Making Every Mile Count in Rural Rehabilitation

The research on therapy dose, and how immersive therapy fits more meaningful practice into every rural visit

National Rural Health Day falls on November 19 this year, and it is a chance to recognize the therapists who keep rural communities moving. Our companion blog, *How to Give Rural Therapists the Powerful Support They Deserve*, covers the access gap itself, from therapist shortages to long drives and increasingly complex caseloads.

This paper picks up where the blog leaves off with a narrower question: once a patient has made the trip, how much recovery-building practice happens during the visit, and how can each session deliver more? To answer it, we draw on two decades of research on therapy dose and on newer evidence about immersive therapy.

32

Average task-specific arm repetitions per session observed in typical stroke therapy

322

Average repetitions per one-hour outpatient session in a high-repetition protocol

73%

Stroke patients cleared to resume driving after simulator training, compared with 42% of controls

Recovery Runs on Repetition

Rehabilitation science has long held that the brain relearns movement through practice. A large volume of specific practice is thought to be needed to drive the changes that underlie recovery (Lohse et al.). A 2014 meta-analysis in *Stroke* put that idea to the test across randomized trials. Groups that received more therapy improved more than groups that received less, and the amount of therapy time predicted improvement even after accounting for time since stroke (Lohse et al.).

The same authors noted that scheduled minutes are an imperfect measure of dose. They recommended tracking active practice time or the number of repetitions a patient completes instead (Lohse et al.). Two patients can spend the same hour in a clinic and leave with very different amounts of practice.

What a Typical Session Delivers

Researchers once observed 312 physical and occupational therapy sessions for people with stroke across seven rehabilitation sites. Task-specific arm practice happened in only 51 percent of the sessions that addressed the arm, and those sessions averaged just 32 repetitions (Lang et al.). In animal models of stroke recovery, lasting change comes from

hundreds of repetitions a day. The authors concluded that typical doses may be too low to fully support recovery.

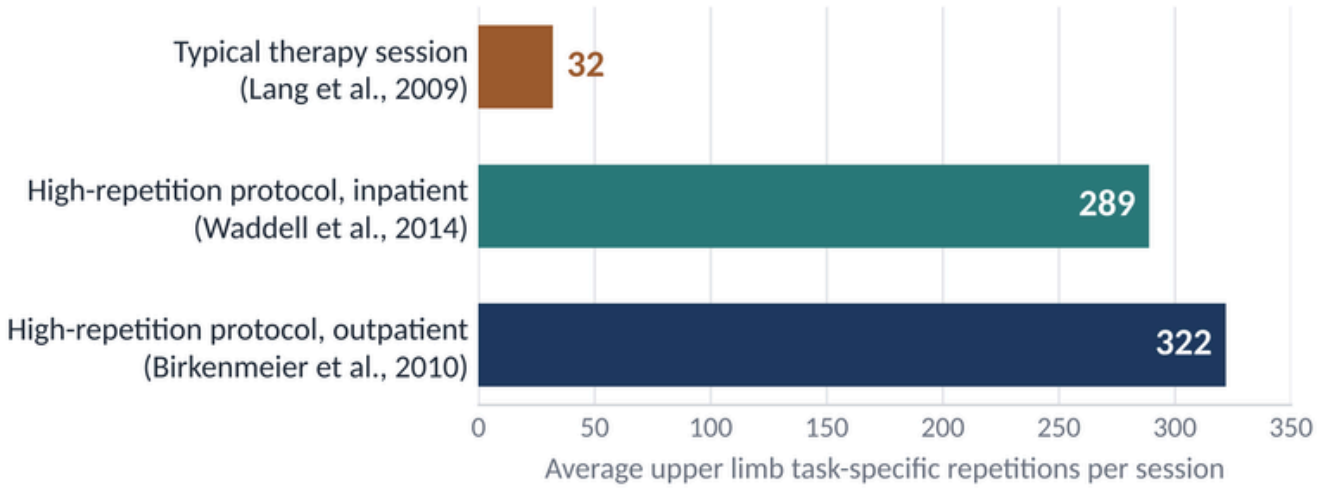


Figure 1. Average upper limb task-specific repetitions per therapy session in typical care compared with two high-repetition protocols delivered in one-hour sessions.

The encouraging news is that this gap can be closed within an ordinary appointment. In a proof-of-concept study, people with chronic stroke averaged 322 arm repetitions per one-hour outpatient session, three times a week for six weeks, and their scores on measures of everyday activity and participation improved (Birkenmeier et al.). A follow-up study in an inpatient rehabilitation setting found similar results. Patients averaged 289 repetitions per one-hour session, spent 47 of those 60 minutes in active training, and improved on both impairment and activity measures (Waddell et al.).

