



Aging & Chronic Diseases

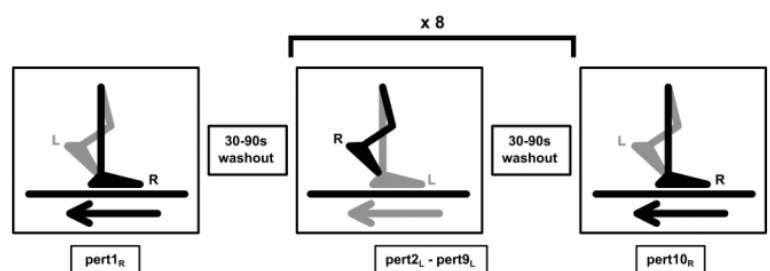
Older adults' reactive balance

...do they show fast and transferable improvements after repeated balance disturbances?

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Older adults can rapidly improve their reactive balance recovery responses following repeated large balance disturbances. Improvements made during repeated disturbances to one leg can even be transferred to benefit performance when the untrained leg is disturbed. These conclusions can be drawn from our study, in which we used treadmill belt accelerations to create balance perturbations during walking.

Falls and their consequences are a problem for our ageing populations and fall prevention research is therefore a large field. One emerging subfield in fall prevention is the use of controlled, mechanical perturbations to study training effects on reactive balance control. This type of intervention applies mechanical perturbations in a manner that



closely simulates the effect of common causes of falls such as trips and slips. The aim is to trigger improvements in reactive balance control in a highly task specific manner. This research has been rapidly developing over the last twenty years, in part due to improvements in (and availability of) technology for applying these perturbations.

As part of my PhD dissertation research, we aimed to gain a more detailed understanding of the stability and adaptation of gait during such mechanical perturbations. This may help improve the effectiveness of interventions for falls reduction. We also wanted to further our understanding of how old age might affect gait stability and adaptability. More knowledge about this could improve the effectiveness and specificity of exercise-based falls reduction interventions for both healthy and clinical populations at an increased risk of falls.

To do this, we used treadmill belt acceleration perturbations as shown in the figure (adapted from McCrum et al. 2018 (1)). The right leg (R) was perturbed by a treadmill belt acceleration first (pert1R), followed by eight perturbations (pert2L – pert9L) to the left leg (L), and the final perturbation (pert10R) was again applied to the right leg (R). In the key study described here, 28 older adults and 30 young adults (all healthy) were measured using this protocol.

We found that healthy older adults can improve their balance recovery responses following eight repeated balance disturbances to one leg during walking and can then perform similarly to young adults. Such rapid improvement is one of the key features underlining the potential for perturbation-based balance training in practice. We also found that older adults can transfer these improvements made from the “trained” leg to their recovery following a perturbation to the untrained leg. This retained adaptability in older age lends further support to the potential for perturbation-based balance training as an approach to fall prevention.

Additional reference

(1) McCrum et al., *Commun Biol* 1 (2018) 230. All rights reserved to The Author(s). [Click here for the free full text version.](#)

> *From: McCrum et al., Geroscience* 42 (2020) 39-49. All rights reserved to The Author(s). [Click here for the online summary.](#)



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