D.E. HUIZENGA, I. HANDZIC, R. EDGEWORTH, M. LAZINSKI, T. RAMAKRISHNAN, D. ROSE, S.H. KIM, K.B. REED. Gait enhancing mobile shoe. Gerontechnology 2018;17(Suppl):95s; https://doi.org/10.4017/gt.2018.17.s.093.00 **Purpose** The Gait Enhancing Mobile Shoe (GEMS) is designed to change interlimb coordination and strengthening the paretic leg of individuals with asymmetric walking patterns caused by stroke[1,2]. The underlying concept of the GEMS is similar to that of a split-belt treadmill[3], but allows the individual to walk over ground, which is hypothesized to help with long-term retention of the altered gait pattern[4]. In addition, the GEMS can be manufactured for a lower price and can, thus, be made available in more locations and could enable a home-based gait rehabilitation solution. The GEMS is completely passive and uses spiral-like (non-constant radius) wheels[5], which redirect the downward force generated during walking into a backward force that generates a consistent motion. Small unidirectional dampers on the front and back axels prevent uncontrolled motions. After the shoe stops moving backward, the user toes off, and springs attached to the axels reset the position of the wheels for the next step. The front of the GEMS is able to pivot to more naturally conform to the user's toe-off. **Method** The experiment is based on protocol NCT02185404 as listed on ClinicalTrials.gov. Before training, subjects' gait patterns are evaluated using a ProtoKinetics Zeno Walkway (ProtoKinetics, Havertown, PA). They then complete 4 weeks of training 3 times a week under the guidance of a physical therapist. Each of the 12 sessions includes 6 bouts of walking on the GEMS for approximately 5 minutes with breaks between bouts. Their gait is tested one week after training. All subjects agreed to participate in this study and signed a consent form that was approved by the Western Institutional Review Board. **Results & Discussion** Symmetry was calculated as $100 * \frac{abs(M_{paretic} - M_{non-paretic})}{0.5*(M_{paretic} + M_{non-paretic})}$ where M is one of the first three measures shown in *Table 1*, and a value of 0 indicates symmetry. Comparisons were made between gait evaluations conducted before training and after completion of training. An ANOVA was used to analyse all the steps in the pre- and post-tests. The results, summarized in *Table 1*, are compared to a split-belt treadmill (SBT) study that used the same number of training sessions[3]. The SBT had a slightly larger effect on step length (6 percentage points compared to 4 for the GEMS). However, the SBT had no effect on double limb support, and the GEMS changed it by 5 percentage points. Neither affected stance phase symmetry. The SBT targets only one specific gait parameter (step length), but the GEMS is able to benefit both step length and double limb support.

References

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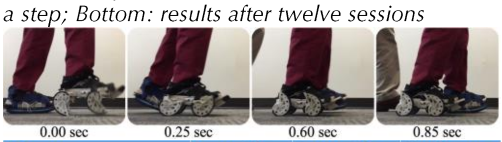
Table 1. Top: motion of the GEMS as a user takes a step; Bottom: results after twelve sessions



Measure	Pre-training	Post-training	Significance
Step Length Symmetry (lower is better)	**21.7%**	**17.9%**	**p = .0017**
Double Limb Support Phase Symmetry (lower is better)	**26.1%**	**21.8%**	**p = 0.016**
Stance Phase Symmetry (lower is better)	22.0%	22.3%	p > .05
Timed Up and Go (TUG) (lower is better)	**24.3** seconds	**22.1** seconds	**p = .0026**
Gait Velocity (higher is better)	**40.7** cm/sec.	**49.2** cm/sec.	**p < .001**
Cadence (higher is better)	**78.7** steps/min	**84.9** steps/min	**p < .001**