GAIT TRAINING WITH AUDITORY RHYTHMS AND INSTRUCTIONS IN CHRONIC STROKE

Matthew P. Ford and Laurie A. Malone*

University of Alabama at Birmingham, Birmingham, AL, USA
*** Lakeshore Foundation, Birmingham, AL, USA**

KEY WORDS: metronome, walking speed, gait analysis

INTRODUCTION: During walking in healthy adults, characteristic movement patterns between the upper and lower body relate directly to walking velocity. In persons who suffer a stroke, walking velocity decreases as motor deficits appear in both the arm and leg opposite the side of the stroke. Recent findings indicate that treadmill walking to a metronome beat impacts arm motion, however, the effect is dependent on the severity of motor deficits. The changes in arm motion lead to changes that are indicative of improvements in overall walking function. The purpose of this project is to determine the efficacy of over-ground gait training using an external auditory rhythm directed at arm movement versus leg movement on improving movement coordination, walking velocity, and daily physical activity in persons who have suffered a stroke.

METHODS: Data collection for this project is currently underway. To date, two volunteer participants have completed the study; a total of twenty (55-85 years of age) is desired. Procedures for data collection include: baseline gait analysis (Vicon Motion Analysis 460), daily step activity measure, 12 week walking program, post training gait analysis. A participant's walking is assessed: at a comfortable walking velocity, a comfortably fast velocity, stepping to, and moving the arms to the beat of increased metronome frequencies (1.0 to 2.0 Hz, in 0.2 increments). Participants are then randomly assigned to one of two over-ground walking training groups. Group 1 (n=1) trains with instruction to move their arms to the metronome beat and Group 2 (n=1) trains with instruction to move their legs to the metronome beat. Both groups train 3x/week, 20 min/session, for 12 weeks. Each participant trains at 25%, 50%, 75%, and 100% of their comfortably fast walking speed for 3 weeks at each level. Daily step activity is collected using a Stepwatch3™ Activity Monitor (SAM; Cyma Corporation) throughout the training period and 2 weeks pre and post training.

RESULTS: S1 had a baseline comfortable walking velocity of 0.63 m/s while S2 walked at 1.05 m/s. Each participant showed significant increases in arm swing, stride length, cadence, movement coordination, and walking velocity when walking at increasing metronome frequencies. However, with these two participants there appeared to be no differences between instruction sets in changing gait. No changes were found in walking velocity or movement coordination following the metronome training program. SAM data revealed that during the day participants were inactive [S1=82%, S2=85%]. A moderate level of step activity occurred for S1 and S2 only 8% and 5% of the time, respectively.

DISCUSSION: Data collection is ongoing. The present findings suggest that success of a gait training program is dependent on continued physical activity at home, as well as, training to an auditory rhythm set a rate that matches the comfortably fast walking velocity.

CONCLUSION: This project will contribute to the development of gait training programs that improve the walking velocity, daily physical activity and quality of life for persons who have suffered a stroke. Persons who live in either rural or urban environments, and are of lower socioeconomic status will benefit, as a metronome (i.e. external auditory rhythm) is a relatively inexpensive device, which can be used to facilitate walking with minimal resource.

Acknowledgement

We would like to thank the Hill Crest Foundation for their support of this project.