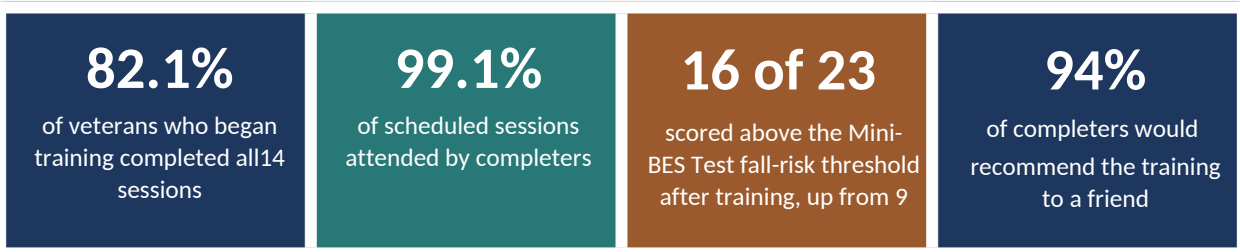
RESEARCH PAPER

Virtual Balance Training for Older Veterans: What One Study Shows

A review of a 2026 VA pilot study on simulation-based treadmill training and what it means for therapist-led rehabilitation

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FiguresfromConroy et al., *BMC Geriatrics*, 2026.

Abstract

Background. Older veterans carry a higher fall-risk profile than non-veterans, and virtual reality has become common across veterans' care, which makes simulation-based balance training a natural area of study for this group (Conroy et al.).

Study reviewed. Researchers at the Baltimore VA Medical Center enrolled 30 community-dwelling veterans aged 65 to 88 with a history of falls or a documented fall risk in a pilot of virtual reality motor-cognitive treadmill training delivered over 14 sessions (Conroy et al.).

Findings. Among the 23 veterans who completed the program, Mini-BESTest balance scores rose from 20.91 to 23.13 ($p = .01$) and balance confidence rose from 65.18 to 73.04 percent ($p = .02$). Completers attended 99.1 percent of scheduled sessions, rated their satisfaction 4.7 out of 5, and 94 percent would recommend the training to a friend (Conroy et al.).

Implications. The results show that structured, progressive, clinician-supported simulation-based practice is feasible and well received among medically complex older veterans, and the authors see potential in longer or higher-intensity programs. This paper closes by describing how the Smart Therapy™ Complete Solution reflects these principles in its design.

1. Introduction

Falls are the leading cause of injury among adults aged 65 and older, and roughly 30 percent of older adults fall each year, at an estimated cost of $50 billion in health care spending (Conroy et al.). The issue weighs heavily on veterans' care, because older veterans make up about 49 percent of the nation's 16.5 million veterans and, compared with non-veterans, carry more health conditions, poorer overall health, and a greater risk of age-related cognitive decline (Conroy et al.).

Everyday walking rarely happens in isolation, since talking while walking, carrying an object, or watching for traffic all require a person to divide attention between movement and thought, and that coordination becomes harder with age. The study's authors note that many established fall-prevention exercise programs address individual risk factors separately, do not emphasize combined motor and cognitive practice, and have been studied largely in women, which leaves an opening for approaches built around a mostly male veteran population (Conroy et al.).

Virtual reality has also become a familiar part of veterans' care. The U.S. Department of Veterans Affairs reports more than 4,700 VR headsets deployed across more than 170 VA medical centers and outpatient clinics in all 50 states, Puerto Rico, Guam, and American Samoa, with more than 40 documented use cases and more than 10,000 veteran experiences to date (U.S. Department of Veterans Affairs). With adoption at that scale, clinicians benefit from a clear view of what the research on simulation-based rehabilitation shows for this population.

This paper reviews a 2026 pilot study by Conroy and colleagues at the Baltimore VA Medical Center, which tested virtual reality motor-cognitive treadmill training with older veterans at risk of falling. It summarizes the study's design and key findings, considers what they mean for therapists, and describes how therapist-led tools such as the Smart Therapy Complete Solution reflect the same principles in their design.

2. Study Design and Methods

2.1 Design and Setting

Conroy and colleagues conducted a prospective pilot study at the Baltimore VA Medical Center Geriatric Research, Education and Clinical Center in partnership with the University of Maryland School of Medicine. Every participant received the same structured training program, the protocol was approved by the University of Maryland Baltimore Institutional Review Board and the Baltimore VA Research and Development Committee, and data were collected from August 2022 to March 2025 (Conroy et al.).

