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Walking Tests: Are They Sensitive Enough to Detect Cognitive Decline in Older Adults?

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In this issue Donoghue et al¹ reported no association between baseline mobility and decline in cognitive status in the Irish Longitudinal Study on Ageing (TILDA). The publication of negative results is essential to research progress and collaboration and is important for decreasing publication bias. Still, absence of an association between mobility and risk of cognitive decline runs counter to the findings from several observational cohorts. The TILDA results allow a close look at the stability of research findings and why results may differ.

The authors examined data from a large prospective study of community-dwelling adults aged 50 + years in Ireland. A major strength of this study was the use of a large representative community-based sample of older adults. A total of 8,172 adults were enrolled for the baseline examination in 2009–2011, of which 2,250 were used for their analysis. To explore the relationship between mobility and cognitive decline the authors examined three tests of walking mobility at baseline: usual gait speed, dual-task gait speed, and timed up-and-go. Timed up-and-go is a “complex walking test that not only involves a series of physical movements (standing up, walking, turning around, and sitting down), but requires individuals to process instructions, plan and execute movements, avoid distractions, and react to relevant stimuli.”¹ It is a much greater cognitive challenge compared with straight-line walking and was hypothesized to be more sensitive to cognitive decline than usual gait speed and dual-task gait speed. However, none of the mobility tests was predictive of cognitive decline during follow-up. Multiple cognitive assessments were conducted every 2 years for 6 years, including global cognition, executive function, memory, processing speed, and attention.

Mobility impairment, particularly slowed gait speed, has been shown to predict both cognitive decline^{2,3} and the onset of cognitive impairment.^{4,5} What may account for the null findings in the TILDA study? There are several possible explanations. First, mixed-effects models examined gait speed at baseline with change in cognitive status but did not examine the temporal association between changes in mobility and cognition. It is possible that

slowing of gait speed is a stronger predictor of cognitive decline than baseline gait speed. Findings from two observational cohorts of healthy but older adults, Health ABC and WHAS-II, support this dynamic relationship between changes in cognition and changes in mobility.^{6,7} Segmenting temporal relationships may be critical for seeing this association. For example, in Health ABC early decline between years 0 and 4 in gait speed predicted later decline between years 4 and 9 in cognitive performance.

Second, the follow-up period was short, and, indeed, the authors reported very little change in cognitive status over the course of the study. This is not surprising, given the sample of healthy, relatively young, high-functioning adults enrolled in TILDA. It is possible that subgroup analyses by age (<65, 65–74, 75–84, or ≥85 years) would yield a different pattern of results, with gait speed predicting accelerated cognitive decline in older age cohorts.

Third, mobility performance may need to be considered as part of a larger causal chain to assess its relevance for cognitive change. People with better mobility are likely to be more physically active (and more motivated to be active), and research suggests physical activity may have neuroprotective properties.⁸ However, people with minor mobility impairment may also engage in physical activity and gain cognitive benefit. This would attenuate the mobility–cognition association.

Finally, depression is relevant to both mobility and cognitive change in late life. Individuals with depression are more vulnerable to accelerated brain aging, which puts them at risk for developing cognitive challenges and physical declines.⁹ Depression may represent a target for preventing decline in cognitive function and other downstream negative consequences, such as disability and reduced quality of life. However, further investigation into the interplay among mobility, cognitive function, and common mental illness is important in understanding the pathways to disability and loss of independence in older adults.

What is next in this line of work? The authors speculated that new or more sensitive tests of walking speed may be required, especially if we want to detect early cognitive change in healthy, community-dwelling older adults. Other researchers¹⁰ have examined the predictive ability of various walking tests (usual gait speed, fast gait speed, and walking with a cognitive or neuromuscular challenge) and found that inability to walk fast was the strongest predictor of cognitive decline. Walking fast requires more attentional control and cortical activity and may be a more sensitive predictor of accelerated cognitive decline compared with usual gait speed. Walking tasks that incorporate more diverse cognitive challenges (like the timed up-and-go) may in fact be less efficient in isolating the effect of a brain–motor–mobility pathway for risk of cognitive decline.

Declines in both cognitive and physical function are common in older adults and are believed to be due to a shared underlying neural mechanism. Much more research is needed to determine whether and at what rate of change gait speed might be a clinical marker for cognitive decline.

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