

## Effects of Focal Vibration on Gait in Individuals with Diabetic Peripheral Neuropathy

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**Background:** Approximately 70% of individuals with diabetes develop diabetic peripheral neuropathy (DPN). DPN causes loss of feeling in the legs, toes, arms, and hands, and decreased proprioception, leading to alterations in gait, i.e. spatiotemporal, kinematic, and kinetic parameters, thereby decreasing functional ability in patients with DPN and causing other health risks, e.g., increased falls or risk of falls. Multiple approaches have been proposed for the treatment of DPN related gait impairment, yet there is no consensus. Focal vibration (FV) therapy has shown great improvement in gait performance for other conditions such as Stoke and Spinal Cord Injuries.

**Purpose:** The purpose of this study was to investigate FV as an intervention to improve gait performance in individuals with DPN.

**Methods:** We piloted a single group pre-post study. Consenting participants with type 2 diabetes with DPN who can walk were instructed to apply two modified Myovolt wearable FV devices to the three muscles most relevant for gait on each leg for 10 minutes per muscle daily for 3 days/week over 4 weeks. Timed-Up-and-Go (TUG) and TUG Cognitive tests were conducted at baseline to further investigate whether individuals with DPN that were at a fall risk would further benefit from the FV therapy. Spatial-temporal, kinematic, and kinetic data were collected at baseline and the end of the 4-week at the Center for Human Performance Measurement with Qualysis™ motion capture system and AMTI™ force plates. Each participant underwent 5 trials at a self-selected speed at each visit. Data were analyzed using Visual3D© and Excel™. Descriptive statistics and paired-tests were used for data analysis.

**Results:** 13 patients with DPN, 4 males and 9 females, aged  $65.7 \pm 8.4$  years have completed the study so far. Cycle time, right step length, left and right step time, and right swing time were found to be significantly improved ( $p < 0.05$ ), while stride length and double support were found to be slightly improved ( $p = 0.056$  and  $p = 0.064$ , respectively). No statistically significant improvements were observed for the kinematic and kinetic parameters. For the fall risk group ( $n = 5$ ), significant improvement was found for gait speed, left step time, left stance time, double support duration, right plantarflexion range, and right peak plantar flexor moment ( $p < 0.05$ ) and slight improvement in right step time ( $p = 0.075$ ).

**Discussion/Conclusion:** Despite observations in improvement in kinematics or kinetics of gait performance in only the fall risk group, participants with DPN demonstrated significant improvements in spatial-temporal measures of gait after 4-week of using FV. More data with larger samples will be needed to further confirm and understand the gait improvements.

**Relevance to Allied Health:** The findings of this project are important for all allied health professions to utilize FV therapy as an intervention for gait impairment in DPN. The implications for this project include the use of FV therapy to improve gait for other conditions, e.g., Parkinson's disease, multiple sclerosis, or lower limb amputation.