

Dementia and Mobility Aids

Gradual loss of safe and independent mobility is a common feature of dementia that impacts everyday function, safety, caregiving, and quality of life ¹.

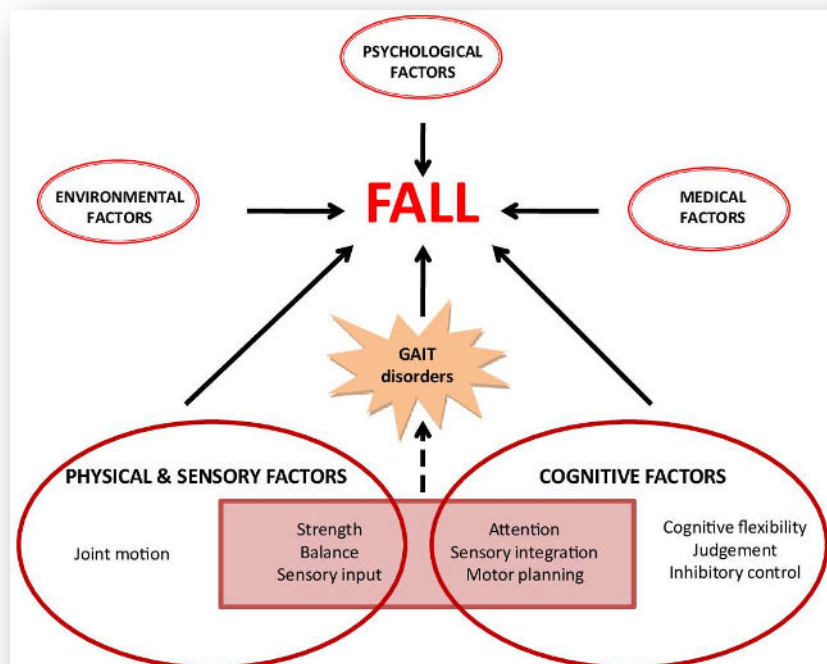
Among adults with dementia, balance problems and gait disorders are common and progressive leading to an evolving increase in falls risk ².

Falls also become increasingly common as dementia progresses. Each year, 60% - 80% ² of individuals with advanced dementia fall ¹, twice that of their cognitively healthy peers. They also carry a higher risk of major fall-related injuries ². This comes with a significant impact on morbidity and mortality, health care costs, and caregiver distress ¹.

Falls in people with dementia are multifactorial, including orthostatic syncope from disease-related changes in autonomic function, prescription medications, vision problems, functional status and the severity of the disease ².

The provision of a mobility aid can be an important preventative treatment option to compensate for balance and gait impairments, as mobility is fundamental to successful aging and quality of life in older adults ². However, use of a mobility aid is strongly related to an increase in falls ³.

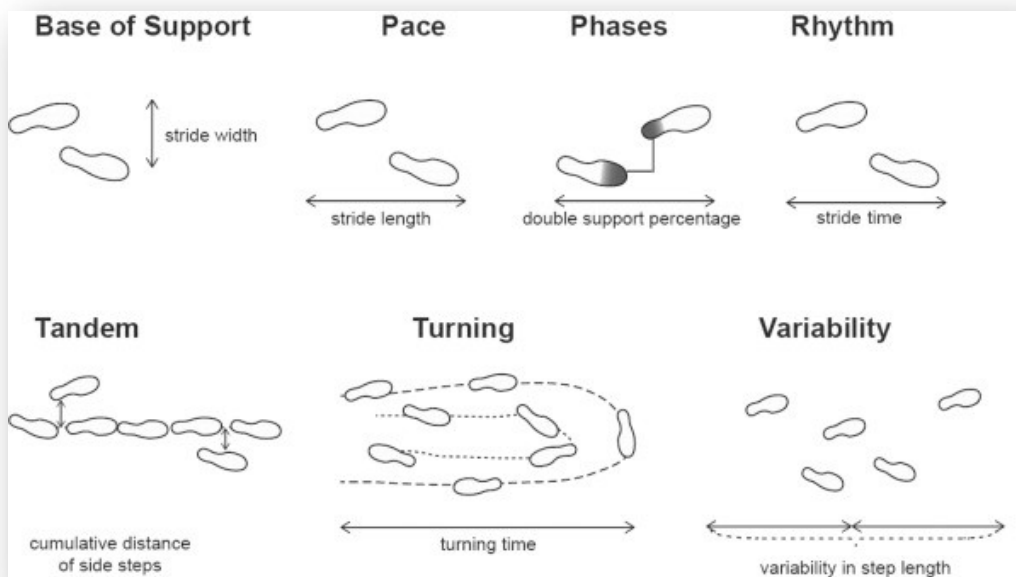
Early detection and interventions for mobility safety are critical to success of mobility aid use.



