Falls: What causes them and how do we prevent them

Ronald T. Garry, M.D.
Naples Premier Concierge

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FALLS

- *Definition: coming to rest inadvertently on the ground or at a lower level*

- One of the most common events threatening the independence of older adults

- Most falls are not associated with syncope or trauma

- Falls literature usually excludes falls associated with loss of consciousness for this reason

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Falls in Long Term Care are

- A) Equivalent to those in the community
- B) Twice as common
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- D) Less Common

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Fall Prevention Strategies

- A) Are ineffective
- B) Not cost effective
- C) Involve a multidiscipline approach
- D) Hasn't changed in the last 10 years

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Fall Screening test include

- A) 30 second chair stand test
- B) 4- stage balance test
- C) Timed Get up and Go
- D) Falls Efficacy scale
- E) All of the above

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Medications that increase falls include all except

- A) Antidepressants
- B) Narcotics
- C) Antihypertensive
- E) Benzos
- F) All of the above (they all increase falls)

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Dual Task Demand

- A) Decreases with aging
- B) Increases fear of falling
- C) Improves Balance
- D) Decreases risk of falling
- E) All of the above

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Falls Epidemiology

- 30-40% of community-dwelling elderly
- Increases 50% in those >80
- 50% of NH residents (3x higher than in Community)
- 60% of those with hx of fall, fall again
- 6 % of inpatient elderly
- Multiple causes & risk factors
- Potentially preventable

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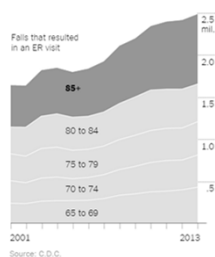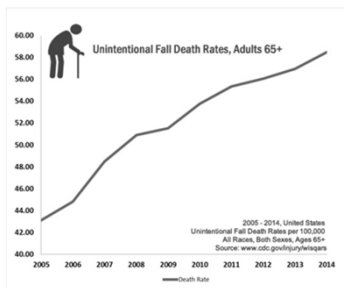## Falls Increase with Aging

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Death Rates from Falls

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Falls Mortality

- Accidents: the 5th leading cause of death in older adults
- Deaths from falls: 2/3 of accidental deaths
- 72% of U.S. fall-related deaths occur in the 13% of population age 65+

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SEQUELAE OF FALLS

- Associated with:
  - ➢ Decline in functional status
  - ➢ Nursing home placement
  - ➢ Increased use of medical services
  - ➢ Fear of falling

- Half of those who fall are unable to get up without help ("long lie")

- A "long lie" predicts lasting decline in functional status

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Costs of Falls

- 8% of pop ≥70 visit ERs for falls yearly
- 1/3 of these are hospitalized
- 5.3% of hospitalizations ≥65 are due to falls
- U.S. cost est. 2020→$32 B.
- 42% of fallers reduce activity after fall
- Precipitate ALF/NH entry

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CAUSES OF FALLS BY OLDER ADULTS

- Rarely due to a single cause

- May be due to the accumulated effect of multiple impairments (similar to other geriatric syndromes)

- Complex interaction of:
  - ➢ Intrinsic factors (eg, chronic disease)
  - ➢ Challenges to postural control (eg, changing position)
  - ➢ Mediating factors (eg, risk taking, situational hazards)

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INTRINSIC RISK FACTORS

- Older age
- Cognitive impairment
- Female gender
- Past history of a fall
- Leg weakness or gait problems
- Foot disorders

- Balance problems
- Hypovitaminosis D
- Pain
- Parkinson's disease
- Stroke
- Arthritis

The risk of falling increases with the number of risk factors

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CAUSES: INTRINSIC

- Age-related decline
    - ➢ Changes in visual function
    - ➢ Proprioceptive system, vestibular system
    - ➢ Regulation of systolic blood pressure
    - ➢ Reduced total body water, risk of dehydration with stressors
- Chronic disease
    - ➢ Parkinson's disease
    - ➢ Strokes
    - ➢ Osteoarthritis, chronic pain
- Medication use (*address later*)

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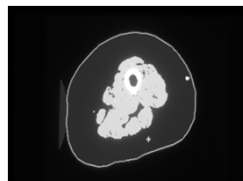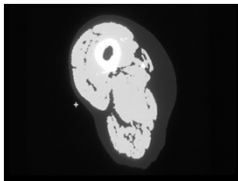
Physiological changes with aging

