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Changes in balance control during walking after eight-week dynamic perturbation training in older adults

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Background: Walking is commonly reported daily activity in leisure time and usually used to evaluate dynamic balance in older adults. The movement of the whole body center of mass relative to the center of pressure indicates the gait stability. The inclination angle is defined as the angle between the line passing through the center of mass and center of pressure reference to the vertical line. Inclination angle has been used to evaluate balance performance. In the previous study, the inclination angle decreased in anteroposterior and increased in mediolateral direction during walking when compared to the young adults. The changes in inclination angle in older adults indicated their declined dynamic balance control and might increase the risk of fall. Perturbation-based training has been proved that can increase the distance of functional reaching in older adults. Therefore, the purpose of this study was to examine that whether the perturbation balance training can improve the balance control during walking in older adults.

Methods: Older adults who can ambulate independently without assist device were included in this study. They attended an eight-week balance training course for two sessions per week, 1 hour per session. The split-belt balance perturbation treadmill and the modular interactive tiles system were used in the training. Motion analysis system with 10 cameras and 3 force plates were used to collect kinetic and kinematic data.

Results: Seven older adults were included in this study (3 females, age: 69.06±3.07 year-old, height: 159.42±5.72 cm, weight: 61.51±6.34 kg). The anteroposterior inclination angle was significantly increased at toe off (18.65±9.21 degree, p=0.046), but was not changed at heel strike (10.74±12.08 degree, p=0.740). There were no significant differences in the mediolateral inclination angle at heel strike (15.61±12.43 degree, p=0.402) nor at toe off (16.62±11.87 degree, p=0.196) after the training.

Conclusion: After eight-week dynamic perturbation training, the increased anteroposterior inclination angle at toe off during walking might indicate the improvement of dynamic balance performance in older adults. Future study will focus on the training effect in older adults with high risk of fall.

Biography

Jo-En Chien is a graduate student in the School and Graduate Institute of Physical Therapy at National Taiwan University, Taiwan. She completed her Bachelor's degree of Physical Therapy in the Department of Physical Therapy at Tzu Chi University in Taiwan. She is a licensed Physical Therapist in Taiwan. She currently works with Dr. Wei-Li Hsu in the Movement Science Laboratory at National Taiwan University in Taiwan. Her research interests are falls and the body movement in older adults.

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