

VIBRATION BASED FEEDBACK FOR GAIT TRAINING IN THOSE WITH CHRONIC ANKLE INSTABILITY

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BACKGROUND

- Lateral ankle sprains are the most common injury in sport¹ and 40% of cases progress into CAI².
- CAI is associated with proprioceptive impairments that lead to altered biomechanical gait patterns, including a laterally shifted COP³ and increased inversion throughout stance⁴.
- Traditional treatments do not alter gait biomechanics, thus, novel interventions such as external feedback are needed.
- Visual and auditory feedback cannot be deployed in the real world, but haptic feedback can. Thus external haptic feedback may be able to alter gait biomechanics in those with CAI.

OBJECTIVES

To determine if there is an association between a comprehensive set of baseline measures of proprioception and biomechanical changes during walking gait following a single haptic feedback gait retraining session in CAI subjects.

METHODS

Procedures:

- Subjects completed baseline proprioceptive tests and were fitted with the haptic feedback device and motion capture sensors.
- Participants then completed a 14-minute treadmill walking session which consisted of a pretest (no feedback), a training session (with feedback), and a posttest (no feedback).

Statistical Analysis:

- Spearman's bivariate correlations with an 0.05 alpha level were used to determine associations.

Demographics:

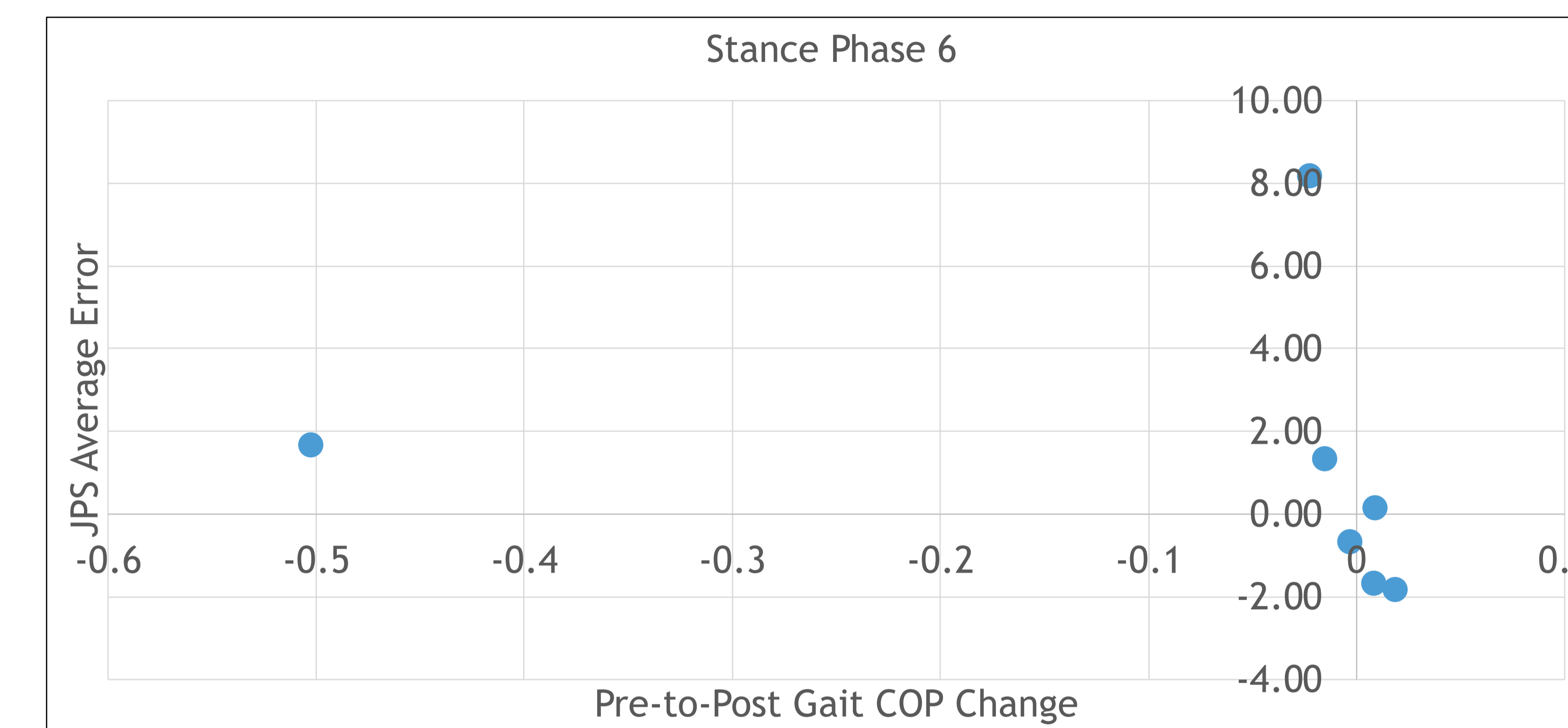
- 7 participants, age 23.28 ± 3.49 yrs, height 170.49 ± 10.02 cm, weight 73.26 ± 11.59 kg, number of ankle sprains 4.43 ± 2.32 .

ASSOCIATIONS

Proprioception Measures		Biomechanical Measures
Joint Position Sense (JPS) Error	VS.	Pre-to-Post Change in: Inversion Angle and Center of Pressure (COP) Change
Balance with eyes open: Side to side and front to back sway		
Balance with eyes closed: Side to side and front to back sway		
Cutaneous Threshold: 1 st metatarsal head		
Cutaneous Threshold: 5 th metatarsal head		

RESULTS

Average Error JPS and Pre-to-Post Gait COP Change			
Stance Phase	r _s	p	BCa 95% CI
1	-0.964	<0.01	[-1.0, -0.912]
2	-0.964	<0.01	[-1.0, -0.769]
3	-0.929	<0.01	[-1.0, -0.721]
4	-0.929	<0.01	[-1.0, -0.684]
5	-0.929	<0.01	[-1.0, -0.111]
6	-0.857	<0.05	[-1.0, -0.133]
7	-0.857	<0.05	[-1.0, 0.032]
8	-0.857	<0.05	[-1.0, 0.971]
9	-0.857	<0.05	[-1.0, 0.0]
Average Error JPS and Pre-to-Post Gait Inversion Angle Change			
7	0.893	<0.01	[-0.66, 1.0]
8	0.929	<0.01	[0.86, 1.0]
9	0.857	<0.05	[0.009, 1.0]



Exemplar figure of the significant associations identified.

DISCUSSION

- The significant correlations suggest that the haptic feedback intervention was less effective at shifting COP medially in those individuals with CAI who had poor JPS scores.
- The findings are suggestive that a healthier proprioceptive system is better able to process and use the haptic feedback delivered.
- Further research is needed to determine why JPS but not other measures of proprioception were associated with treatment success.

REFERENCES

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