- Muscle weakness
- Reduction in neural cell number
- Reduction in nerve conduction velocity
- Impaired reflexes
- Exaggerated hypotensive response to meals/meds
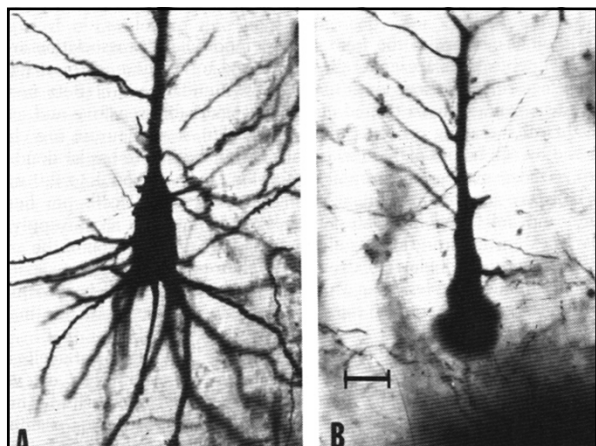- Impaired cardiac response to changes in BP

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Thigh

Young   **Elderly**

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Disease Related Risk Factors

- Perceptual deficits
  - Cataracts
  - Hearing loss
  - Peripheral neuropathy
  - Vestibular disease
- Orthopedic
  - Arthritis
  - Orthopedic injury
  - Spinal stenosis

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Disease Related Risk Factors (Cont'd)

- Cardiovascular
  - Arrhythmia
  - Valvular disease
  - Postural hypotension
  - Postprandial hypotn.
  - Carotid Sinus Syndrome
- Neuromuscular
  - Stroke
  - Myopathy
  - Parkinson's Dz.
  - Hydrocephalus
  - Peripheral Neuropathy
  - Alzheimer's Disease

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Disease Related Risk Factors (Cont'd)

- Drugs and alcohol
  - Diuretics
  - Antihypertensives
  - Sedatives
  - Anticholinergic medications
  - Alcohol

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Drugs & Falls: Meta-analysis

- Psychotropics, any: 1.73 *(1.52-1.97)*
  Neuroleptics: 1.50 *(1.25-1.79)*
  Sedative/hypnotics: 1.54 *(1.40-1.70)*
  Antidepressants: 1.66 *(1.40-1.95)*
  Benzodiazepines: 1.48 *(1.23-1.77)*
- Diuretics: 1.08 *(1.02-1.16)*
- Anti-arrhythmics (Ia) : 1.59 *(1.02-2.48)*
- Digoxin: 1.22 *(1.05-1.42)*

Leipzig, Cumming, Tinetti, JAGS, 1999

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Environmental Hazards

- Poor lighting
- Slippery floors
- Loose rugs, electrical cords
- Moveable furniture
- Stairs
- Poor fitting shoes

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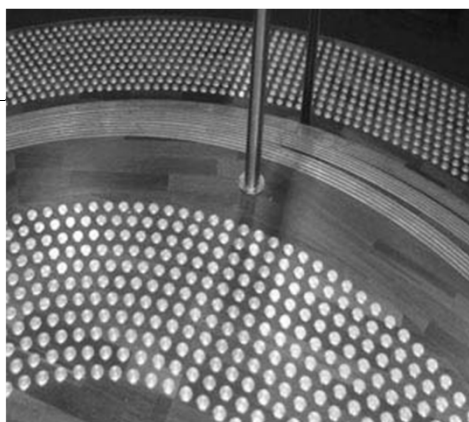
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Falls are Multifactorial

- Falls result from the interaction of multiple physiologic changes, pathologic conditions, external hazards, and situational stresses.
- Risk of falling increases with the number of risk factors.
- Falls occur in 10-27% of community-dwelling elders with 0-1 risk factors and 69-78% of those with ≥ 4.

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Falls are Multifactorial

- Evaluation requires a comprehensive assessment to identify multiple risk factors.
- The treatment of falls requires an effort to reduce modifiable risks.

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Risk Factors for Falls

Risk Factor	OR/RR	Range		Risk Factor	OR/RR	Range
Muscle Weakness	4.4	1.5-10.3		OA	2.4	1.9-2.9
Hx of Fall	3	1.7-7		ADL deficit	2.3	1.5-3.1
Gait Deficit	2.9	1.3-5.6		Depression	2.2	1.7-2.5
Balance	2.9	1.6-5.4		Cognition	1.8	1.0-2.3
Assistive Device	2.6	1.2-4.6		Age > 80	1.7	1.1-2.5
Visual Issue	2.5	1.6-3.5				

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Do we just stand or walk?

