# Intensive Goal-Directed Treatments in Enriched Environments Augments Patient Outcomes Post-Stroke

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## OBJECTIVE

- **Previous research indicates that patients post-stroke take an inadequate amount of steps (400-800 steps per session)[1] and work at inadequate intensities (24-35% of HR Max)[2] to promote neuroplastic changes and maximize recovery[3,4,5,6].**
- **Research indicates that medically stable individuals can safely begin gait training earlier after a stroke and have better outcomes than individuals that start training later[7,8].**
- **The goal of this study was to examine feasibility and outcomes of high-intensity, high-dosage stepping practice for individuals after stroke in the inpatient rehabilitation setting.**

## METHODS

- **21 patients post sub-acute stroke (<6 months)**
- **Standardized outcomes assessed weekly:**
  - **6-Minute Walk Test (6MWT)**
  - **10-Meter Walk Test (10MWT)**
  - **Berg Balance Scale (BBS)**
  - **Postural Assessment Scale for Stroke (PASS)**
- **Steps were collected with step activity monitors, and intensity was monitored and collected with heart rate monitors and BORG Rate of Perceived Exertion Scale (RPE).**
- **Target intensity was defined as:**
  - **Heart rate values of 70-85% of HR Max and RPE values of 14-20.**
- **Each subject was scheduled for 1-2 hours of physical therapy per day.**

## Results of High-Intensity, High-Dosage Gait Training

Figure 1


Figure 2

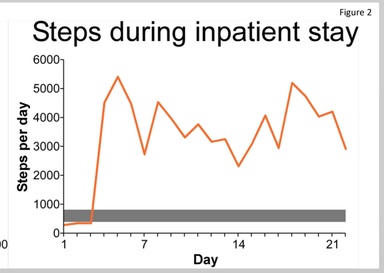


**Figure 1** – Actual recorded number of steps taken by an individual during one day of inpatient stroke rehabilitation. **Figure 2** - Actual recorded number of steps taken by an individual throughout duration of inpatient stroke rehabilitation. Gray bar indicates average steps taken by individuals in stroke programs across United States (400-800 steps per session).

Figure 3

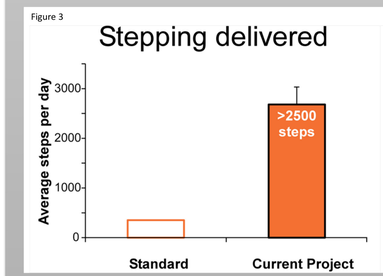


Figure 4

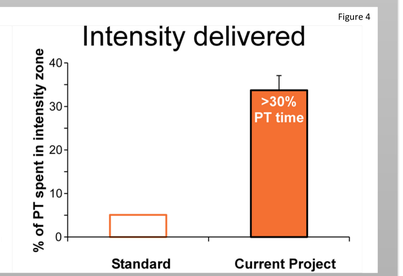


Figure 5


Figure 6


**Figure 3** - The stepping dosage of the current project versus the average number of steps taken by individuals in stroke programs across the United States. **Figure 4** - The intensity of training of the current project versus the intensity delivered to individuals in stroke programs across the United States. **Figure 5** - The changes in the 6-Minute Walk Test (6MWT) recorded during the current project compared to what is considered clinically significant. **Figure 6** - The changes in the Berg Balance Scale (BBS) recorded during the current project compared to what is considered clinically significant.

## Correlation of Outcomes and High-Intensity, High-Dosage Gait Training

Figure 7

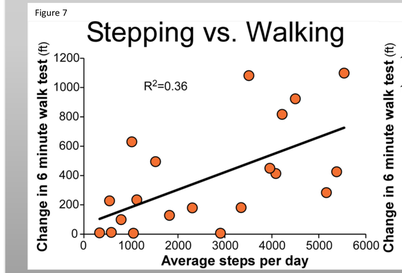


Figure 8

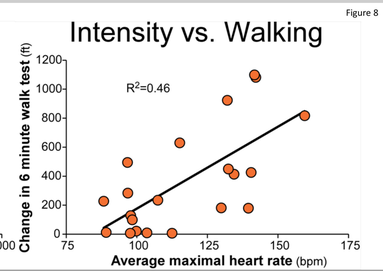


**Figure 7** – Correlation between actual stepping data taken from all individuals admitted for inpatient stroke rehabilitation and their change in 6-Minute Walk Test (6MWT). Individuals taking a greater number of steps tended to have greater improvements in their 6MWT. **Figure 8** – Correlation between actual recorded average maximal heart rate from training sessions and their change in 6MWT. Individuals working at a higher intensity, as measured by average maximal heart rate, tended to have greater improvements in their 6MWT.

## RESULTS AND CONCLUSIONS

- **Stepping data indicated that subjects received an average daily stepping dosage of 2000-8000 steps per day, well above previously reported values.**
- **During the 2-month collection period, subjects demonstrated ability to tolerate a high-intensity, high-dosage stepping gait training program within the intensities defined.**
- **Individuals within this program took >750% more steps and worked at the target intensity level (70-85% of HR max) >650% more frequently than currently seen in stroke inpatient units across the United States.**
- **Individuals within this program showed improvements in 6-Minute Walk Test and Berg Balance Scale results, of approximately 2x more than reported levels of significant clinical change.**
- **Analysis of collected stepping and intensity data showed a positive correlation of both increased stepping and intensity levels when compared with improvements in 6-Minute Walk Test.**

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