

Effectiveness of Waist Vibrotactile Feedback for Improving Posture Balance

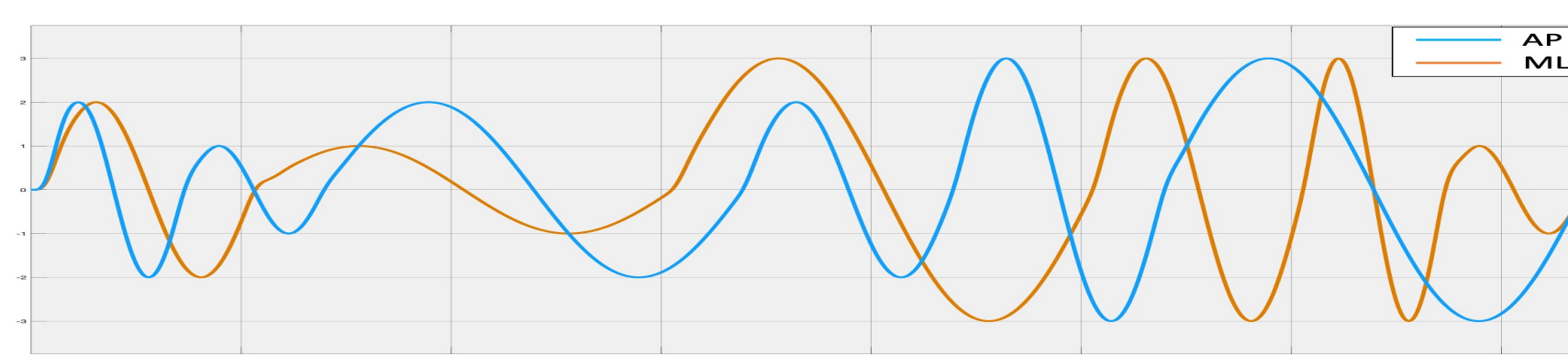
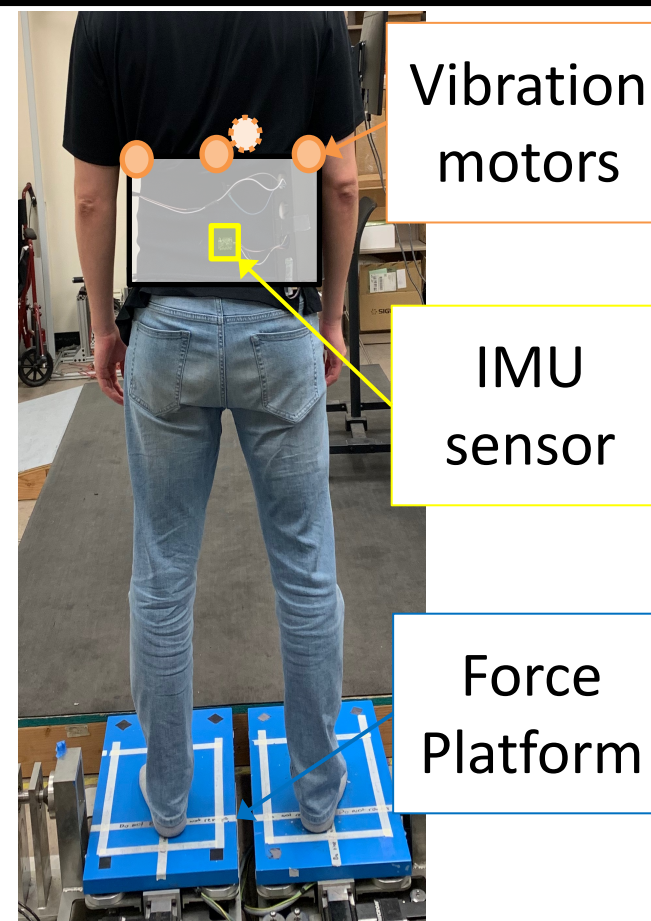
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Research Questions

- Does the waist vibrotactile feedback improve one's posture balance during standing on a challenging platform?
- Is the waste vibrotactile feedback still effective even under the fatigue condition?

