



Falls and Prevention in Older Adults and People with Dementia

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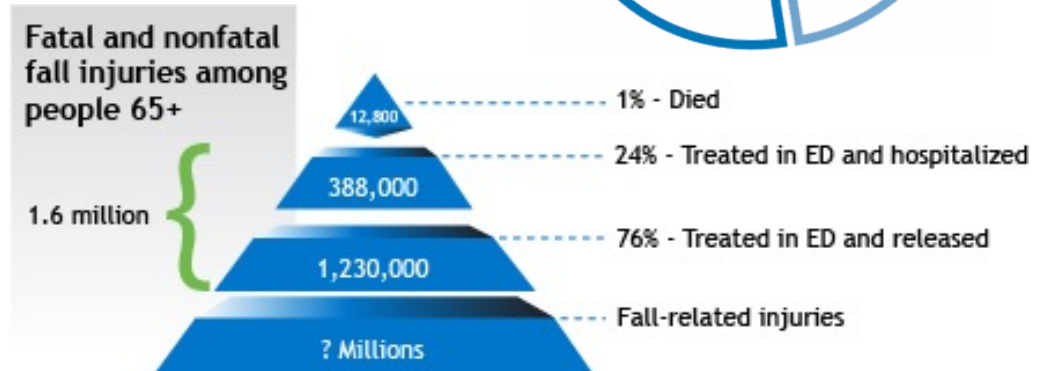
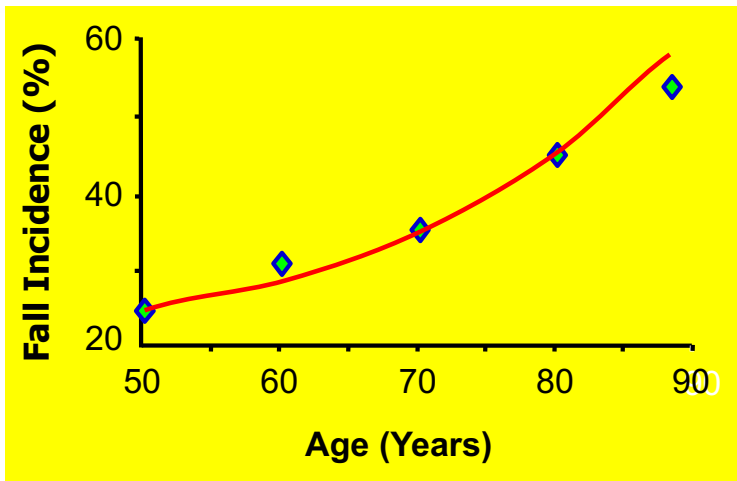
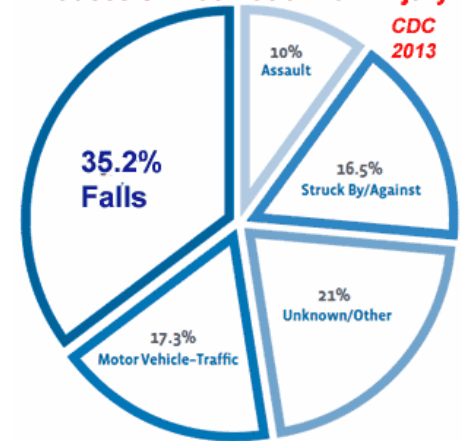
Georgia State University

