Case Study: Restoring Mobility After Injury, How Aspire Motion Supported Progressive Recovery in an Elderly Patient

Subject Profile:

Age: 74
Gender: Female
Health Status: Generally healthy and fit

Injury and Treatment History:

A 74-year-old female in good overall health, sustained a traumatic injury to her right ankle when she walked into a ground-level sprinkler hole. The injury resulted in a clean break of both the tibia and fibula bones. No surgery was required as there was no lateral displacement of the bones. Following the injury, the patient was placed in a cast that extended up to her knee for 8 weeks.

Mobility and Sedentary Phase

During the post-injury recovery phase, the patient relied on a wheelchair for mobility. The use of crutches was not feasible due to instability and intense pain caused by vibrations at the injury site. This prolonged period of immobility (8 weeks) significantly impacted her independence and daily activities. The sudden loss of daily activity contributed to muscle deconditioning and reduced confidence in her mobility.

Rehabilitation and Recovery

Eight weeks after the injury, the patient began a cautious rehabilitation program aimed at regaining mobility, improving gait, and rebuilding strength. Due to persistent pain and apprehension about weight-bearing activities, the patient delayed using the affected limb for an additional three weeks.

Once she transitioned to walking without aid, the patient continued with a structured rehabilitation program supported by Aspire Motion. The program included twice-weekly assessments over 10 weeks to monitor her progress through dynamic and static movement tests including:

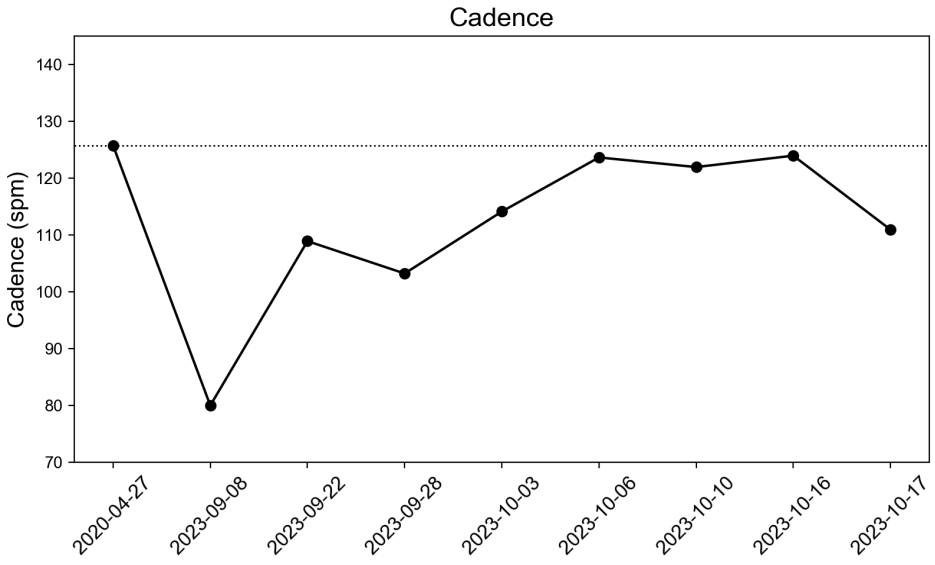
- 10-meter x 2 walk
- 30-second feet together eyes open balance
- 30-second feet together eyes closed balance
- 5x sit-to-stand

The assessments revealed steady, gradual improvements over time. The objective gait metrics provided particularly valuable insights into her progress. Key gait parameters included: cadence, step time, landing force, single support time, and oscillatory energy ratios.

Data from April 2020 (pre-injury) served as a reference point for her rehabilitation progress.