Dual tasking is the norm…
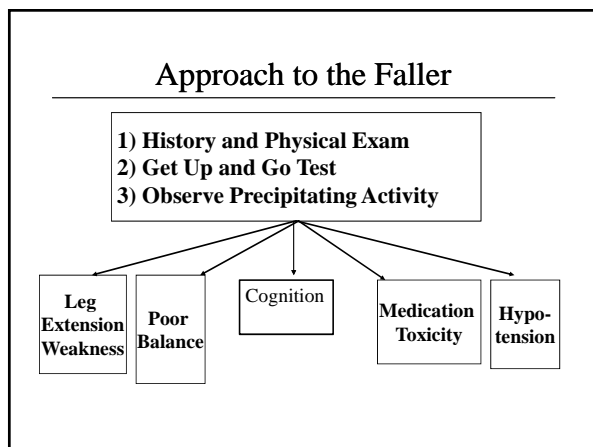and it disrupts our balance

Hebrew SeniorLife | HARVARD MEDICAL SCHOOL AFFILIATE

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Standing   Standing + Counting

500, 497, 494…

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Approach to the Faller

1) History and Physical Exam
2) Get Up and Go Test
3) Observe Precipitating Activity

Leg Extension Weakness | **Poor Balance** | Cognition | **Medication Toxicity** | **Hypo-tension**

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Evaluation of the Faller: History = DDROPP

- Diseases
- Drugs
- Recovery
- Onset
- Prodrome
- Precipitants

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Evaluation of the Faller:
Physical Exam

- Postural vital signs
- Carotid bruits and upstroke
- Murmurs of AS, MR, or HCM
- Stool hemoccult
- Neurologic exam: sensation, motor, reflexes, cerebellar
- Observe activities associated with the fall

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"Get Up and Go" Test

1. Chair stand: get up from chair without using hands
2. Romberg: eyes open and closed, then sternal push
3. 20-foot walk (10 feet and turn around)
4. 360-degree turn

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Get up and Go

Normative Reference Values by Age*

Age Group	Time in Seconds	(95% CI)
60 – 69 years	8.1	(7.1 – 9.0)
70 – 79 years	9.2	(8.2 – 10.2)
80 – 99 years	11.3	(10.0 – 12.7)

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Gait Observations

- Shuffle: Parkinsons
- Petit-pas: frontal/CVD
- Hemiparetic: stroke
- Ataxic: cerebellar

- Antalgic: arthritic
- Spastic: Cerv. Spond.
- Foot Drop: Peroneal
- Sensory: Neuropathy

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Lab Studies are Few

- CBC, electrolytes, BUN/creatinine, glucose
- Drug levels where appropriate
- Syncope or cardiac sx: EKG
- Suspected arrhythmia: event monitor, CSM.
- Focal neuro. abnormalities: EEG, MRI or CT
- Suspicious systolic murmur: cardiac echo
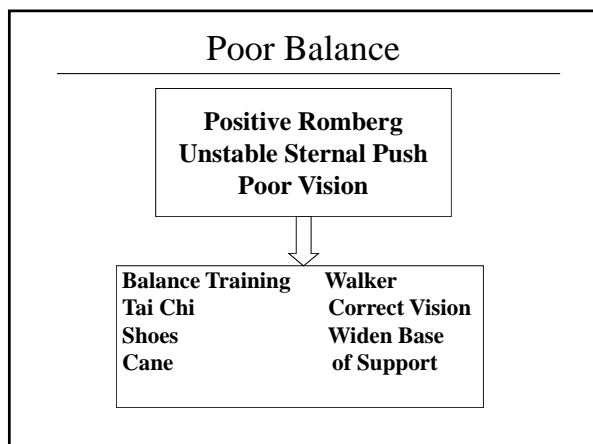- Selected patients: audiogram, neck films, ENT referral

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Leg Extension Weakness

**Impaired Chair Stand
Stair Climbing
Slow Gait Speed**
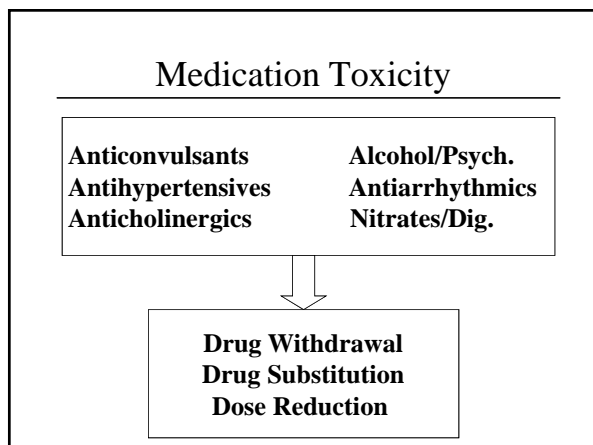
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**Resistance Training
Quadriceps Sets**