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Falls in Older Adults

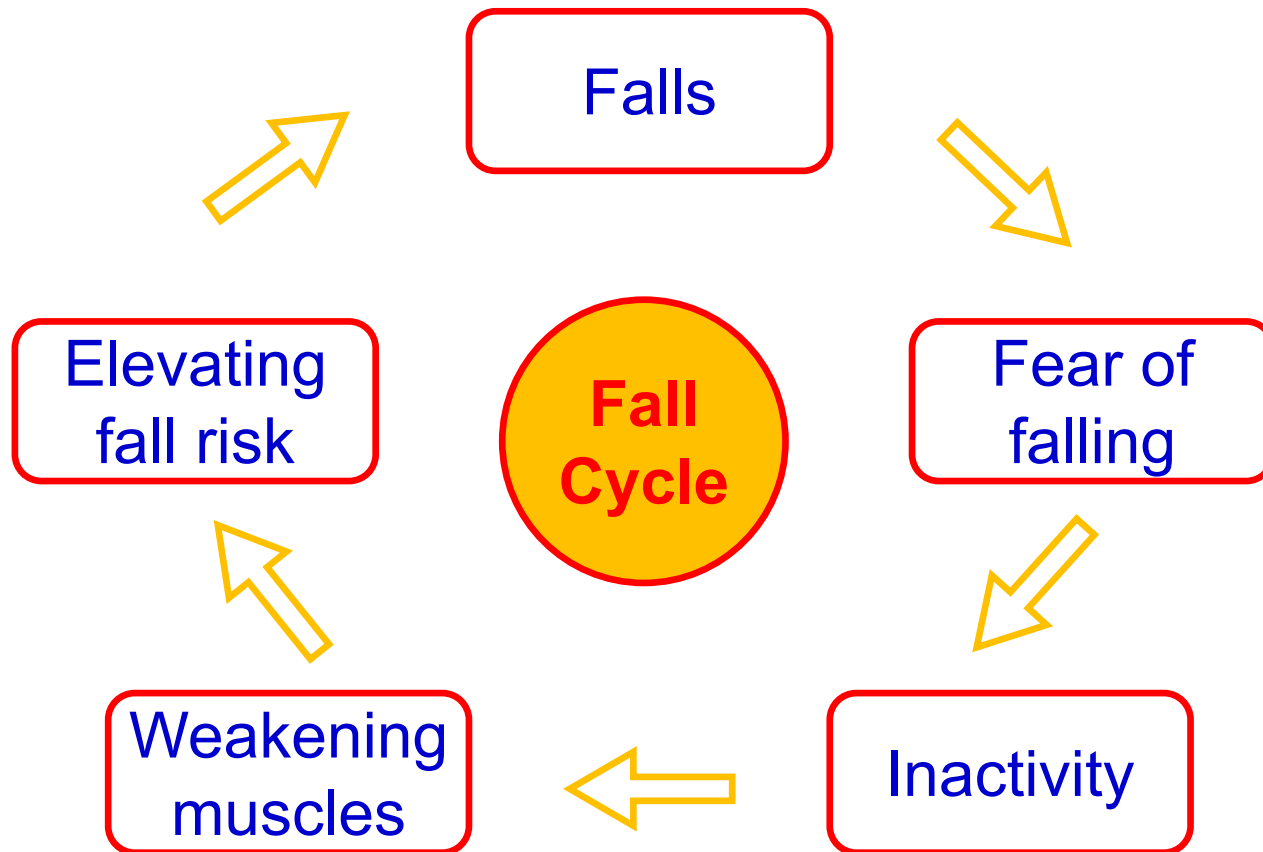
- Falls can cause serious medical consequences to older adults
 - ❖ every one of 4 older adults falls at least once each year
 - ❖ lead to injuries or deaths

Causes of Traumatic Brain Injury



Falls in Older Adults

➤ Falls impose psychological impact



Falls in Older Adults

➤ Falls are costly



- ❖ average cost for a fall injury is \$34,294 in 2012
- ❖ \$34 billion in 2013 and \$50 billion in 2015
- ❖ expected to reach \$101 billion by 2030

Each year, falls lead to
8 million ER visits
Slip and falls lead to
1 million ER visits