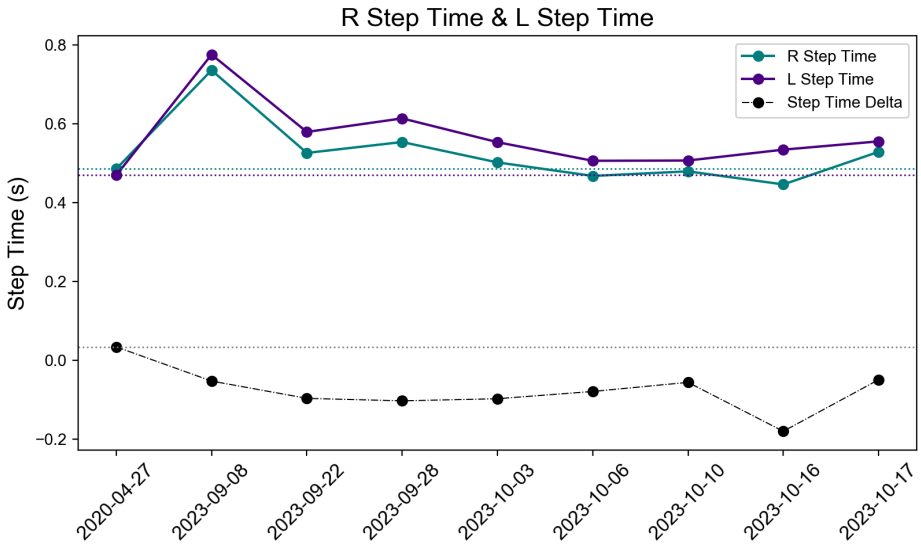
Cadence

The post-injury cadence baseline was established on September 9, 2023, two weeks after the patient started walking unaided. A significant drop was observed compared to her pre-injury cadence. Over the next few weeks, cadence values steadily approached pre-injury levels, indicating improved confidence and mobility.



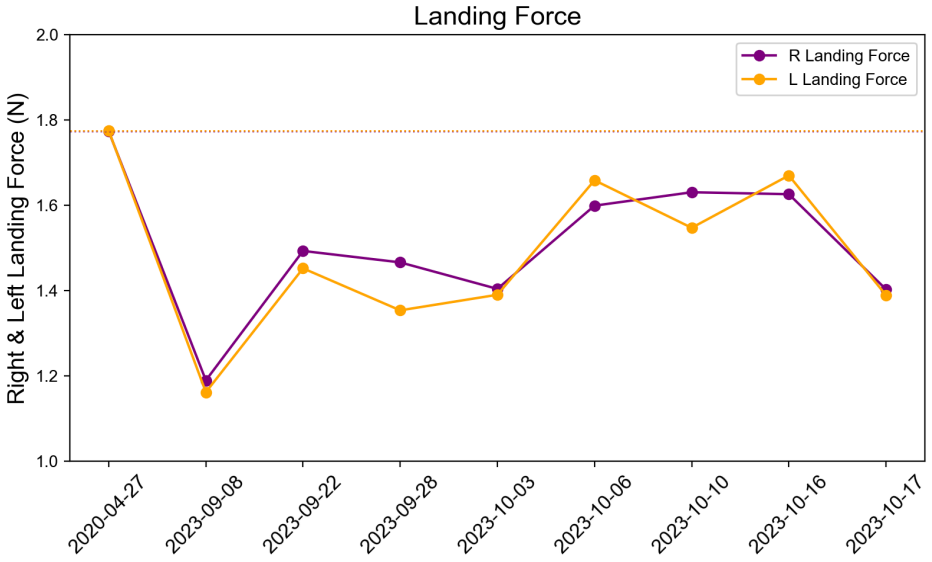
Step Time Comparison

Step time assessments from September 2023 onward showed an initial asymmetry in her gait pattern, with gradual realignment towards her pre-injury baseline by the end of the 10-week program.



Landing Force

The patient's baseline landing force prior to the injury was approximately 1.8 times her body weight. Early post-injury assessments revealed a significant reduction in landing force, correlating with her reported pain and tendency to walk cautiously or "gingerly." Weekly improvements in landing force reflected her increasing strength and comfort with weight-bearing on the injured limb.

