

Rhythmic Auditory Stimulation For Improved Gait in Parkinson's Disease

Margaret Sherron, SPT, Sarah Stevenson, SPT, Nina Browner, MD, Michael Lewek, PT, PhD
 University of North Carolina at Chapel Hill

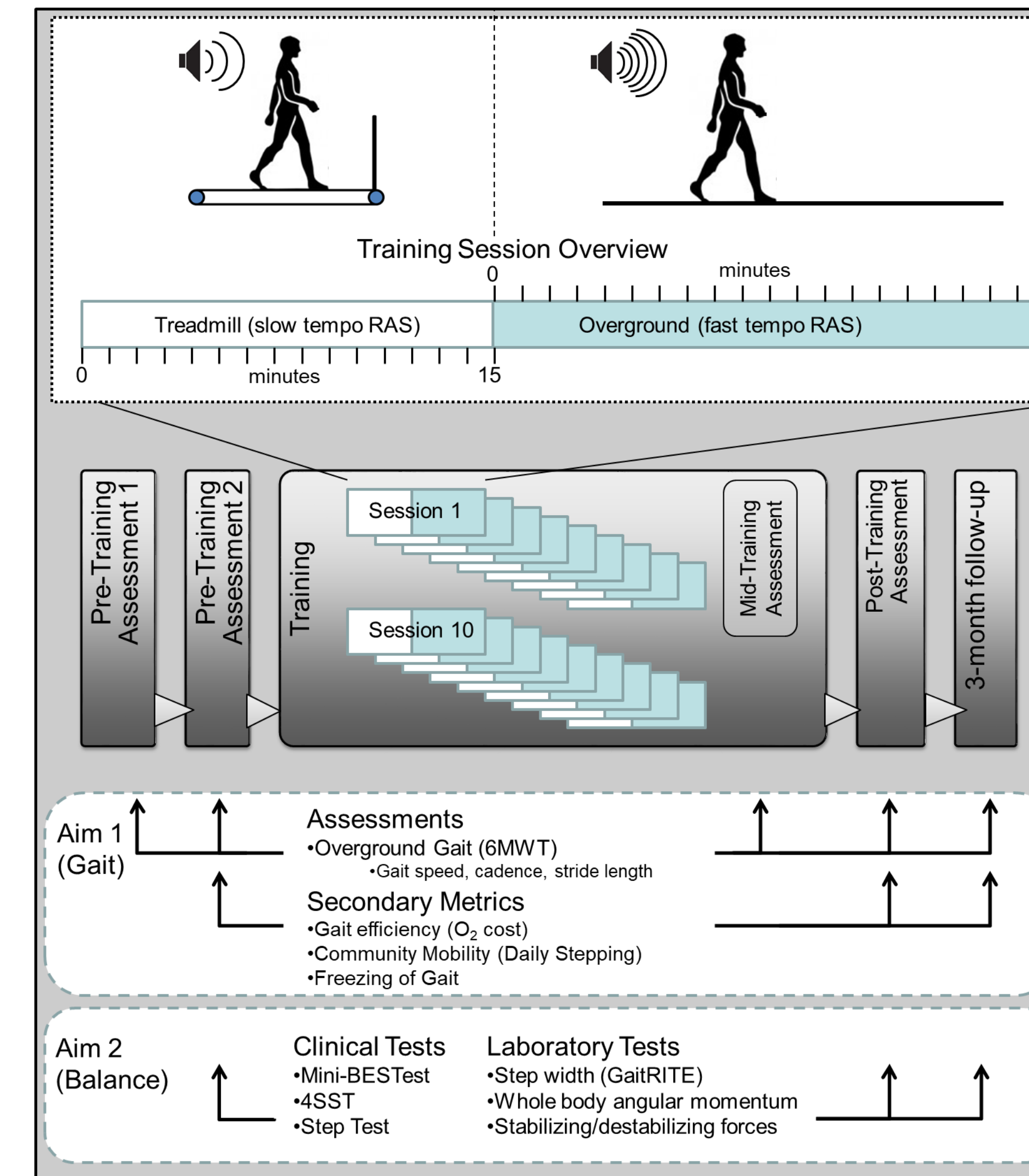
Introduction

- Individuals with Parkinson's disease demonstrate slow gait speed and shorter stride lengths^{1,2}
- Pharmacologic management can improve disease symptoms
 - is ineffective at improving gait deficits^{4,5}
- Impaired automaticity of gait contributes to episodes of freezing of gait and increased risk of falls³
- Intensive gait training is often utilized as an adjunct to pharmacologic management⁶
 - Cues for increased automaticity
 - Treadmill provides external cues that can improve gait automaticity⁸
 - Overground walking represents typical daily context
 - Rhythmic auditory stimulation (RAS) can improve gait speed, stride length and cadence²
 - Literature proposes faster frequencies (sources)
 - Would produce shorter strides on a treadmill
 - RAS also has the potential to improve static and dynamic balance⁸

Purpose

the purpose of this case series was to describe the use of a novel pairing of both big, slow movements (obtained with *slow* tempo RAS on a *treadmill*) followed by high-intensity rapid movements (obtained during *fast* tempo RAS during *overground walking*) during gait training for individuals with PD

Methods



Participants			
	Age	Gender	H&Y Stage
Participant 1	72	Male	2
Participant 2	66	Female	2
Participant 3	75	Female	2



- Training occurred ~3x/week for 6 weeks.
- Metronome frequency
 - Treadmill: 85% of participants self-selected cadence
 - Overground: 115% of participants self-selected cadence