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Poor Balance

Positive Romberg
Unstable Sternal Push
Poor Vision

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Balance Training	**Walker**
Tai Chi	**Correct Vision**
Shoes	**Widen Base**
Cane	**of Support**

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Medication Toxicity

Anticonvulsants	**Alcohol/Psych.**
Antihypertensives	**Antiarrhythmics**
Anticholinergics	**Nitrates/Dig.**

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Drug Withdrawal
Drug Substitution
Dose Reduction

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'Fall-Risk Increasing Drug' (FRID)

Table I. Risk of falling and drug use: results from meta-analyses, pooled odds ratios from Leipzig et al.[42,43]

Drugs	Odds ratio (95% CI)
Any psychotropic	1.73 (1.52, 1.97)*
Antipsychotics	1.50 (1.25, 1.79)*
Sedative-hypnotics	1.54 (1.40, 1.70)*
Benzodiazepines (any)	1.48 (1.23, 1.77)*
Short acting	1.44 (1.09, 1.90)*
Long acting	1.32 (1.09, 1.90)*
Antidepressants	1.66 (1.44, 1.95)*
TCAs	1.51 (1.14, 2.00)*
Type 1a anti-arrhythmics	1.59 (1.02, 2.48)*
Digoxin	1.22 (1.05, 1.42)*
Centrally acting antihypertensives	1.16 (0.87, 1.55)
Nitrates	1.13 (0.95, 1.36)
ACE inhibitors	1.20 (0.92, 1.58)
β-Blockers	0.93 (0.77, 1.11)
Calcium channel blockers	0.94 (0.94, 1.14)
Any diuretic	1.08 (1.02, 1.16)*
Thiazide diuretics	0.97 (0.78, 1.20)
Loop diuretics	0.90 (0.73, 1.12)
Opioids	0.97 (0.78, 1.12)
Non-opioids	1.09 (0.88, 1.34)
NSAIDs	1.16 (0.97, 1.38)
Aspirin	1.12 (0.80, 1.57)

ACE = angiotensin-converting enzyme; **CI** = confidence interval; **NSAIDs** = nonsteroidal anti-inflammatory drugs; **TCA** = tricyclic antidepressant; * indicates statistically significant odds ratio.

Huang A, Mallet L, Rochefort C, Eguale T, Buckeridge D, Tamblyn R. Medication-Related Falls in the Elderly. Drugs & Aging. 2012;29(5):359-76
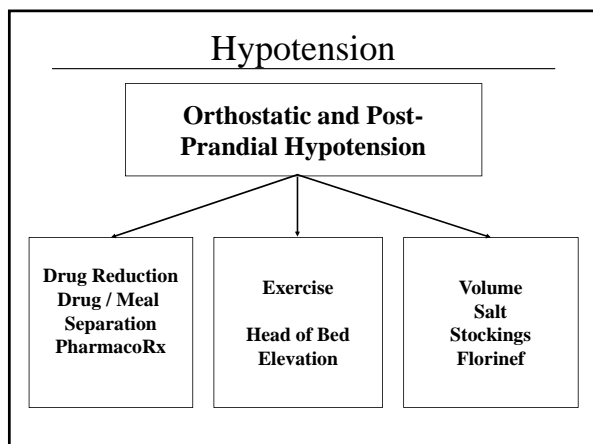
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Hypotension

Orthostatic and Post-Prandial Hypotension

Drug Reduction Drug / Meal Separation PharmacoRx

Exercise

Head of Bed Elevation

Volume Salt Stockings Florinef

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Cognitive Frailly

- Look at 4 domains
  – Memory
  – Attention
  – Executive Function
  – Processing speed
- 1.5 SD from age matched mean

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Cognitive Frailly

- Increase risk of falls and fracture
- Multiple studies showing reduction in risk of falls and falls with cognitive training
- Processing speed most predictive
- Emerging Area of research- Future of Falls

J C Davis et al JAGS 2017;65:916-923
D S Lipardo et al Archives of Physical Medicine and Rehabilitation 2017;98:2079-96
J Blackwood et al J Nutr Health Aging 2018;10:138-145
F Barba et al Brain Science 2017;7

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What doesn't work

- Medication review without action (3/4 community studies).
- Modification of home environmental hazards (1/2 studies equivocal).
- Staff education in a chronic care clinic.
- Self-management programs (5 studies).
- Advice w/o action (3/5 studies equivocal).

