

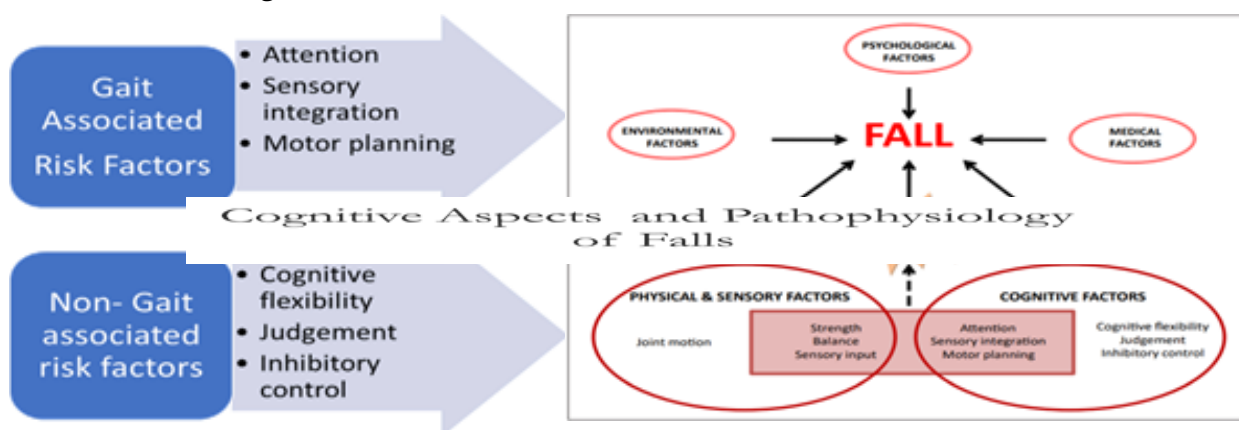
FALLS IN OLDER ADULTS WITH COGNITIVE IMPAIRMENT

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Background: Clinical and research evidence has established that cognitive impairment and falls are coexistent; gait impairments and falls are common in individuals with dementia. Older adults with Mild Cognitive Impairment (MCI) are at higher risk for falls than those with normal cognitive aging. The extent of falls increases with the severity of cognitive impairment. Several prospective cohort studies relative to older adults fall systematically excluded those with moderate or severe cognitive impairment, which was a challenge in standardized fall evaluation across the full mental spectrum.

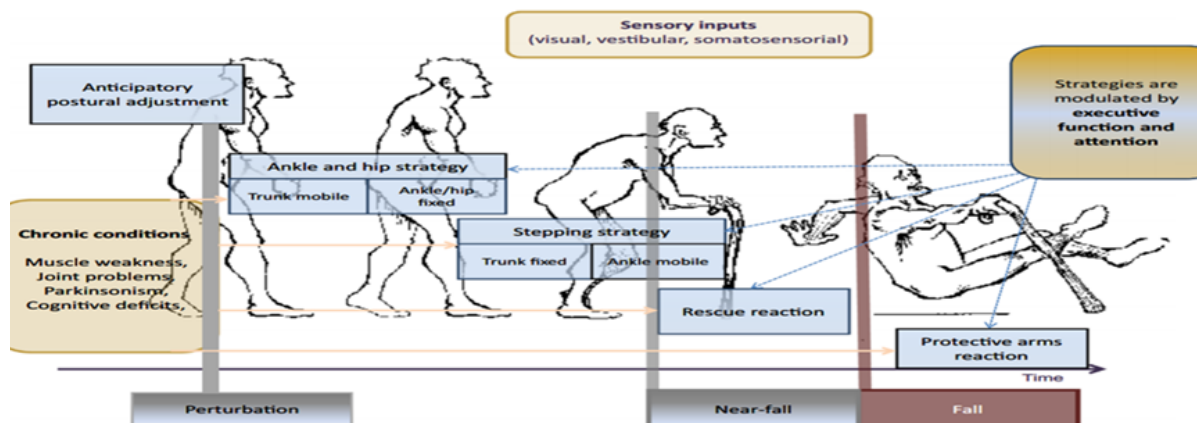
Risk Factors: Medical: Orthostatic hypotension and syncope caused by medication side effects are standard features of fall-related factors in older adults with dementia. Physical: CI older adults are more sedentary and perform less physical activity than the cognitively intact cohort. The impaired executive function can result in apathy and lack of motivation in daily living activities; consequently, the decline in physical functioning leading to an increased risk of falls. Psychological: Depression, impulsivity, and behavioral disturbances such as wandering are associated with increased fall risk in older adults with dementia. Environmental: Ambulation with a walking aid is a complex task that requires high levels of motor control and cognitive response to multiple sensory inputs and environmental conditions. The conscious demands associated with ambulation and walking aid could lead to an inability to maintain or recover balance during falls.



Adapted from Zhang et al (2019). Review of gait, cognition and fall risk

Cognitive impairment co-exists with gait decline and present changes in gait parameters even in the early stages of neurodegenerative diseases, for example, in Alzheimer's disease. These gait changes can be used as an early biomarker of dementia. Motor and cognitive functions share genetic determinants, mental and rate control share neural networks. Figure 1 illustrates the relationship between gait and falls in older adults with dementia. Strength, balance, and sensory input within the physical and sensory factors, together with attention, sensory integration, and motor planning within the cognitive aspects, directly impact gait performance resulting in an increased risk of falls in this population. For the physical and sensory factors, and mental characteristics, such as inhibitory control and judgment, this may also contribute to the risk of falls. Gait control is mediated by frontal subcortical circuits, which overlap with circuits controlling executive function. Executive function is a set of higher-order cognitive processes that regulate, integrate, organize, and maintain other mental abilities that play a significant role in compensating for the age-associated decline in motor function. It is the domain most commonly associated with gait dysfunction.

Cognitive Aspects and Pathophysiology of Falls



Adapted From: Odasso, M.M. & Speechley, M. (2018). Falls in Cognitively Impaired Older Adults: Implications for Risk Assessment and Prevention, *JAGS-66*(2) pp. 367-375. DOI: 10.1111/jgs.15219

Strategies for Fall Prevention: Fall prevention interventions should include motor and cognitive aspects relating to falls, tasks specific, and generalized training. The intervention centered around the user's needs: Strength training on focused muscle groups, cognitive training, and virtual reality multimodal intervention exercises. The V-TIME focuses on speed and cognitive deficits to enhance mobility, physical activity, and cognitive function. The current working version of V-TIME is shown in the first picture from the first row. A patient trains on a treadmill while watching a virtual environment that demonstrates obstacles, different types of challenges, as it provides feedback.

V-Time

Strength Training (ST) and Cognitive Training (CT)

Trained Muscle Groups (ST)

Cognitive Training (CT)

Reviewing Meds

Balance Exercises
FOR SENIORS
Strength Balance
Cognitive Training

TRIPS, SLIPS, AND FALLS

Remove hazards to walking safely

Hearing
Vision
Correcting vision and hearing problems

Correcting Vitamin D

Summary: Cognitive deficits are a significant risk factor for falls. Executive function and attention require evaluation during the routine fall risk assessment and can help treat gait motor control deficits and prevent falls. Consider older adults with MCI at high risk for falls to apply comprehensive evaluation for cognitive screening and fall prevention and intervention strategies. Pharmacological cognitive enhancer use in individuals with Alzheimer's dementia is a promising fall prevention strategy! (consider with caution).

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