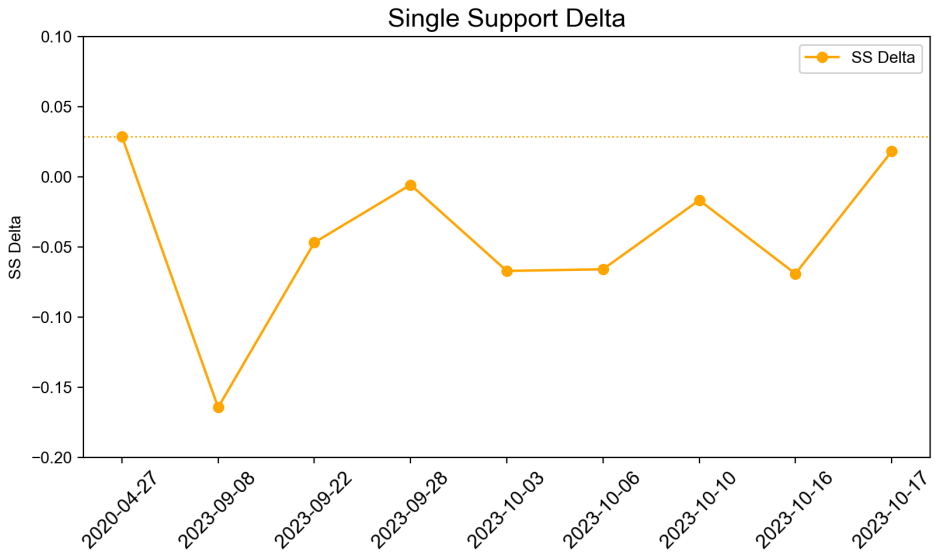


Single Support Delta

Single support time is the duration of weight-bearing on each leg. Single Support (SS) Delta is calculated as:

$$\text{Single Support (SS) Delta} = \frac{\text{Right SS Time} - \text{Left SS Time}}{\text{Average SS Time}}$$

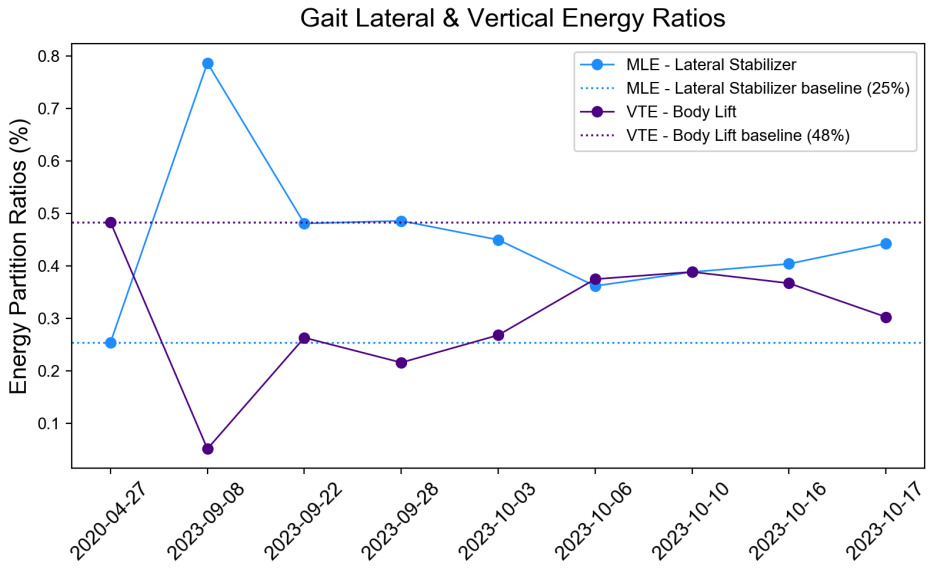
The patient's single support delta revealed an initial imbalance with her left leg heavily favored. Before the injury, the patient displayed a slight preference for her right leg (delta > 0). Post-injury, her walking pattern shifted to favor her left leg (delta = -0.18). As rehabilitation progressed, the delta value moved closer to 0, reflecting a return to symmetrical gait.