GAIT CHANGES

Alterations in gait are common and occur early in the dementia disease process, in fact they may precede the development of cognitive symptoms in people who later present with symptoms of dementia ⁵.

Three independent gait domains (Base of Support, Pace, and Rhythm) and Global Gait are associated with cognitive decline. Two independent gait domains (Pace and Variability) and Global Gait are associated with dementia onset ⁶. Poor performance on these independent gait domains precedes cognitive decline and dementia ⁶.



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Common changes in gait among people with dementia include ^{5,7,8}:

- Excessive step width
- Decreased gait speed
- Decreased step and stride length
- Increased single limb stance time
- Increased double limb support time
- increased gait variability.

Transitions, such as the sit-to-stand and turns of direction reflect additional, independent and putatively distinct mobility domains ⁸.

Transitioning from a sitting to standing position requires a series of complex motor skills such as moving forward with the body while seated, accelerating in the vertical plane while pushing upward from the seat and moving the body upward, and then slowing the momentum to achieve stability to stand ⁸.

Comparatively, turning requires a series of other complex motor skills involving coordination of the limbs, aligning and stabilizing one's posture with various aspects of gait, and manipulating specific

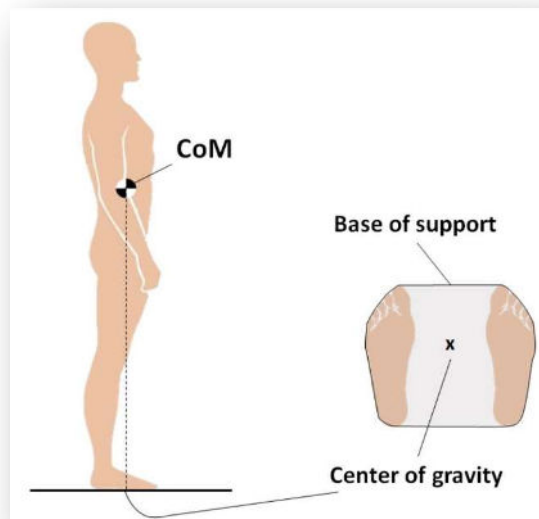
subsets of movements are required. Additionally, turning also requires greater involvement of visual processing along with intact balance and spatial perception 8.

Studies have found that while both transitions and turns are associated with executive functioning, turns are additionally associated with processing speed, and visuo-spatial perception 8, leading to increasing risk of falls when deficits in cognition occur.

Mobility during dual-task conditions, transitioning and turning during single-task conditions make walking less safe and increase the risk of falls 8.

BALANCE

Balance decreases with progression of cognitive impairment in dementia. Postural control is affected in many ways by disease progression. In particular, there are visual perceptual changes, slower sensory processing, reduced motor responses and increased attentional demands that impact static and dynamic balance 2.



In people with Dementia their centre of mass moves closer to the boundaries of base of support during movement 7. This challenges balance reactions and can increase instability especially for those with a decreased limit of stability.

Biomechanically, these larger movements of the centre of mass could be compensated for by appropriate foot placement, although commonly they fail to make these adaptations which contributes to a decline in stability 7.