\$
60-80 billion
Estimated annual medical costs
of falls

Dementia and Falls

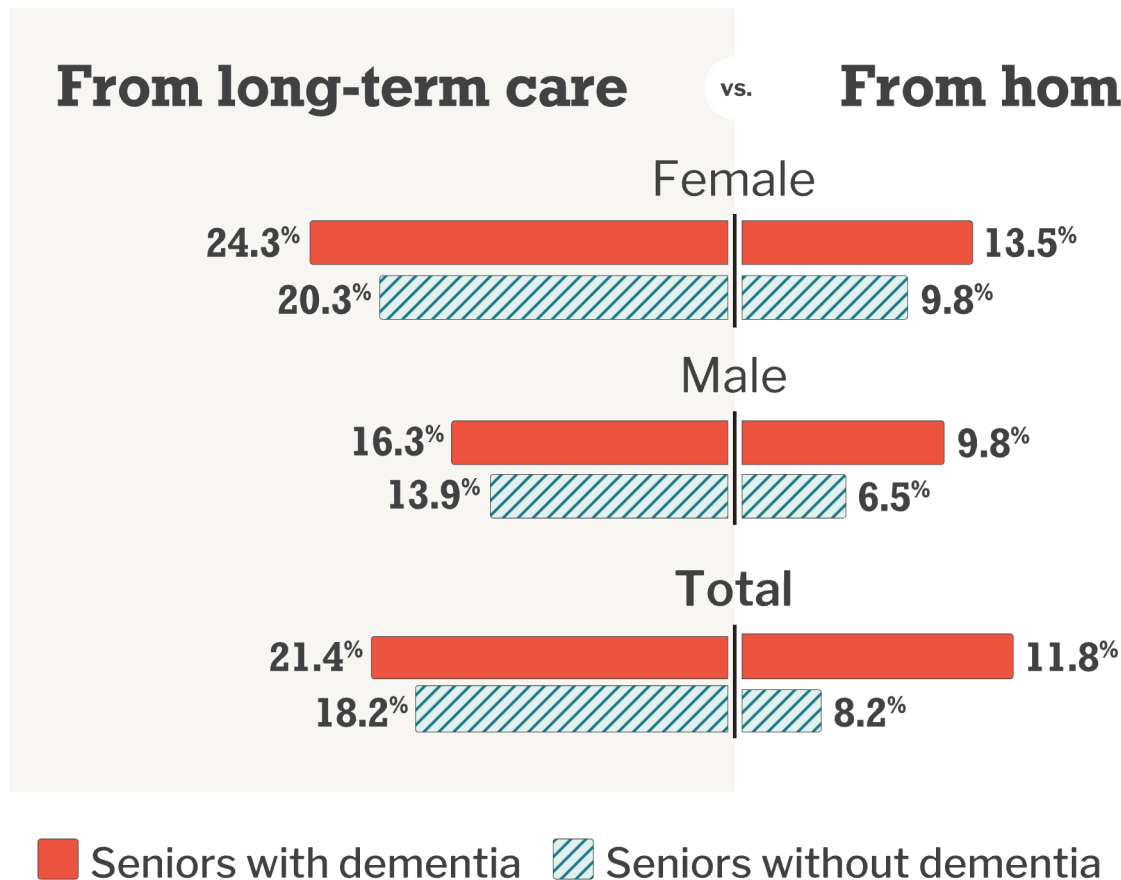
- Dementia increases the falls risk in older adults.
- Our recent meta-analysis (based on 24 studies and 5,899 individuals) indicated that about **40.5%** of people with Alzheimer's disease (AD) or mild cognitive impairment (MCI) fall yearly.
- ~ **50%** higher than in general older adults.

Dementia and Falls

- The annual number of falls is **1.12 falls/person** for people with AD or MCI.
- ~ **3 times** higher than in general older adults (**0.3 falls/person**).
- Among the fallers, **~43%** experience recurrent falls and **45%** (vs. ~20% in older adults) experience at least one injury.