Table 1. The study at a glance

Detail	What the study did
Design	Prospective pilot with assessments before and after training
Setting	Baltimore VA Medical Center, VA Maryland Health Care System
Participants	90 veterans screened, 30 enrolled (aged 65 to 88; 26 men, 4 women), 23 completed and analyzed
Eligibility	Community-dwelling veterans with a history of falls or a documented fall risk
Dose	14 sessions, twice a week over about 7 weeks, roughly 45 minutes each
Intervention	Treadmill walking in a screen-based virtual environment with motor and cognitive challenges and real-time feedback

2.2 Participants

Researchers screened 90 older veterans within the VA Maryland Health Care System, and 30 met enrollment criteria. Before baseline testing, each participant completed a general physical examination, a cognitive screen, lower-extremity strength and sensation testing, and a five-minute trial walk on the treadmill in a safety harness. Figure 1 shows how participants moved through the study (Conroy et al.).

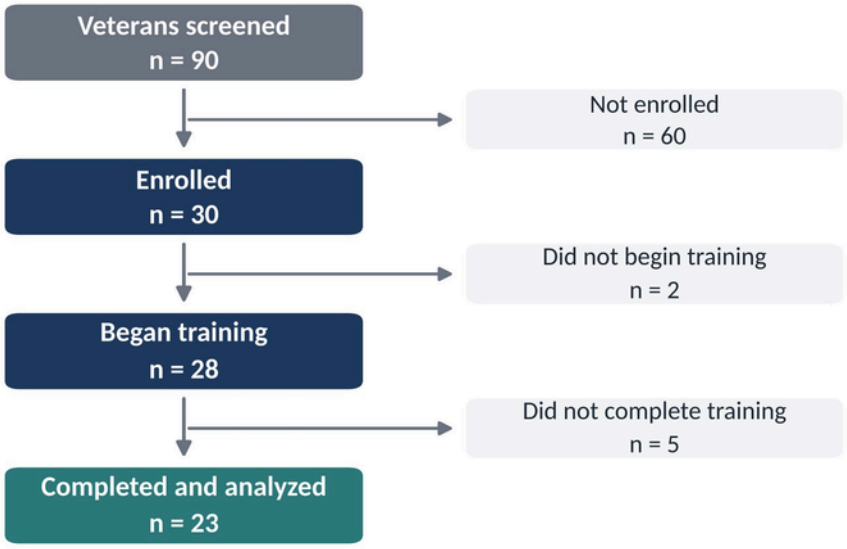


Figure 1. Participant flow from screening to analysis. Data from Conroy et al.

The 23 veterans who completed the program reflected the real complexity of older veterans' care. Among them, 91 percent were men, 65 percent had ten or more diagnosed conditions, 70 percent had reduced sensation in their legs, 83 percent showed cognitive deficits on a standard screen, 83 percent had arthritis, and 35 percent had peripheral neuropathy (Conroy et al.).

Just over half (52 percent) used a walking device, 39 percent lived alone, 52 percent reported a fall in the six months before enrolling, and 87 percent reported a fear or concern about falling

at baseline. Average baseline scores on the Mini-BESTest and the Activities-specific Balance Confidence Scale both fell in the range that indicates fall risk, which gave the training clear room to make a difference (Conroy et al.).

2.3 Intervention

Each veteran walked on a treadmill while a camera tracked markers on their shoes and projected an avatar of their feet onto a screen showing a virtual city street or park. Virtual hurdles asked them to lift their feet higher and virtual puddles asked them to take longer steps, while the program layered in thinking tasks such as remembering items, choosing which way to turn, and staying focused through passing cars, pedestrians, and fog (Conroy et al.).

The challenge grew as each veteran improved. The program offered 15 difficulty levels, moving a participant up after more than 80 percent success over obstacles and adjusting the level to keep each session within reach. Treadmill speed started at 80 percent of each veteran's comfortable pace for the first three visits and climbed to 40 percent above that pace by the final session, while handrail support was reduced from two hands to one and then to none when possible (Conroy et al.).

Feedback came from both the system and a person. The screen gave immediate visual and audio feedback on step length, gait symmetry, and obstacle clearance, along with a score after each walking bout, and a supervising trainer added verbal cues on step timing and gait quality during the first two weeks before tapering them off as veterans gained independence. Sessions were one-on-one in the first week and then paired each veteran with one other participant, with two walking bouts per session that grew from 10 to 18 minutes in a safety harness that did not support body weight (Conroy et al.).

2.4 Outcome Measures

The same experienced assessor completed every measure before and after training, and the authors compared each veteran's scores using a one-sample Wilcoxon test with a significance level of .05 (Conroy et al.).