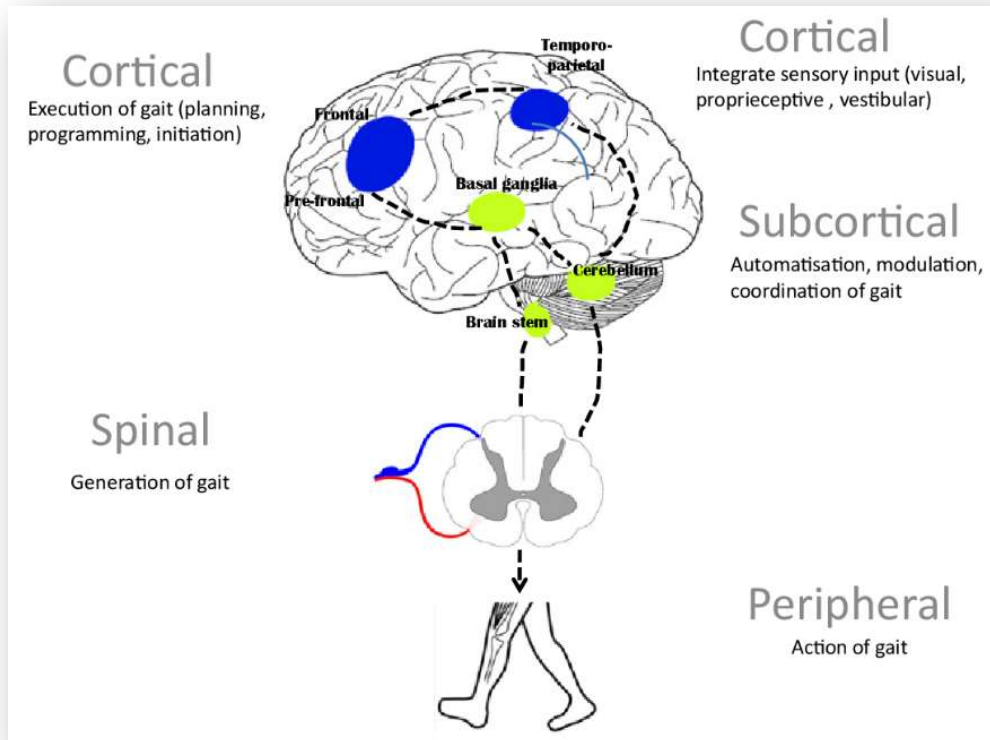
COGNITION & MOBILITY

Cognition and mobility are both multifaceted. Cognitive functions can be classified into executive function, memory, attention, language, and processing speed. Gait, a predominant aspect of mobility, can be subdivided into pace, rhythm, asymmetry, and variability.

There is compelling evidence that these cognitive functions and mobility domains are interrelated, especially among older adults 8. Changes in certain aspects of gait predict cognitive decline and dementia, while the converse has also been observed with executive function and memory (mostly verbal memory) predicting a decline in gait 8.

Global measures of cognition as well as specific domains including working memory and executive function have been linked to changes in physical performance in older adults 9.

Moreover, likelihood of disability increases with worsening severity of cognitive impairment and the rate of progression to disability is exacerbated by presence of impaired cognitive function. There is also evidence to suggest that decline in cognition is associated with decline in mobility regardless of whether the physical task requires a great cognitive input or not 9.



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DETERIORATION OF MOBILITY

The ability to move about one's environment is one of the prerequisites for independent living and a significant determinant of quality of life in old age 9.

Compared to cognitively healthy individuals, older adults with cognitive impairment tend to perform poorly on mobility tests and to report higher levels of disability 9.

The causes of mobility decline in dementia are multifactorial, including neurodegenerative changes, cerebrovascular disease, and age-related musculoskeletal or sensory changes. Cognitive changes and the presence of behavioural symptoms associated with dementia can also contribute to mobility deficits in this population 1.

Early disturbances in cognitive processes such as attention, executive function, and working memory are associated with slower gait and gait instability during single and dual-task conditions and these cognitive disturbances assist in the prediction of future mobility loss, falls, and progression to dementia 10.

While progression of Alzheimer's Disease (AD) is associated with greater decline in mobility compared to remaining cognitively healthy, the other forms of dementia may lead to an even greater decline. Compared to those who remained cognitively healthy, participants who progressed to non-AD diagnoses (covering the varied stages of dementia) declined in mobility at a rate that was twice that observed in AD individuals 9.

MOBILITY AIDS

Mobility aid provision is a common strategy that allows for improved independence in mobility as it provides physical support and haptic sensory feedback.



Wheeled walkers are the most commonly prescribed and used mobility aid for this population. This observation is consistent with the rate of walker use greatly increased in recent years and that wheeled walkers are the most common prescribed mobility aid for older adults 2.

Use of a mobility aid has been found to improve walking stability and allow greater ambulation and social participation in cognitively healthy older adults 2. Use of mobility aids by the person with dementia has been associated with a reduction in anxiety and relief of burden in carers that is related to the person with dementia's improved safety 5.

