Tracking daily movement patterns may one day help predict dementia

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Wearable movement-tracking devices may someday be useful in providing early warnings of cognitive decline among older adults, suggest new findings from researchers at the Johns Hopkins Bloomberg

School of Public Health.

The researchers analyzed data from ActiGraph activity monitors, which use an activity-tracking sensor similar to those found in Fitbits and Apple watches, worn by nearly 600 participants in a long-running community-based health study of older adults. They found significant differences in movement patterns between participants with normal cognition and those with mild cognitive impairment or Alzheimer's disease. These differences included less activity during waking hours and more fragmented activity during afternoons among the mild cognitive impairment/Alzheimer's participants.

The results were published July 19 in the *Journal of Alzheimer's Disease*.

"We tend to think of physical activity as a potential therapy to slow cognitive decline, but this study reminds us that cognitive decline may in turn slow physical activity—and we might someday be able to monitor and detect such changes for earlier and more efficient testing to delay and maybe prevent cognitive impairment that leads to Alzheimer's," says study lead author Amal Wanigatunga, Ph.D., MPH, assistant scientist in the Department of Epidemiology at the Bloomberg School.

The recent introduction of wearable activity-tracking devices, which are now used by tens of millions of people around the world, has presented an important opportunity for health researchers to measure and track changes in physical movement. The devices can provide automatic, objective measures of daytime physical activity, sleep patterns, heart rate, and blood oxygen levels—and they are typically Internet-connected, allowing their manufacturers to build datasets covering millions of users. Researchers previously did not have such an easy way to access such health-relevant data at such a large scale.

The aim of the new study was to determine whether activity-tracker

patterns recorded from a cohort of older adults differ meaningfully between the cognitively normal and the cognitively impaired. Alzheimer's disease, the most common form of dementia, is known to be a decades-long process, and researchers generally expect that future disease-modifying interventions will be more effective when started earlier in the disease course. If scientists could identify a distinctive change in activity that predicts the slide into mild cognitive impairment, and eventually Alzheimer's and other forms of dementia, then in principle older individuals who show this change in activity could be given further cognitive testing—and when available, earlier treatment.

The study made use of data from a larger, ongoing health research project known as the Baltimore Longitudinal Study of Aging (BLSA), in which the National Institute on Aging has been studying thousands of people in the Baltimore area since 1958. The analysis was based on 585 BLSA participants for whom sufficient activity-tracker data and cognitive assessments were available during the period July 2015-December 2019. These included 36 participants with either mild cognitive impairment or Alzheimer's diagnoses.

Adjusting for differences based on age, sex, and race, the researchers found that overall differences in all-day activity measures were not strongly different between the mild cognitive impairment/Alzheimer's and normal cognition groups. However, when the researchers focused on activity patterns during certain times of the day, some differences were revealed.

In the mornings (6 a.m. to noon) and even more so in the afternoons (noon to 6 p.m.), the mild cognitive impairment/Alzheimer's group had significantly lower measures of activity compared to the normal group. The most striking finding was that activity "fragmentation"—a breaking up of activity into smaller time periods—was 3.4 percent higher for the mild cognitive impairment/Alzheimer's participants during the afternoon

period.

"Seeing this difference in the afternoons was interesting—one of the main symptoms of Alzheimer's dementia is the 'sundowning' phenomenon involving increased confusion and mood changes that start in the afternoon, and it might be that these activity markers are capturing some movement related to these symptoms," Wanigatunga says.

The findings, he notes, are preliminary because of the cross-sectional, "snapshot" nature of the study design, though they do support the idea that cognitive decline into mild cognitive impairment and dementia is accompanied by changes in activity patterns.

He and his colleagues plan additional studies that will follow participants over time, to see if measurable yet slight changes in everyday activity patterns help capture early symptomology of mild cognitive impairment and subsequent Alzheimer's disease dementia.

  More information: Amal A. Wanigatunga et al, Daily Physical Activity Patterns as a Window on Cognitive Diagnosis in the Baltimore Longitudinal Study of Aging (BLSA), *Journal of Alzheimer's Disease* (2022). DOI: 10.3233/jad-215544

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