Table 2. Outcome measures reported in this paper

Domain	Measures
Balance	Mini Balance Evaluation Systems Test (Mini-BESTest), Four Square Step Test
Mobility	Timed Up and Go dual task (walking while counting backward by threes)
Balance confidence	Activities-specific Balance Confidence (ABC) Scale
Feasibility	Retention, session attendance, perceived exertion, and a satisfaction survey

3. Key Findings

Veterans finished the program with significantly better balance and balance confidence, showed improving trends in stepping and dual-task mobility, and rated the training highly (Conroy et al.).

Table 3. Key outcomes after 14 sessions (n = 23)

Outcome	What it measures	Result
Mini-BESTest (0 to 28 points)	Anticipatory, reactive, and dynamic balance	Rose from 20.91 to 23.13; significant (p = .01)
ABC Scale (%)	Confidence doing daily activities without losing balance	Rose from 65.18 to 73.04 percent; significant (p = .02)
Four Square Step Test	Quick stepping and changes of direction	Averaged 13.06 seconds, below the 15-second fall-risk threshold; improving trend (p = .06)
Timed Up and Go, dual task	Standing, walking, and turning while counting backward	About 2.71 seconds faster on average; improving trend (p = .08)

3.1 Balance and Balance Confidence

The balance gainsshowed up where the training focused. The largest Mini-BESTest improvement came in dynamic gait, and the number of veterans scoring above the test's 23-point fall-risk threshold rose from 9 (39 percent) before training to 16 (69.6 percent) afterward. Six veterans improved by four points or more, the test's minimal clinically important difference, and four of those six had reduced sensation in their legs at the start (Conroy et al.).

Confidence moved in the same direction. The group's average balance confidence score climbed above the scale's 67 percent fall-risk threshold, and four veterans gained more than 18 percent, the scale's minimal clinically important difference (Conroy et al.).

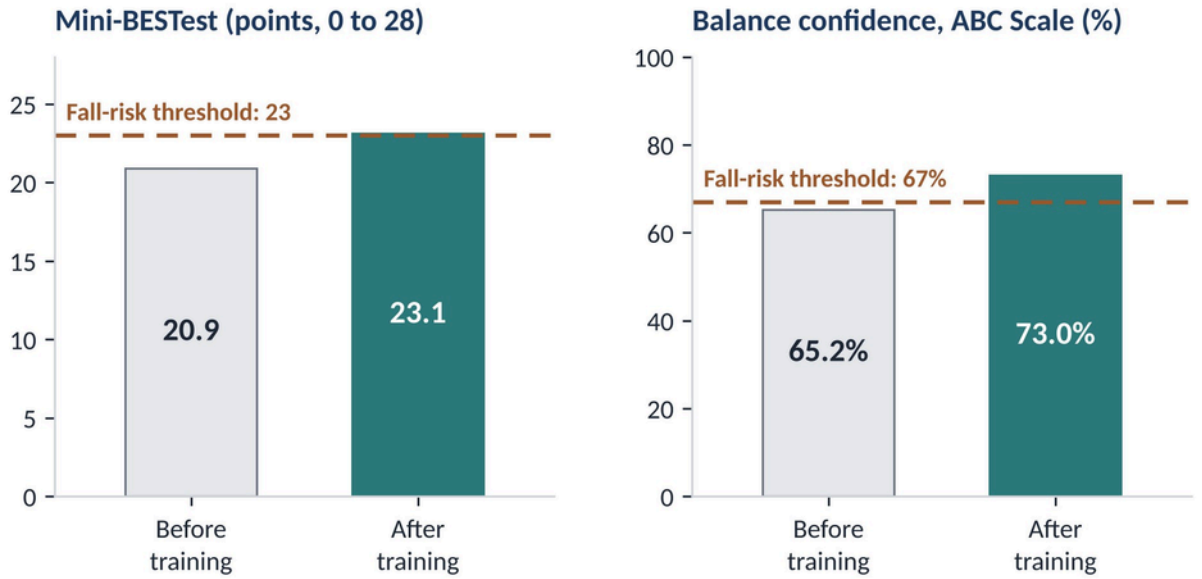


Figure 2. Average Mini-BESTest and ABC Scale scores before and after 14 sessions (n = 23). Dashed lines mark the fall-risk thresholds the authors applied: Mini-BESTest scores below 23 points and ABC scores at or below 67 percent indicate fall risk. Data from Conroy et al.

3.2 Stepping and Dual-Task Mobility

Stepping and dual-task mobility moved in the same positive direction. Four Square Step Test times trended toward improvement ($p = .06$), with an average post-training time of 13.06 seconds that sits below the 15-second fall-risk threshold, and dual-task Timed Up and Go times dropped by an average of 2.71 seconds ($p = .08$), an encouraging sign for a group that must often walk and think at the same time (Conroy et al.).