Dementia and Falls

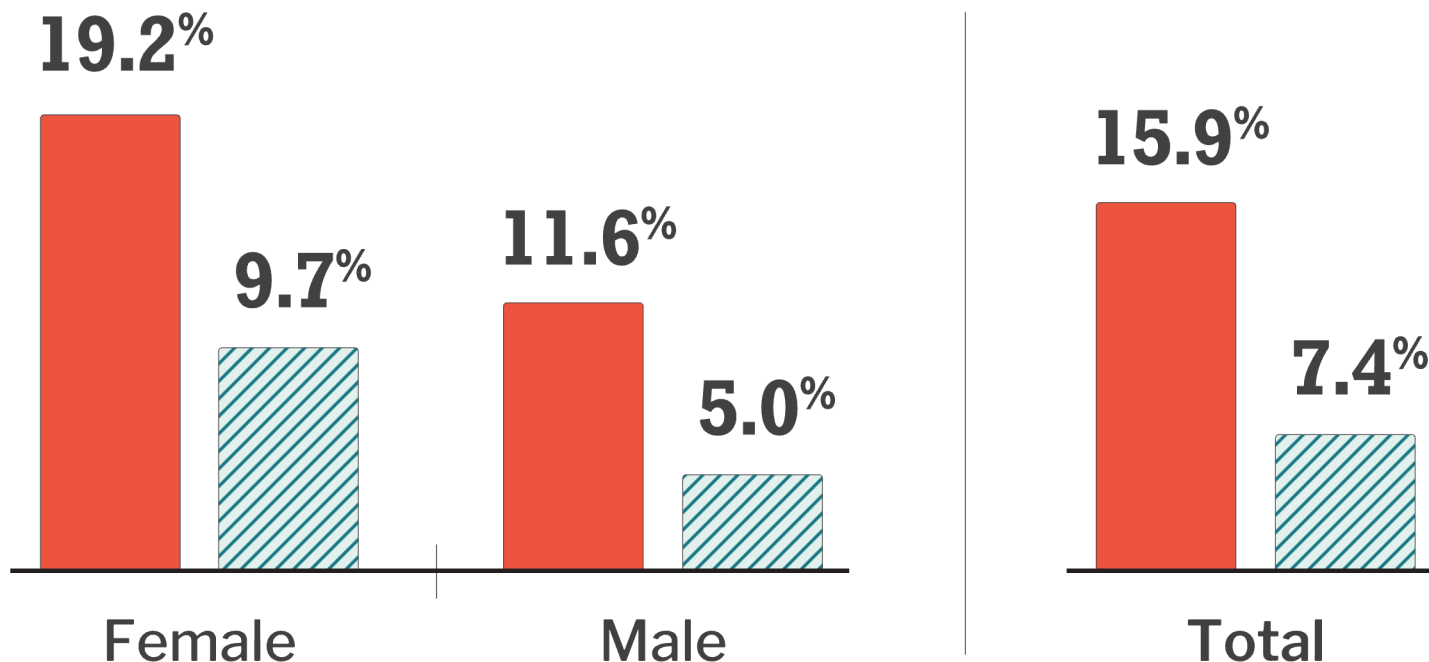
- Dementia increases the number of fall-related ED visits



Dementia and Falls

- Dementia increases the number of fall-related hospital admission

■ Seniors with dementia ▨ Seniors without dementia



Dementia and Falls

- In comparison with general older adults, people with dementia are **more than 3 times** more likely to sustain hip fracture from falling, which leads to surgery and immobility.
- The rate of death following a hip fracture for those with dementia is also increased.

Dementia and Falls

- Falls cause severe medical, economic, and psychological burdens to individuals with dementia, their caregivers, families, and the healthcare system.
- As the population ages and life expectancy extends, the risks of falls and dementia upsurge.
- The commingling effects of the aging and dementia make fall prevention critical.
- It was estimated that up to 2/3 of falls are preventable.