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The whole is greater than the sum of its parts

- Environmental modification, medication manipulation, assistive devices, and health or behavioral education have not been proven effective *in isolation*.
- These interventions do appear to be effective as components of a multifactorial intervention.

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Tia Chi

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Tai Chi in PD

- 195 PD pts randomized to
  - Tai Chi
  - Weight Training
  - Seated Stretching
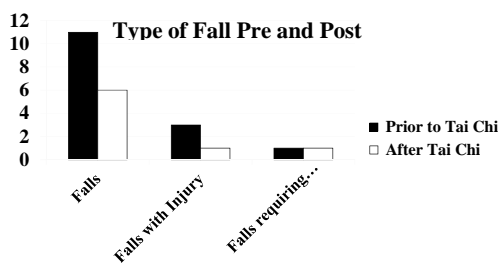- 2 x week for 60 minutes

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Tai Chi in PD

- 6 months later
  - Tai Chi group could lean further forward and backwards
  - Movement was smoother
  - Longer Stride length
- Both weight training and Tai Chi walked faster, able to get up from chair quicker and increased leg strength
  -

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Tai Chi in AD

Type of Fall Pre and Post

- Prior to Tai Chi
- After Tai Chi

Falls
Falls with Injury
Falls requiring…

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Tai Chi in AD

Percent Reduction in Falls and Injuries

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Highlight: 79-year-old female, history of falling
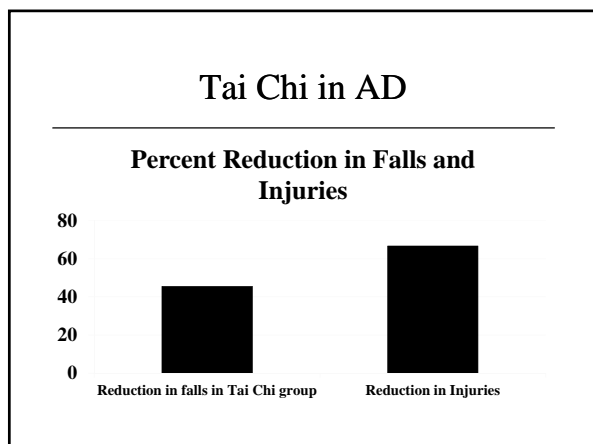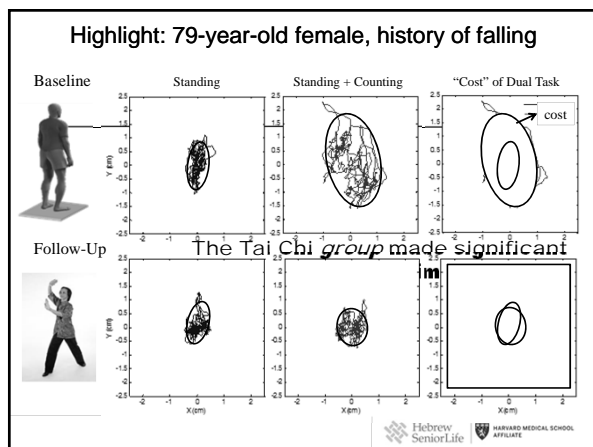
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Balance is critically linked to brain function.

Cognitive Training

Mind-Body Interventions → Tai Chi

Noninvasive Brain Stimulation

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Home-Based Exercise Program

- 12 month single blinded, randomized trial
- Age 70 > who had a fall w/in 12 months
- Usual care vs home-based strength and balance retraining exercise program (Otago Exercise Program)
- Outcome- self reported falls

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Home-Based Exercise Program

Figure 2. Accumulation of Falls and Cumulative Hazards of First and Second Falls by Treatment Group
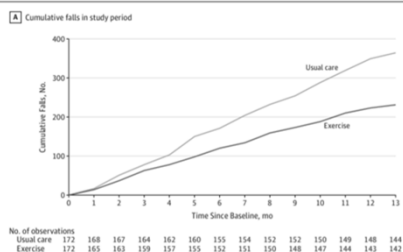
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SUMMARY

- Falls by older adults are common and usually multifactorial

- Falls are associated with functional decline

- Screening and targeted preventive interventions are most effective

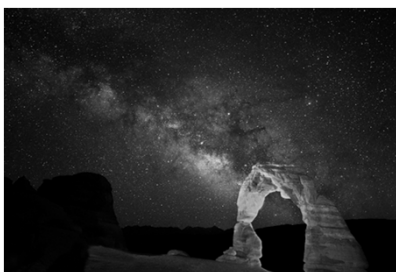- AGS falls prevention guidelines are available and recommend multifactorial interventions

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Thank You

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