


# Smartphone app could help prevent falls in older adults

January 12 2024


Workout
?
⚙️
⋮

Week 1
Oct 21 -


Balance Program Week 1  
3/3 Complete
30 Min


0
0
0

Week 2
Oct 28 -


Balance Program Week 2  
2/3 Complete
30 Min

0
0
0

Week 3
Nov 04 -


Balance Program Week 3  
0/3 Complete
30 Min


0
0
0

Week 4
Nov 11 -

User
Record
Workout

←
Week 2
?

Semi-tandem stance
2 x 30 sec



a. Stand with the inside part of your right heel next to the inside part of your left big toe  
b. Hold this position for 30 seconds  
c. Repeat with the inside part of your left heel next to the inside part of your right big toe  
d. Hold this position for 30 seconds

⌚
Remaining: 30.0 sec

▶ Draw number with left foot
10 reps

▶ Draw number with right foot
10 reps

⏸️
0/24 Completed

Weekly workout programs and example exercise instruction set with images as displayed to participants in the smartphone-based intervention group. Credit: *Sensors* (2023). DOI: 10.3390/s23177451

Researchers at Binghamton University, State University of New York's Motion Analysis Research Laboratory have developed an app to help study and prevent falls in older adults. Their research is [published](#) in the journal *Sensors*.

Most adults who find themselves in their golden years quickly realize that their overall ability to maintain balance isn't what it used to be. One out of every four adults ages 65 and up in the United States is likely to suffer from a fall, the leading cause of fatal and nonfatal injuries in that age group.

But they don't have to be—and a Binghamton University study has been working to prevent falls, using something found in nearly every person's pocket.

"We can use a phone not just for evaluation but for delivering intervention. In this case, we can ask somebody to stand still with the phone in their pocket, or record standing while looking straight ahead. The phone itself will use accelerometers to see how much body sway is happening," said Vipul Lugade, an associate professor of physical therapy and one of the co-principal investigators of this study.

"The scale is tiny. We can actually look at this amount of movement and figure out how stable the person is while standing."

Lugade is the director of the Motion Analysis Research Laboratory (MARL), where the first step of this research into older adult fall risk

prevention using smartphones was recently completed.

"As you get older, you need to be aware of your body's ability to maintain balance while standing and walking," Lugade said. "The ability to do two tasks at the same time is compromised as you get older. Older adults have an inability to either allocate attention to both tasks simultaneously or have an inability to switch between tasks."

The MARL intervention study began in June 2022 and set out to investigate some of these issues. Among the cutting-edge equipment in the lab are a 12-camera motion analysis system, a Biodex System Dynamometer (for individual muscle rehabilitation), a Portable GAITRite System (electronic walkway for measurement), and eye-tracking glasses.

Most important in this study is a Computerized Dynamic Posturography (CDP) system, which measures "postural sway" by analyzing foot pressure, force and motor reactions while the user stands in a harness on a locked or moving platform.

Using this specialized motion-capture gear, researchers looked at gait speed and balance. Improvements in gait speed especially have been shown to reduce the risk of falls; if individuals show an improvement after utilizing the smartphone-based program, the intervention could be seen as clinically effective.

This is helpful, as the main goal for this stage of research is to find out if the smartphone app they've developed is even a usable tool in helping [older adults](#) with balance-related deficiencies. By completing regular exercise programs and weekly balance evaluations at home, are these participants getting everything they can out of the program—and is it an improvement or even a change from a paper version of the test?

Out of the 31 participants who were involved, 29 older adults completed all the exercises and tests and were reevaluated at the end of the study. This high completion rate showed virtually no difference in the electronic vs. paper applications.

"The app is a viable alternative to paper and can be safely used to deliver balance interventions to a person's phone," said Suzanne O'Brien, the second co-principal investigator and an associate professor of physical therapy. "We want to take some next steps to use the app to deliver exercises and prevent falls in older adults in this [rural] area. Later on, we'd like to do the same in some patient groups, such as Parkinson's disease and stroke."

Connecting with the participants was an important aspect of the study. A separate measurement included the likelihood and happiness of individuals in completing the app-based practice. To this end, O'Brien completed weekly phone check-ins during the four-week study, and testers were in the room during all in-office visits to ensure participant safety.

Although some participants indicated experiencing physical and mental fatigue as well as muscle soreness from the exercises and tests, the overall study found that seniors were capable of using the [smartphone app](#) and that its development could be a boon to patient balance and well-being.

The researchers in this study, however, weren't content with just collecting this data. Their secondary goal is to ensure that what they collected can now be used by the community in addition to the physicians and individuals who can benefit from the interventions.

Along with Lijun Yin, a professor of computer science at Binghamton, the team has started working on a computer dashboard that looks at

performance metrics and compares the users with the "normal" range.

The long-term idea would be to collect data nationwide so that the user could compare via demographics like age and gender; clinicians across the country could use the model to focus on results across their patient set to provide the best care possible, and someday may even be able to push updates automatically—from real-time records of the patient's results, and adjusted to performance.

The researchers hope in the next steps of the project to modify certain aspects for more accurate results: for example, by increasing sample size or addressing potential participants from underrepresented communities who may need the interventions but don't have access to smartphones.

**More information:** Vipul Lugade et al, Smartphone- and Paper-Based Delivery of Balance Intervention for Older Adults Are Equally Effective, Enjoyable, and of High Fidelity: A Randomized Controlled Trial, *Sensors* (2023). [DOI: 10.3390/s23177451](https://doi.org/10.3390/s23177451)

Provided by Binghamton University

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