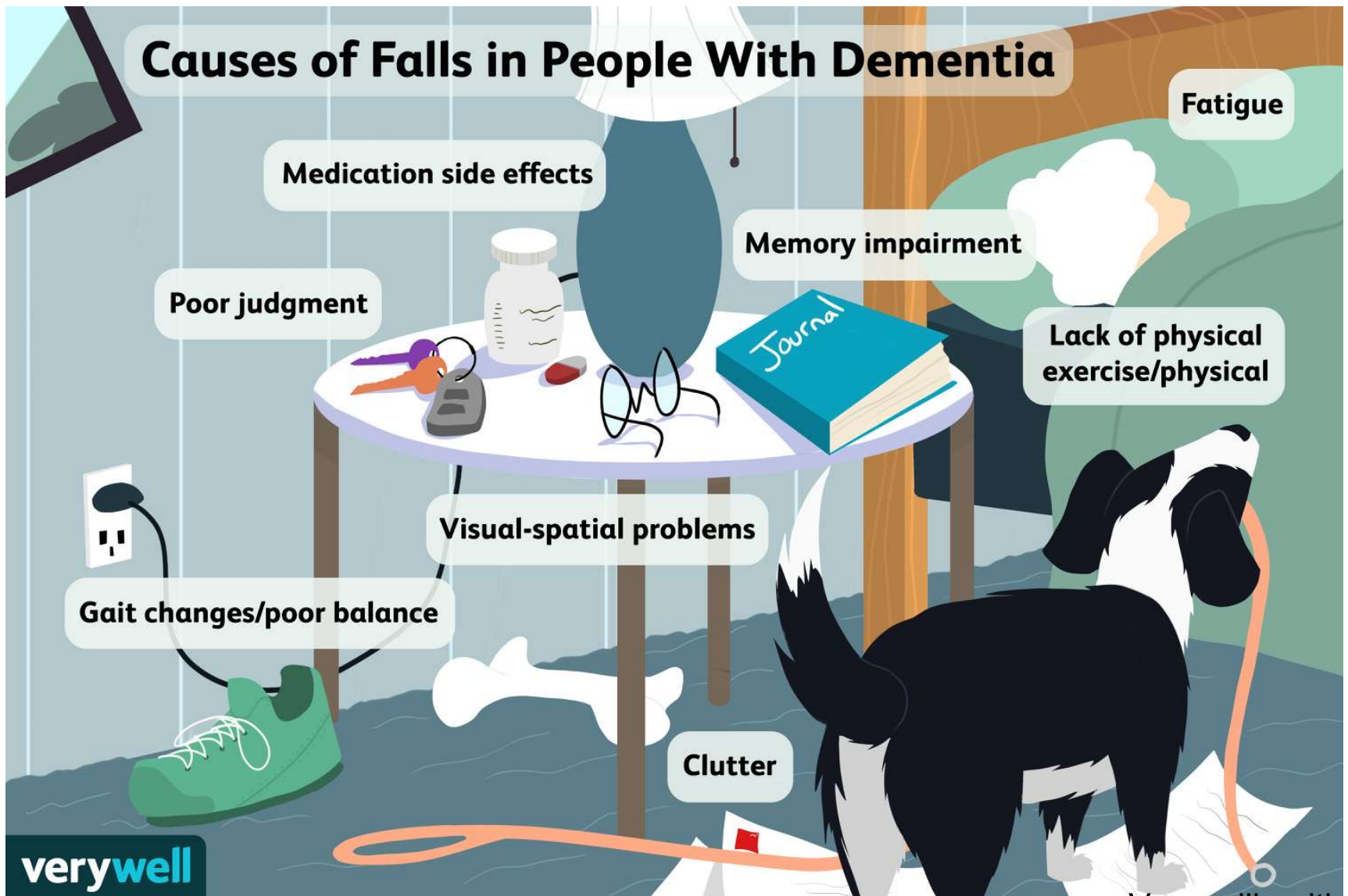
Our Research Interests

Long-term research goal is to develop and deploy community-based novel and cost-effective fall prevention paradigms for older adults and individuals with neurological diseases.



