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A novel fall prevention training using a treadmill-based balance perturbation during walking in older adults with osteopenia

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Studies have shown that muscle quality and good posture alignments are critical for balance control in older adults. People are diagnosed with osteopenia often combining with muscles weakness, and increased spine kyphosis leading vertebral fractures and poor balance control, even falls. Identifying the factors related to falls occurring within this population is essential for developing effective regimes for fall prevention. The split-belt balance perturbation treadmill has recently been developed to provide postural perturbations during walking. Treadmill-based perturbation balance training utilizes repeated unpredictable external perturbation that caused postural interference. It can generate unexpected accelerations forward or backward to simulate a slip or a trip and can also generate sideway displacements at various speeds to compromise the lateral stability of participants. The aim of this study was to develop a novel fall prevention training using a treadmill-based balance perturbation during walking. We used a split-belt balance perturbation treadmill and playware tiles to improve dynamic balance in older adults with osteopenia. External perturbations during treadmill training can activate involuntary adaptive postural responses in aging adults. The results showed that this training can improve muscle strength, bone mineral content, static and dynamic balance, thereby reducing the risk of falls in aging adults. The unique contribution of the results lies in integrating an explicit physical examination and biomechanical approach to a relevant clinical problem into a translational model. The findings provide a new paradigm of treatment approaches for balance control and might reduce the risk of falling and fracture. This research can potentially be applied to persons with poor balance who are at a high risk of falling.

Biography

Wei-L Hsu is currently an Associate Professor and the Director of Movement Science Laboratory in the School and Graduate Institute of Physical Therapy at National Taiwan University, Taiwan. She completed her PhD in Biomechanics and Movement Science at the University of Delaware, USA and Post-doctoral studies in Neuroscience at the University of Oregon, USA. Her research interests are centered on gait and posture in older persons and individuals who has movement disorders. She also continues her clinical practice as a physical therapist to bridge the gap between bench and bedside. She has extensive experience in characterizing movement patterns in patients with spinal disease, poor balance control, characterizing muscle strength, and analyzing the effect of physical therapy and surgical interventions on movement functions. She serves as an editor and reviewer for numerous scientific journals. She has been an invited speaker at national and international scientific meetings.

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