Yet, the use of a mobility aid in people with dementia has been found to be independently associated with a three-fold increased risk of falling 2. Walking with a mobility aid in novice and experience users of wheeled walkers results in increased cognitive load and gait instability 5.

Most injuries sustained while using a wheeled walker resulted from a fall, 60% of these injuries were fractures and hip fracture (25%) was the most common. The three-fold increased odds of falls in people with dementia over the cognitively healthy, as well as the former group's higher risk of sustaining major fall-related injuries, warrants a more holistic approach to identify physical functional elements and implement safe use of a mobility aid 2.

The transition to use of a mobility aid is an important milestone for people with dementia as it can occur when brain function may be challenged to accommodate greater resource utilisation required to use the mobility aid 2. Cognitive impairments may compromise learning of new tasks resulting in unsafe practices when using the equipment 2.

Use of a mobility aid is a complex motor activity requiring motor sequencing and coordination, navigating and selecting a path through in the environment, along with remembering strategies for use 2.

Factors that could link mobility aid use to an elevated fall risk in people with dementia include the underlying neurodegenerative processes, incomplete motor learning, limited insight into safe gait aid use and increased cognitive demands related to attentional processing and neuromotor control ². Mobility with a wheeled walker, in particular manoeuvring around obstacles, requires greater attentional cognitive cost in people with dementia ¹¹.

Gait velocity will increase when using a wheeled walker compared to no aid however this only improves gait in simple walking, as benefits diminished upon dual-task conditions ¹².

Gait with a mobility aid is a unique dual task condition, of which people with dementia will find difficult and increase the risk of instability and falls. These simultaneous motor tasks place increased demands on executive function in healthy young and older adults ¹¹, making the ability for a person with dementia to use a mobility aid more challenging.

Lack of knowledge for how to use an aid safely can also increase the risk for falling, which can result from a lack of training and limited insight into one's physical abilities in a given situation. The effects of dementia on physical function (balance, gait, strength), problems with dual tasks at the same time and distractions in the environment increase demands on the brain which increase instability ⁵.

Learning to use a wheeled walker is cognitively demanding and any additional tasks increases the demands, further adversely affecting gait. The increased cognitive demands result in a decrease in gait velocity ¹³ when performing transitions and turns, amongst other changes that adversely effect the ability to achieve safe and functional mobility.

MAXIMISING POSITIVE OUTCOMES

Most people do not see a Therapist when they acquire a mobility aid and there is a need for Therapists to be more involved in the prescription, provision and training of people living with dementia in the use of mobility aids in order to increase the uptake of aids and their safe use ¹⁵. Therapists will perform a holistic assessment of single/ dual tasks, simple/ complex gait and motor sequence testing to assess people with dementia for mobility aid use ¹⁶.

Early detection of mobility and/or cognitive changes in older adults is imperative, allowing intervention to enhance deployment of therapies for those with clinical impairments ⁸. Early detection allows for timely implementation of targeted interventions to improve gait and/or cognition.

Decline in mobility has a cognitive component and interventions to maintain functionality and prevent future disability are likely more successful at earlier stages in the disease process ⁹.

As both cognitive functions and mobility decline, it becomes imperative to provide specific targeted interventions to improve cognitive, motor function and their inter-relationships that can subsequently result in improved functional mobility and cognition.

Quantitative gait analysis, particularly performed during dual task conditions, can detect gait deficits that cannot yet be seen by the naked eye, even to a trained specialist. Gait disturbances are measurable years before mild cognitive impairment, dementia or mobility difficulties clinically

manifest ¹⁷. This early detection also allows the timely implementation of interventions ¹⁷ including use of a mobility aid at a time where capacity for learning remains more cognitively intact.

Deterioration in the ability of gait aid use after the diagnosis of dementia indicates a need for re-assessment or re-training of mobility aid use over time. Clinical assessment of conditions when mobility aids are beneficial, what duration and aspects require instruction to ensure effective use by people with dementia are needed ¹⁸.

Therapists may consider using a more extensive mobility aid training approach to optimise learning of safe gait patterns and mobility aid use, which may produce better outcomes ¹⁹.

A person with dementia commencing use of a mobility aid after diagnosis presents unique challenges. It is important to recognise that people with dementia have a preserved capacity for learning ².