This matters for rural patients because adding visits is often hard when each trip means a long drive. Both high-repetition studies reached their doses within the one-hour session that clinics already schedule, so the content of each visit is the most practical place to add practice.

What Immersive Therapy Adds

Immersive therapy is one way to increase the amount of practice while keeping patients engaged, and the broader research on virtual reality training supports it. A 2025 meta-analysis in the *Journal of Medical Internet Research* pooled 15 studies with 1,243 stroke patients. It found that virtual reality-based training produced significantly greater gains than conventional therapy in arm function and in independence with daily activities (Xu et al.). The authors linked the strongest effects to programs with more than 15 hours of training, delivered in roughly hour-long sessions over four to six weeks. They also noted that most programs shared two design features: individualized goals and quantified activity, such as repetition counts.

Smaller studies show how this plays out within individual therapy sessions. In a pilot study of ten outpatients with chronic stroke, an embodied virtual reality system delivered a median of 4,713 movements across ten sessions. Training intensity rose from 13.2 to 17.3 movements per minute as the program went on, and participants reported very low levels of pain, stress, and fatigue (Perez-Marcos et al.).

Practice for the Tasks Rural Life Demands

Research suggests that task-specific practice may be one of the best ways to promote recovery after stroke (Birkenmeier et al.). That makes the most valuable repetitions the ones that resemble the life a patient is going home to, and the Smart Therapy Complete Solution was designed with that idea in mind. The patient wears a Pico Neo 3 Pro headset while the therapist watches the same view on a tablet and adjusts difficulty in real time. Sessions follow the system's Plan, Deliver, Measure, Document workflow, so each activity produces both meaningful practice and a record of what the patient did.

Driving on Rural Roads

For many rural patients, driving again is closely tied to independence, since the clinic, the pharmacy, and the grocery store may all be miles from home. Rural roads also demand more of a driver than city streets do. In 2024, rural areas were home to an estimated 21 percent of the U.S. population and 31 percent of vehicle miles traveled, but they accounted for 41 percent of traffic deaths. The fatality rate per mile driven was 1.5 times higher than in urban areas (National Highway Traffic Safety Administration). Wildlife adds another hazard, with an estimated one to two million collisions between vehicles and large animals each year. Deer are involved in most of these crashes, and 89 percent of them happen on two-lane roads (Federal Highway Administration).

Driving simulators also have a track record in stroke rehabilitation research. In a randomized trial, 83 people with a first stroke received 15 hours of training over five weeks, either on a driving simulator or through driving-related cognitive tasks. At the official fitness-to-drive assessment six to nine months after stroke, 73 percent of the simulator group who were assessed passed and could legally drive again, compared with 42 percent of the control group (Akinwuntan et al.).

The Smart Therapy’s activity, Driving Simulator brings, this kind of practice into the headset, using hazards that rural drivers actually face. A car may appear ahead, or a deer may step onto the road, and the patient has to spot the hazard and stop in time. Because the therapist runs the activity from the tablet, the patient can practice scanning, reaction time, and safe stopping many times in one visit without the risks of an on-road lesson. This practice is meant to complement a formal driving evaluation, not replace it.

Everyday Tasks at Home and in Town

Everyday tasks get the same treatment, starting with the grocery store simulation. Patients scan the shelves, reach beyond their base of support, and stay focused until the

task is done. Each trip through the store works on the visual scanning, balance, and endurance that real shopping requires.

Life Simulator is a suite of everyday scenarios where patients practice household tasks such as laundry while working on balance, which helps them prepare to return home. Balance and coordination activities and a baseball catching game round out the library, giving therapists more ways to work on reaching, timing, and stability through tasks patients enjoy repeating. Because performance is measured as the patient works, the therapist gets objective information about what each visit delivered. That moves rural clinics closer to the active-practice measures of dose that Lohse and colleagues recommended.

Every Visit Counts

National Rural Health Day honors the therapists who make recovery possible far from large medical centers. A clinic cannot shorten the drive its patients make, but it can change how much practice happens once they arrive. The research on dose suggests that is where much of recovery is built.

About Neuromersive

Neuromersive develops the Smart Therapy Complete Solution, an immersive therapy platform for physical, occupational, and neurologic rehabilitation that pairs a patient headset with a therapist-controlled tablet. The system is registered with the FDA as a Class II exempt medical device and is HIPAA compliant.

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