**Step Width Haptic Feedback for Gait Stability in Spinocerebellar Ataxia:
Preliminary Results**

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**Objectives and relevance:**

To examine the possibility of using wearable step width haptic-biofeedback to enhance gait stability and reduce fall-risk in individuals with SCA. Wider step width and lower step-to-step variability are linked to improved gait stability and reduced fall risk. It is unclear if patients with spinocerebellar ataxia (SCA) can learn to adjust these aspects of gait to reduce fall-risk.

**Methods:**

Thirteen people with SCA3 performed step width training (single-session) using real-time haptic based feedback using sensing inertial measurement units (IMUs). When step width values exceeded the maximum threshold, haptic feedback was provided to prompt a narrower step, whereas values below the minimum threshold prompted feedback for a wider step.

**Results:**

Step width increased post-training (19.3cm, interquartile range IQR 16.3-20.2cm) and at retention (16.6cm, IQR 16.2-21.1cm), compared to baseline (11.0cm, IQR 5.2-15.2cm; *p*<0.001). Step width variability decreased during post-training (19.7%, IQR 17.4-26.2%) and at retention (22.3%, IQR

18.6-30.2%), compared to baseline (44.5%, IQR 28.5-71.2%; *p*<0.001). Crossover steps, another mark of instability, decreased after training (*p*<0.031).

**Conclusions:**

These pilot results suggest that patients with SCA can use a novel, wearable biofeedback system to improve their gait stability. Our findings demonstrate the potential of using portable and readily accessible rehabilitative interventions for individuals with ataxia within clinical settings and everyday environments, based on routine training to ensure long term retention, reduce fall risk and improve gait stability. The present study and its novel findings set that stage for a large-scale randomized controlled trial.