

iPhone Gait Metrics Benchmark Functional Recovery After Ankle Fracture

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Purpose: Quantifying recovery after injury is limited by the absence of pre-injury functional data. iPhone mobility metrics provide a novel opportunity to objectively compare pre-injury and post-injury gait patterns, offering individualized baselines for functional recovery. This study leverages passively collected iPhone gait data to track changes in mobility following ankle fracture, allowing for precise measurement of deficits and improvements over time.

Methods: In total, 91 patients with ankle fracture were enrolled and monitored for 6 months following treatment. A custom iPhone application was developed to passively collect gait metrics, capturing data from 30 days prior to injury through 6 months post-treatment. Each metric was analyzed as a percentage of the patient's pre-injury baseline at 6-week, 3-month, and 6-month time points, with 100% indicating full recovery. Mean gait metrics assessed included step count (n = 47), walking distance (n = 46), walking speed (n = 45), step length (n = 45), double support percentage (n = 45), and walking asymmetry (n = 40).

Results: All gait metrics declined at 6 weeks post-injury and improved over time. Step count and walking-distance fell to less than 60% at 6 weeks, but recovered to near 90% by 6 months. Walking asymmetry peaked at 650% at 6 weeks, improving to 132% by 6 months but remaining above baseline. Walking speed and step length recovered from 82% and 91% at 6 weeks to 97% and 97% by 6 months. Double support percentage remained elevated (105% at 6 weeks), improving slightly to 102% at 6 months, indicating persistent gait alterations.

Conclusion: iPhone gait metrics captured the initial decline and gradual recovery following ankle fracture. Although most improved over 6 months, asymmetry and gait stability remained impaired, indicating incomplete recovery and potential long-term functional limitations. These findings support iPhone gait monitoring as a tool for tracking recovery, identifying subtle deficits, and guiding rehabilitation strategies to optimize patient outcomes.

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