Cognitive training, mobility, and everyday life

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Few older adults achieve the recommended levels of physical activity despite its well documented health benefits. Older adults, especially those older than 75 years, might be particularly vulnerable to losing physical activity training gains if they cease to engage in exercise programmes. It is commonly cited that about 50% of people (≥18 years) who start an exercise programme will cease within 6 months. Although physical activity interventions might be effective for maintaining mobility, limitations in adherence have prompted researchers to identify non-physical interventions to reduce the risk of dementia.

Interventions that target improvement of specific cognitive domains show transfer to complex physical functions, such as balance and gait speed, and might be especially effective in adults at the highest risk for mobility difficulties. However, these trials compared cognitive interventions with no-contact control groups. No-contact control groups are appropriate for answering certain questions, such as whether the intervention has greater efficacy compared with usual care. However, such designs are unable to inform which components of the intervention drive mobility gains: cognitive training or an inactive component (any part of the trial not expected to cause the treatment effect).

To address this, in their Article published in The Lancet Healthy Longevity, Joe Verghese and colleagues examined whether computerised cognitive training improved mobility-related outcomes compared with an active control group. Compared with the intervention, the computerised task done by the active control group did not progress in difficulty and primarily included games that engaged working memory and processing speed; the intervention group training was instead adaptive and primarily used games that trained executive functions and processing speed (also called process-based cognitive interventions). Despite the active control group missing the active intervention components of adaptive training of process-based cognitive domains, participants in both groups reported a similarly strong belief that they were benefiting from the programme. This belief was partly reflected in the primary results, in which both groups had post-intervention gains in mobility; however, the intervention group did not significantly outperform the active control group. The benefits in mobility did not extend to everyday life outcomes, such as changes in mood, quality of life, fear of falling, step counts, or cognitive or physical leisure activity engagement.

Although the absence of between-group differences might temper one’s excitement about the use of non-physical interventions, we still have much to learn about cognitive training...
and mobility. For example, it is possible that the active control group inadvertently received one or more of the active components of the intervention. The activities in the active control group were chosen to specifically exclude executive functions, but the control group showed significant within-group improvements in two of three executive function tasks (the intervention group improved in all three). It is also possible that the improvement in both groups reflected practice effects. Future trials that incorporate both active and passive control groups would be able to inform the degree to which either programme (intervention or active control) affects mobility compared with no treatment. This approach could also be used to assess the degree to which expectancy effects affect mobility. For example, Verghese and colleagues' \(^8\) sample largely reported perceived benefits from the programme regardless of intervention condition. If there were more variability in perceived programme benefits and a passive control group, we could also answer questions about the role of expectations on mobility outcomes (eg, using cognitive outcomes \(^9\)). Future cognitive interventions that incorporate both active and passive control groups would enrich our understanding of whether cognitive training, increased social engagement, expectancy effects, or some other mechanisms affect mobility.

In addition, there were striking secondary findings that warrant discussion. Since there was high enjoyment of the cognitive training programme, it is possible that participants might seek out other enjoyable cognitively stimulating activities in their everyday life. The decision of authors to include participation in cognitive and physical leisure activities as an outcome should be commended; with the inclusion of these types of outcomes, we can begin to learn about how engaging in an intervention might affect other activities. For example, individuals who begin engaging in one healthy behaviour might be motivated to engage in other healthy behaviours. A critique of cognitive training programmes is that these potential new health behaviours might drive intervention effects, rather than the intervention itself.\(^10\) Previous cognitive intervention trials relied on surrogate everyday functional outcomes, such as falls, changes in self-reported memory, and everyday activities (eg, keeping a daily diary of their activities), but they could not confidently assess changes in the participant’s everyday activities. This study is one of the first to report that cognitive training does not significantly increase participation in other cognitive or physical activities. These findings have exciting implications for future cognitive intervention design; for example, those that might explicitly aim to have participants engage in more cognitive activities outside of the intervention to maximise its potential benefits. Researchers could consider incorporating goal setting or self-efficacy training modules to motivate participants to maintain activity after the intervention is completed.

In closing, there is still much to learn about how and if cognitive training can maintain or improve the physical, cognitive, and psychosocial health of older adults. Verghese and colleagues’ informative work provides a blueprint for one way to measure how participating in an intervention might or might not move the needle on the everyday activities of older adults.
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References

1. Piercy KL, Troiano RP, Ballard RM. The physical activity guidelines for Americans. JAMA 2018; 320: 2020–28. [PubMed: 30418471]
2. Toraman NF. Short term and long term detraining: is there any difference between young-old and old people? Br J Sports Med 2005; 39: 561–64. [PubMed: 16046344]
3. Dishman RK. Compliance/adherence in health-related exercise. Health Psychology 1982; 1: 237–67.
4. Smith-Ray RL, Hughes SL, Prohaska TR, Little DM, Jurivich DA, Hedeker D. Impact of cognitive training on balance and gait in older adults. J Gerontol B psychol Sci Soc Sci 2013; 70: 357–66.
5. Li KZH, Roudaia E, Lussier M, Bherer L, Leroux A, McKinley PA. Benefits of cognitive dual-task training on balance performance in healthy older adults. J Gerontol A Biol Sci Med Sci 2010; 65: 1344–52. [PubMed: 20837662]
6. Smith-Ray RL, Makowski-Woidan B, Hughes SL. A randomized trial to measure the impact of a community-based cognitive training intervention on balance and gait in cognitively intact black older adults. Health Educ Behav 2014; 41 (suppl 1): 625–69. [PubMed: 25274713]
7. Ross LA, Sprague BN, Phillips CB, O’Connor ML, Dodson JE. The impact of three cognitive training interventions on older adults’ physical functioning across 5 years. J Aging Health 2018; 30: 475–98. [PubMed: 28553791]
8. Verghese J, Mahoney JR, Ayers E, Ambrose A, Wang C, Holtzer R. Computerised cognitive remediation to enhance mobility in older adults: a single-blind, single-centre, randomised trial. Lancet Healthy Longev 2021; 2: e571–79. [PubMed: 34522910]
9. Tetlow AM, Edwards JD. Systematic literature review and meta-analysis of commercially available computerized cognitive training among older adults. J Cogn Enhanc 2017; 1: 559–75.
10. Simons DJ, Boot WR, Charness N, et al. Do “brain-training” programs work? Psychol Sci Public Interest 2016; 17: 103–86. [PubMed: 27697851]