Risk Factors of Falls

Causes of Falls in People With Dementia

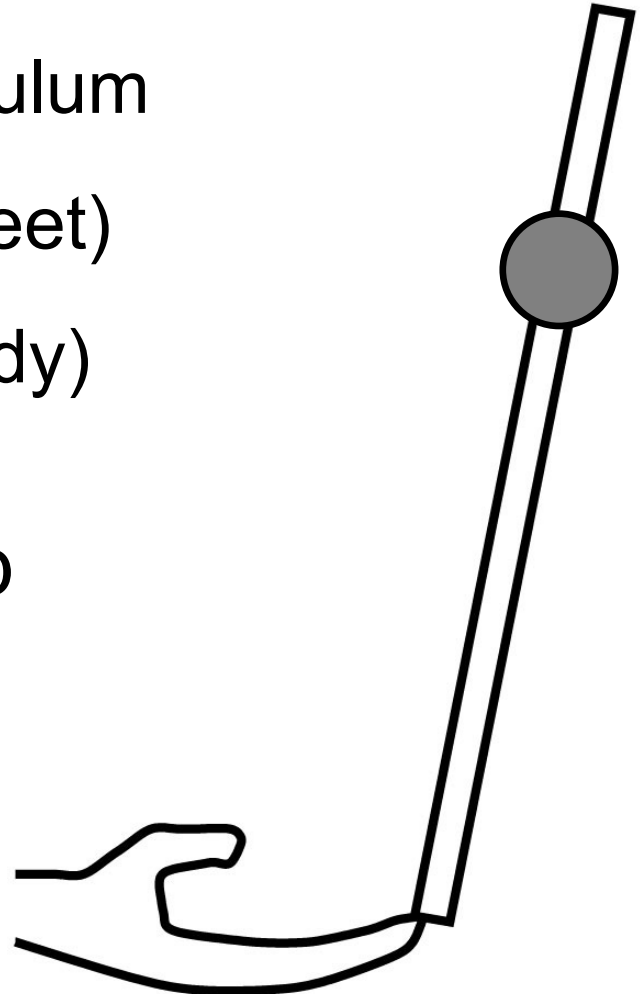


Why Falls Happen?

Human body is inherently instable due to:

- Multi-segmental invert pendulum
- Small base of support (the feet)
- High center of mass (the body)

An appropriate relationship between the body and the feet must be maintained unstoppably.



Why Falls Happen?

The neuro-musculoskeletal system must be able to constantly adjust the body posture to respond to any internal or external perturbations in order to maintain the desired relationship between the body and feet.

When the relationship between the body and feet is disturbed and reaches an irreversible level, a fall would occur.



Why Falls Happen?

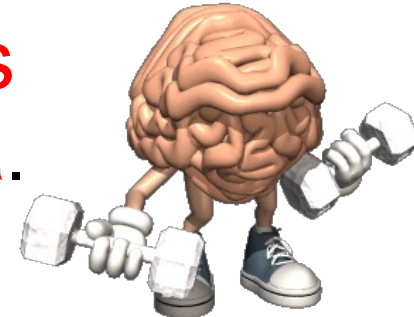
Ultimately, all falls result from a failure to recover!

An effective recovery step is the last defense to avoid a fall.

This is a biomechanics problem...

Interventions

- ❖ **Exercise- or balance-based training**
 - Have shown some benefits in reducing fall risk in people with dementia
 - May experience actual falls and injuries
 - Training done with self-controlled tasks without perturbation
 - Requires high levels of physical activities or supervisions
 - May not be accessible to the public
- ❖ A recent meta-analysis indicates that **no effective fall prevention program is available for people with dementia.**



Interventions

- ❖ **Alternative fall prevention strategies** are needed for people living with dementia.
- ❖ **Perturbation training**
 - A mode of intervention by inducing postural perturbation, either given in stance or gait to elicit stepping recovery response in reaction to a sudden balance loss, eventually focused on preventing falls.
 - It could be effective particularly for people with dementia.

Why Perturbation Training?

- It considers the basic principle of physical training – the concept of specificity.
- The majority (~65%) of falls occurs during walking and results from unexpected perturbations (like slips or trips).
- It is also based on motor control and learning.

