Balance Perturbation Reach to Grasp Training with a Simultaneous Cognitive Task in Older Adults

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INTRODUCTION

- In response to balance perturbations, older adults display:
  - Greater tendency to use reach-to-grasp strategy.
  - Greater frequency of grasping errors.
- Age-related declines in attention shifting between a cognitive task and balance response may underlie reduced grasp accuracy.
- The effects of reach-to-grasp response training are unknown.

OBJECTIVE

- To investigate the effects of dual task cognitive and balance perturbation reach-to-grasp training in older adults on:
  1. Improving reach-to-grasp response of the trained arm
  2. Improving reach-to-grasp response of the untrained arm
  3. Improving balance response in the absence of a handrail

METHODS

Participants:

Six older adults (71±6 years old, 3F: 3M)

Testing:

Four testing conditions with a simultaneous verbal fluency task:

1. Static standing slip, handrail on trained side
2. Walking slip, handrail on trained side
3. Walking slip, handrail on untrained side
4. Walking slip, no handrail

Training:

15 slip-trip standing perturbations and 15 right-left perturbations with a simultaneous cognitive task and handrail on the dominant side

Perturbations were induced using the ActiveStep treadmill (ActiveStep, Simbex, Lebanon, NH, USA)

Balance Responses Improve after 3 Days of Dual Task Reach to Grasp Perturbation-Cognitive Training

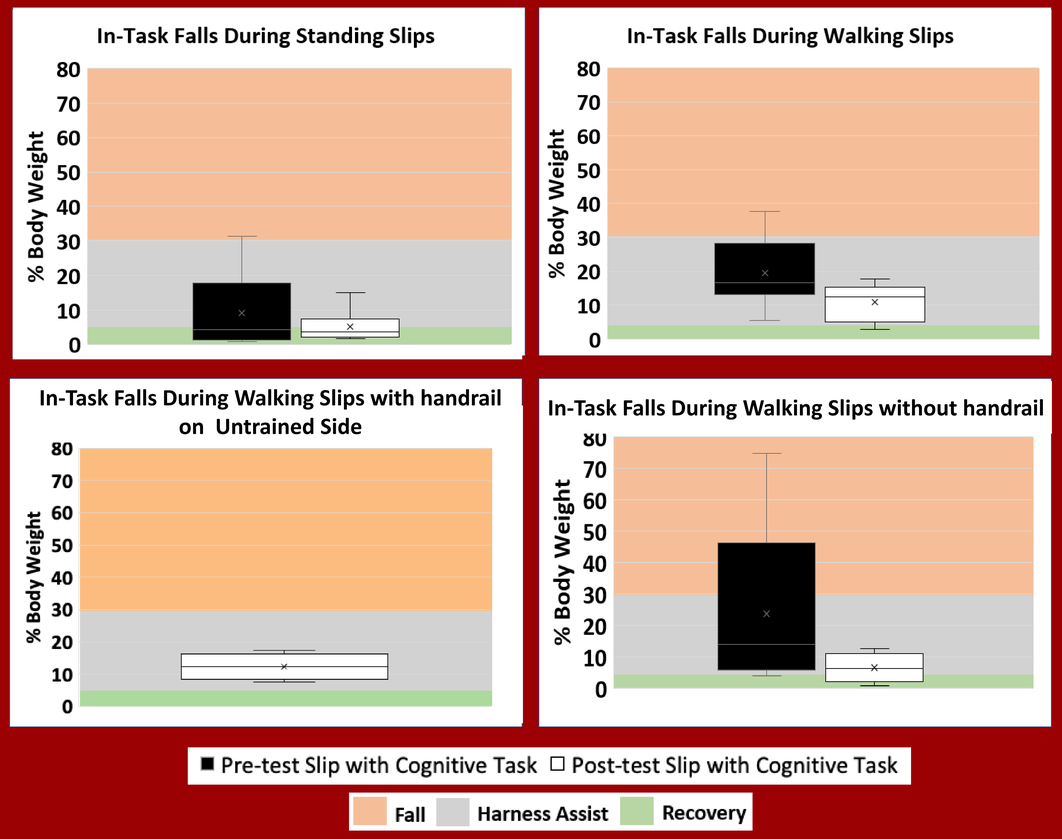

Figure 1. The frequency of in task falls pre- and post-training during standing (top left) and walking (top right) slips with the handrail on the side of trained reach, post-training with a handrail on the untrained side (bottom left), and pre- and post-training without a handrail (bottom right).

In-Task Fall: harness support >30% of body weight
Harness Assist: harness support 4.5-30% of body weight
Recovery: harness support <4.5% of body weight

Funding: NIA R03 AG060290–01 NIH

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Testing and Training Schedule:

Day 1	Day 2	Day 3
•Pre-test	Training	Training
•Training		Post-test

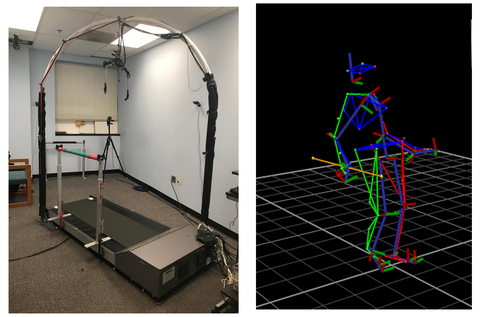

Figure 2. The ActiveStep Simbex® delivers customized balance perturbations (left). A participant responding to a slip perturbation while grasping the handrail (right).

DISCUSSION

- A reach-to-grasp intervention may improve balance responses during **standing and walking and slips**.
- Improvements in the reach-to-grasp response may transfer to the **untrained** side.
- Improvements in balance recovery may also transfer to stepping responses, resulting in reduced in-task falls in the **absence of a handrail**.

REFERENCES

- Alissa N, Akinlosotu RY, Shipper AG, Wheeler LA, Westlake KP. *A systematic review of upper extremity responses during reactive balance perturbations in aging.* Gait Posture. 2020;82:138-146.
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