stepping in the elderly. Four surface EMG electrodes were stucked on the surface of lower limbs muscles, including vastus lateralis (VL), and gastrocnemius (GT) of both sides. Before test, maximal voluntary contraction (MVC) of the respective muscle was obtained using manual muscle testing. The analog raw data of EMG signals were digitized with a sampling frequency of 2000 Hz. The signals were fully rectified and the linear envelope were calculated. Stepping motion cycle was separated into two phases by stepping timing (ST) and pedal return timing (PRT). ST refer to the time when the pedal marker reached the highest height, representing the contra-lateral leg was going to release the pedal. PRT refer to the time when the pedal marker reached the lowest height, representing the contra-lateral leg was going to step the pedal. We assumed that ST acted the same role in initial contact during walking, and PRT for toe-off. The period from ST to next PRT was called pushing phase (PP), during which the leg would start to step with resistance, and we compare this phase with the stance phase in level walking. The period from PRT to next ST was called returning phase (RP), during which leg would not have any resistance in this phase, and we compare this phase with the swing phase in level walking. VL and Gastro muscular activation had similar patterns in both side. The ability may transfer to those needed during loading response, mid-stance and terminal swing phase. User needed to make more effort in stepping compared with walking with similar timing; thus the strengthening of the VL and Gastro may be helpful to improve the walking endurance and efficiency for the elderly.

**Keywords :** elderly, electromyography, seated stepping, walking

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