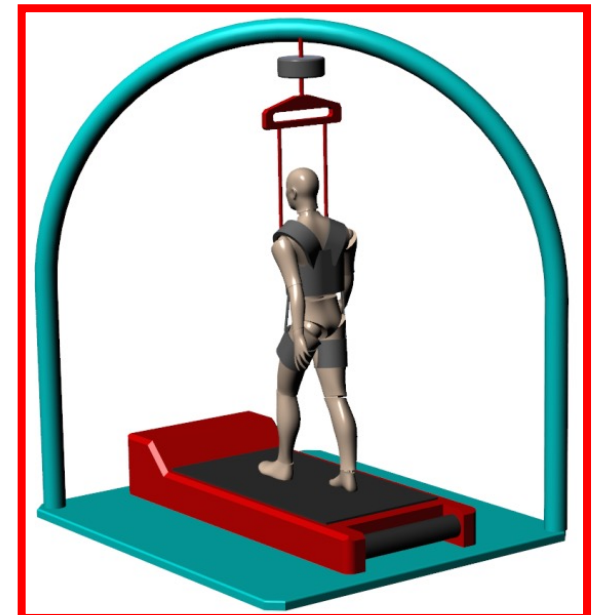
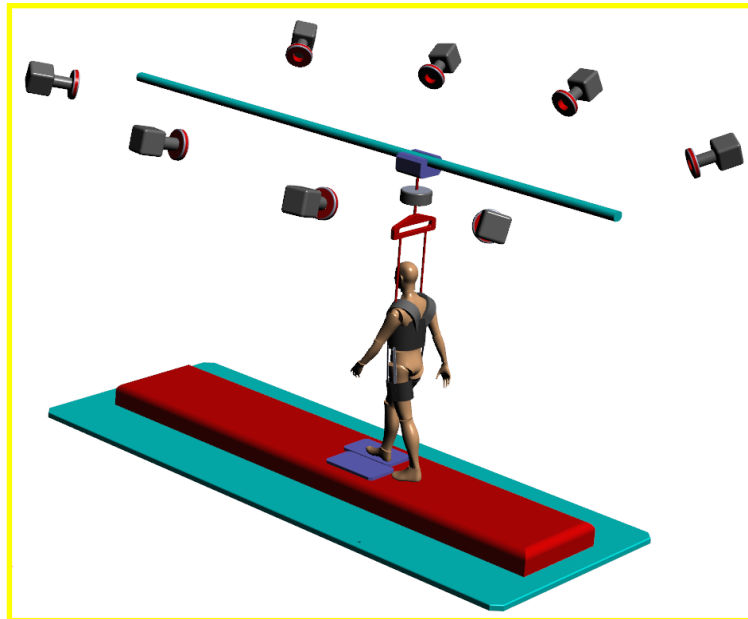
Motor Control/Learning

- When infants/toddlers try to learn how to walk, they experience many falls. After falling so many times, the brain develops the skills that can prevent us from falling further.
- Due to the aging process or neurological diseases, like AD, such skills could be compromised. It explains why people with AD falls more than their cognitively healthy peers.



Motor Control/Learning

- What we are doing is to create a safe environment in which we can force people to fall (under the protection of a harness) and help them regain/relearn the impaired skills and reduce their fall risk.