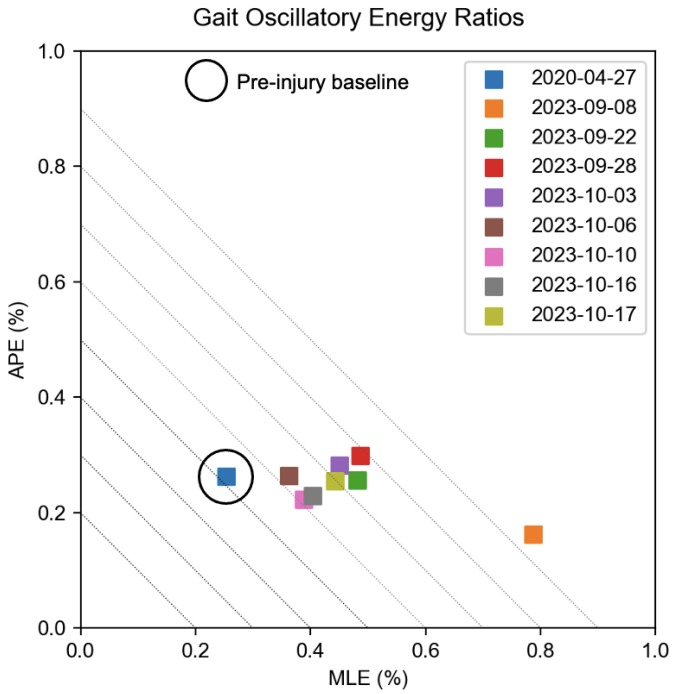
Oscillatory Energy

The oscillatory energy ratios MLE and VTE provide insights into how a person's movement energy is distributed while they walk. MLE (Medio-Lateral Energy) represents the hip and pelvic stabilizer muscles. High MLE indicates walking with a wide base of support, which may be a compensation for balance issues or instability. It can also be a sign of a hip drop, often caused by weakness in the gluteus muscles. VTE (Vertical Energy) measures the natural up-and-down movement of the body as you walk. A healthy gait requires good balance, coordination and strength. With each step, the body is propelled forward and upward to create a smooth, efficient movement. The upward motion is important for ensuring toe clearance and allowing the opposite leg to swing forward without dragging or catching on the ground.

The patient's pre-injury baseline pelvic/hip stabilizer and body lift ratios indicate she had a stable, strong gait. After the injury, her body lift dropped below 10%, suggesting a shuffling gait and tentative steps. Throughout her rehabilitation, her body lift gradually increased while the lateral movement decreased, demonstrating improved stability and a return to her pre-injury gait. These oscillatory energy parameters closely correlate with the other gait metrics in demonstrating improvements in the patient's recovery progress.



The plot below illustrates the oscillatory energy distribution across all three directions: medio-lateral (ML) on the x-axis, anterior-posterior (AP) on the y-axis, and vertical (VT) along the dotted diagonal lines. The AP energy remains relatively constant at around 30% for most data points, except on September 8, 2023, the patient's first rehabilitation assessment. This consistency in AP energy suggests stable trunk control throughout, with no significant forward or backward bending. The most notable changes were observed in the lateral (ML) and vertical (VT) directions, reflecting the primary areas of improvement in her gait stability.



Conclusion

This case study highlights the pivotal role Aspire Motion played in the rehabilitation process of an elderly patient recovering from a severe ankle injury. By providing objective, real-time feedback on functional movements, Aspire Motion enabled precise monitoring of her recovery journey. The observed improvements in cadence, step symmetry, landing force, and sit-to-stand performance underscore the value of structured rehabilitation programs in restoring mobility and independence for elderly patients.