Training protocols that use procedural, implicit learning optimises acquisition and retention of new skills. There is some evidence to suggest that these methods are clinically useful in assisting those with dementia to learn and retain the skills for proper use of their walker. Reinforcement of instructions by all surrounding people facilitates the process of procedural learning ².

It must be recognised that physical strength, balance and quality of gait are independent of unsafe techniques for use of the equipment ². Thus, improvement in these domains may not reliably improve mobility with the walker or reduce risk of falls.

FUNCTIONAL ASSESSMENT

Assessment Scales with Established Reliability for Use in People with Dementia ²:

1. Berg Balance Scale
2. Groningen Meander Walking Test
3. Modified Test for Sensory Interaction in Balance
4. Physical Mobility Scale
5. Rating Scale for Gait Evaluation in Cognitive Deterioration
6. Step Test
7. Timed Up & Go Test

SAFE USE OF MOBILITY AIDS CHECKLIST

In 2020, a new assessment scale, Safe Use of Mobility Aids Checklist (SUMAC), for people with dementia who use a wheeled walker was developed ².

This is the first tool to allow clinicians to objectively quantify, standardise, and track progress of an individual's ability to safely use a wheeled walker. The tool standardises the assessment of the quality of the person's walking and safe practices while using the aid to improve communication across disciplines and aid in care planning.

The SUMAC assesses nine tasks that reflect a core set of skills needed to evaluate independent use of a wheeled walker.

SUMAC tool yields scores in physical function and safe use of the equipment in each task. There is strong support for construct and criterion validity of the SUMAC tool. The SUMAC was determined to have good to excellent inter-rater and test-retest reliability, supporting use of the scale in clinical practice 2.

The tool has the potential to facilitate uniform expectations of performance with the equipment and education with appropriate reinforcement for people using a wheeled walker 2.

CONCLUSION

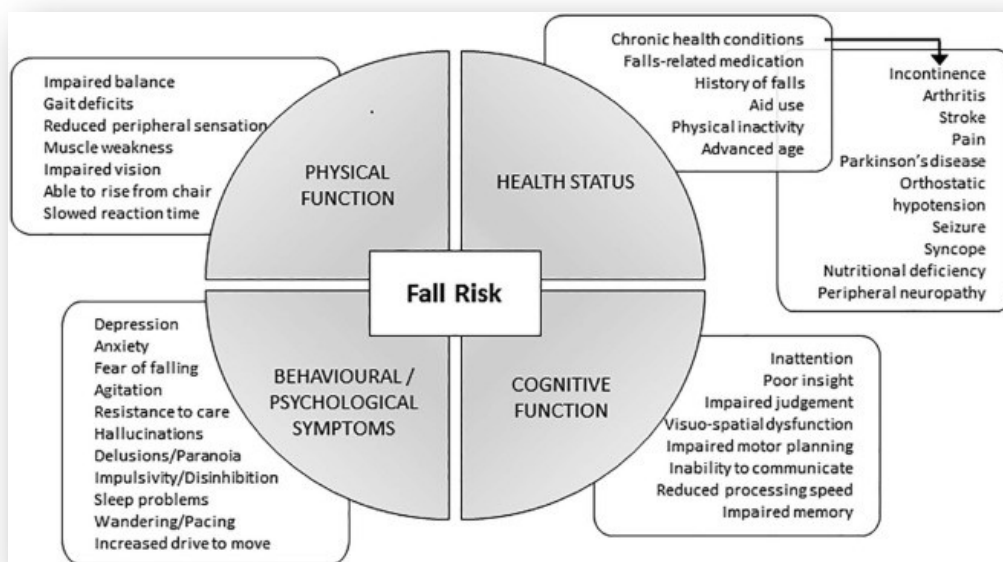
Implementation of a mobility aid to improve gait and stability of people with dementia is a common practice. Most commonly is use of the wheeled walker 2.

Mobility aid usage is more strongly related to falling in people with dementia 3 and independently associated with a three-fold increased risk of falling 2.

Early detection of gait changes can be a marker for cognitive decline and dementia. This early detection allows the introduction of interventions including use of mobility aids, prior to cognitive deterioration.

Thorough functional assessment is required, including single and dual tasks, simple and complex gait patterns and motor sequencing, prior to determination and recommendation of mobility aid use.

The SUMAC Assessment tool provides Therapists with an evidence based format for objectively quantifying, standardising, and tracking progress of an individual's ability to safely use a wheeled walker.



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