Fall Rate Reduction

S1 **Fall**



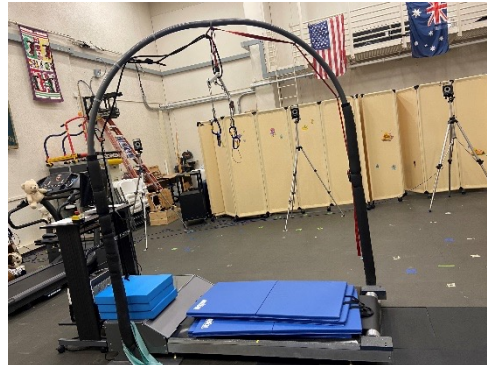
S24 **Non-fall**



Perturbation Training

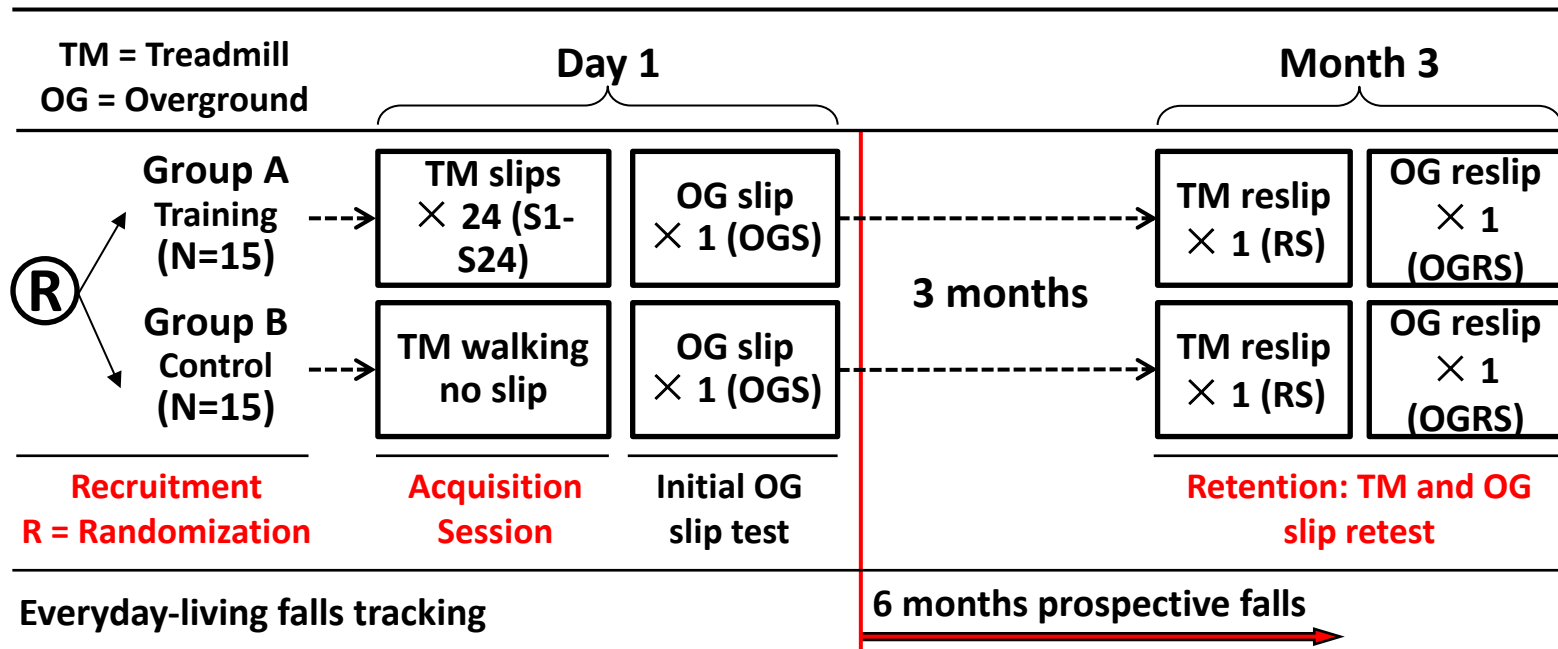
- Perturbation training is an **implicit** (or non-conscious) learning process. Namely, the trainees learn fall resistant motor skills by accident and the trainers do not need to provide any explicit instructions or guidance to the trainees. This is particularly useful for people with cognitive disorders, like AD/ADRD, MS, stroke, etc.
- We have applied this training approach in healthy older adults, people with stroke, and multiple sclerosis with promising results.

Lab Space and Equipment



Our Research Projects

Funded by the NIH and Alzheimer's Association.



H1 (adaptation): for Group A, slip-fall rate: S1 > S24; stability: S1 < S24

H2 (retention): slip-fall rate @ RS: Group A < B; stability @ RS: A > B

H3-a (generalization to OG): slip-fall rate A < B and stability A > B @ OGS & OGRS

H3-b (generalization to daily living): real-life falls hazard: A < B

Interested?

If you or someone else is interested in or can benefit from this study, please feel free to contact us.

fyang@gsu.edu
Tel: 404-413-8357

Transportation and parking will be provided (if needed).

Seeking volunteers for

FALL PREVENTION RESEARCH IN ALZHEIMER'S DISEASE



Location

Biomechanics Lab
125 Decatur St, Atlanta, GA 30303
GSU Downtown Campus

Interested?

Eligibility

- Adults who have mild AD
- Aged 60 years and over
- Can walk at last 25 feet

You will be asked to

- A screening session
- Two 2-hour fall risk assessments
- Falls reporting once every two weeks over 3 months

Your fall risk could be reduced.
Payment of \$15/hour + Parking

For more information

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Thank you!

***Any
questions?***