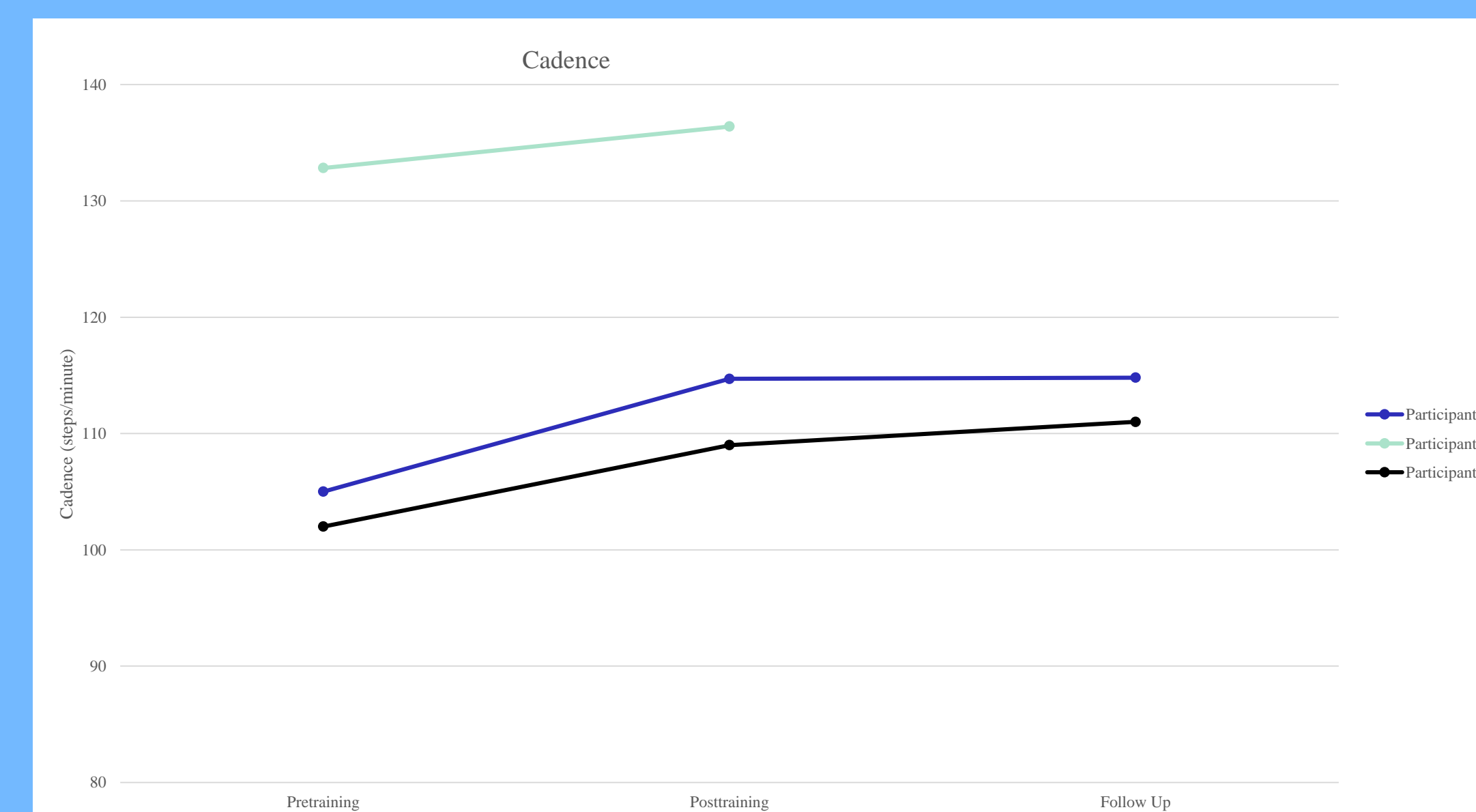
Discussion

- A combined treadmill and overground gait training program utilizing RAS is a feasible intervention for individuals with PD
 - Capable of improving both spatial and temporal gait parameters
 - RAS used on treadmill and overground led to large improvements in gait speed and stride length
 - Changes in cadence were observed with training but were not as large as other parameters
 - No substantial improvements in balance were observed
 - Further research is warranted

References

1. Thaut MH, McIntosh GC, Rice RR, Miller RA, Rathbun J, Brault JM. Rhythmic auditory stimulation in gait training for Parkinson's disease patients. *Mov. Disord.* 1996;11(2):193-200. doi:10.1002/mds.870110213.
2. Suteerawattananon M, Morris GS, Etnyre BR, Jankovic J, Protas EJ. Effects of visual and auditory cues on gait in individuals with Parkinson's disease. *J. Neurol. Sci.* 2004;219(1-2):63-69. doi:10.1016/j.jns.2003.12.007.
3. Harro CC, Shoemaker MJ, Frey OJ, et al. The effects of speed-dependent treadmill training and rhythmic auditory-cued overground walking on gait function and fall risk in individuals with idiopathic Parkinson's disease: a randomized controlled trial. *NeuroRehabilitation* 2014;34(3):557-572. doi:10.3233/NRE-141051.