3.3 Feasibility and Satisfaction

The program was practical and well liked. Of the 28 veterans who began training, 23 (82.1 percent) completed all 14 visits in an average of 7.7 weeks and attended 99.1 percent of their scheduled sessions (Conroy et al.).

Veterans trained at a moderate intensity, rating their effort at an average of 3.76 out of 10, and completed the program without serious adverse events. They gave the training a satisfaction score of 4.7 out of 5, and 94 percent said they would recommend it to a friend, rating that likelihood 9.8 out of 10 (Conroy et al.).

4. Implications for Therapists

The clearest message for therapists is that medically complex older veterans can take part in structured, simulation-based gait training, stay with it, and come away with measurable gains in balance and confidence (Conroy et al.).

Complex patients can participate. Earlier research on virtual reality treadmill training focused largely on people with Parkinson's disease, multiple sclerosis, or stroke. This study extended the approach to community-dwelling veterans living with arthritis, neuropathy, cognitive changes, and many other conditions, and they sustained a moderate training intensity throughout the program (Conroy et al.).

Practice that mirrors daily life targets real risks. The authors found that falls in this population most often happen at home from trips, slips, and obstacles such as stairs and curbs, which supports step clearance and obstacle negotiation as fall-prevention targets. Those are the same skills the virtual hurdles and puddles were designed to train (Conroy et al.).

There is room to build on these results. The authors see potential in higher-intensity or longer programs for this group, pointing to earlier work in Parkinson's disease in which 12 weeks of virtual reality treadmill training produced a greater reduction in falls than 6 weeks (Conroy et al.).

Confidence and performance are both worth measuring. Veterans gained in measured balance and in their own sense of steadiness, and the authors tracked each with its own validated tool. That approach is a useful model for clinics that want to capture both how patients perform and how they feel (Conroy et al.).

5. From Research to Practice

The study points to fouringredients that therapist-led tools can bring into everyday care: an individualized starting point, progression matched to performance, a clinician who coaches in the moment, and outcomes tracked with established measures. The Smart Therapy Complete Solution from Neuromersive was designed around those same ideas through its Plan, Deliver, Measure, Document workflow.

During a Smart Therapy session, the patient wears a Pico Neo 3 Pro headset while the therapist uses a tablet to see what the patient sees and adjust exercise settings as the session unfolds. Each step of the workflow below was designed to reflect principles this research supports.

Plan. Before any training began, each veteran in the study completed a physical exam, a cognitive screen, strength and sensation testing, and a trial walk, and treadmill speed was set from each person's own comfortable pace (Conroy et al.). The plan step is meant to support that kind of individualized start, with the therapist choosing exercises and starting settings based on the patient's evaluation.

Deliver. The study paired structured progression with a trainer who cued step timing and gait quality and then faded those cues over time (Conroy et al.). Smart Therapy keeps that judgment with the therapist, whose live tablet view is designed to help them raise or lower the challenge during a session, keep each activity challenging but achievable, and watch how the patient is responding in real time.

Measure. The researchers relied on established tools such as the Mini-BESTest and the Activities-specific Balance Confidence Scale to capture progress (Conroy et al.). The measure step is intended to give therapists session information they can review alongside those standard assessments when deciding whether a patient is ready to progress.

Document. Older veterans with many health conditions often see several clinicians over months of care, and this study alone followed participants for months after training ended (Conroy et al.). The platform is HIPAA compliant and registered with the FDA as a Class II exempt medical device, and any tablet in a clinic can control any headset assigned to that clinic,

adesign choice meant to support continuity of care when schedules and staff change.

6. Conclusion

Conroy and colleagues add a valuable piece of evidence to a question that matters for veterans' care, namely whether medically complex older veterans can engage in structured, simulation-based balance practice. In this pilot the answer was yes, as participants finished the program with better balance scores, greater balance confidence, and high satisfaction, and the authors see potential for higher-intensity or longer programs to further address fall risk in this group (Conroy et al.).

The veterans in Baltimore improved during a program that met them where they were, raised the challenge as they progressed, and paired technology with a person who coached them through it. The Smart Therapy Complete Solution was built to make that kind of therapist-guided practice workable in everyday clinics, and Neuromersive welcomes conversations with clinicians and researchers who want to expand the evidence for veterans and older adults.

Works Cited

Conroy,SusanS., etal.“Feasibility and Preliminary Effects of Non-Immersive Virtual Reality Motor-Cognitive Treadmill Training in Older Veterans: A Single-Arm Pilot Study.” *BMC Geriatrics*, vol. 26, 2026, article 193, https://doi.org/10.1186/s12877-025-06914-5.

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