4. Sethi K. Levodopa unresponsive symptoms in Parkinson disease. *Mov. Disord.* 2008;23 Suppl 3:S521-33. doi:10.1002/mds.22049.
5. Curtze C, Nutt JG, Carlson-Kuhta P, Mancini M, Horak FB. Levodopa Is a Double-Edged Sword for Balance and Gait in People With Parkinson's Disease. *Mov. Disord.* 2015;30(10):1361-1370. doi:10.1002/mds.26269.
6. Freedland RL, Festa C, Sealy M, et al. The effects of pulsed auditory stimulation on various gait measurements in persons with Parkinson's Disease. *NeuroRehabilitation* 2002;17(1):81-87.
7. Thumm PC, Maida I, Brozgol M, et al. Treadmill walking reduces pre-frontal activation in patients with Parkinson's disease. *Gait Posture* 2018;62:384-387. doi:10.1016/j.gaitpost.2018.03.041.
8. Harro CC, Shoemaker MJ, Frey O, et al. The effects of speed-dependent treadmill training and rhythmic auditory-cued overground walking on balance function, fall incidence, and quality of life in individuals with idiopathic Parkinson's disease: a randomized controlled trial. *NeuroRehabilitation* 2014;34(3):541-556. doi:10.3233/NRE-141048.

Results



Balance Measures

	Participant 1			Participant 2		Participant 3		
	Pretraining	Posttraining	Follow Up	Pretraining	Posttraining	Pretraining	Posttraining	Follow Up
Mini-BESTest	27	27	28	25	28	19	22	23
Step Test (reps)	25	38	37	41	52	30	28	24
4 Square Step Test	11.9	7.9	7.2	6.4	5.1	11.1	11.1	9.3
Freezing of Gait	7	4	4	3	2	10	10	9