Experimental Setup

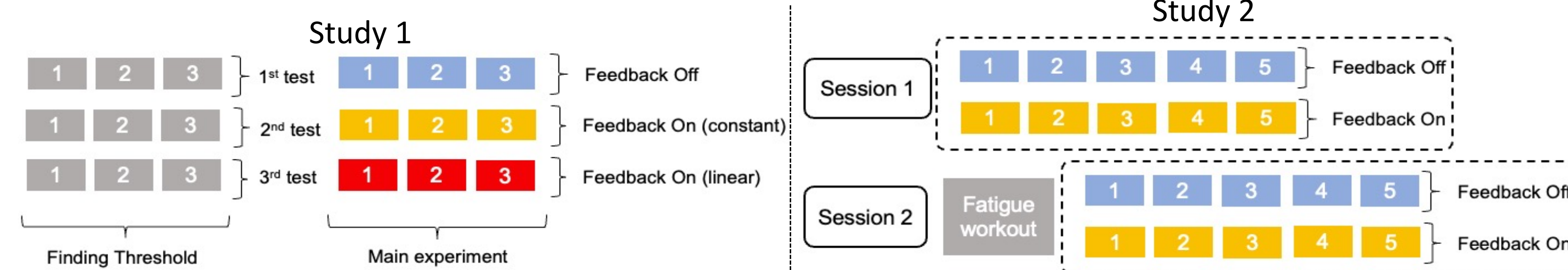
- The experimental setup is consisted of waist vibrotactile feedback and force platform.
- The waist vibrotactile feedback device is consisted of IMU and vibration motors.
- The feedback system operate according to the IMU orientation data, and vibration motors work when the orientation data is over the threshold.
- Platform is designed by randomized 2D (AP & ML) perturbation with 0.5-1.5Hz frequency and 1-3 degree amplitude.



Hypotheses and Methodology

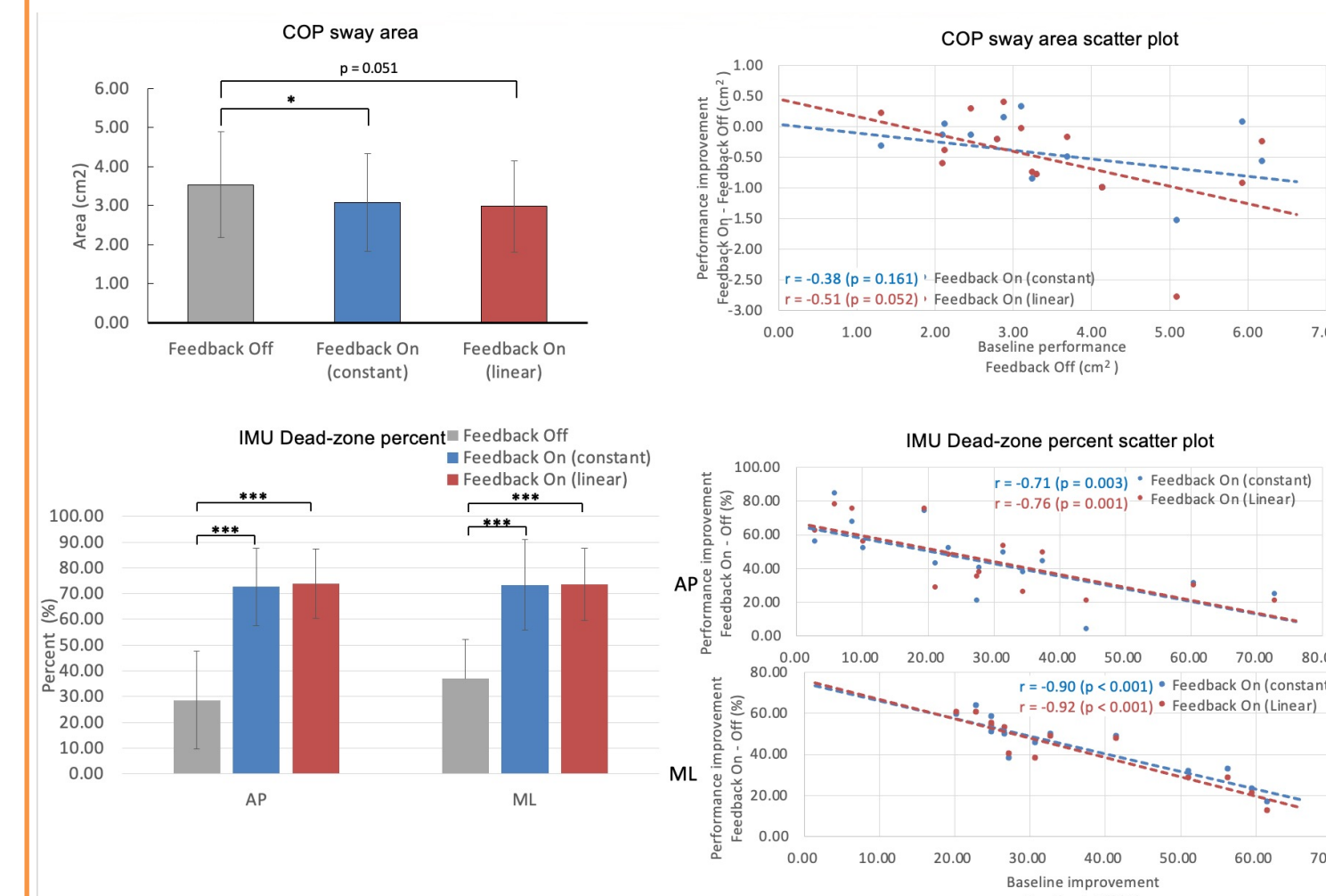
- Hypotheses
 - Study 1: The biofeedback improves the postural balance control
 - Study 2: The biofeedback has an effect even under the fatigue

Methodology



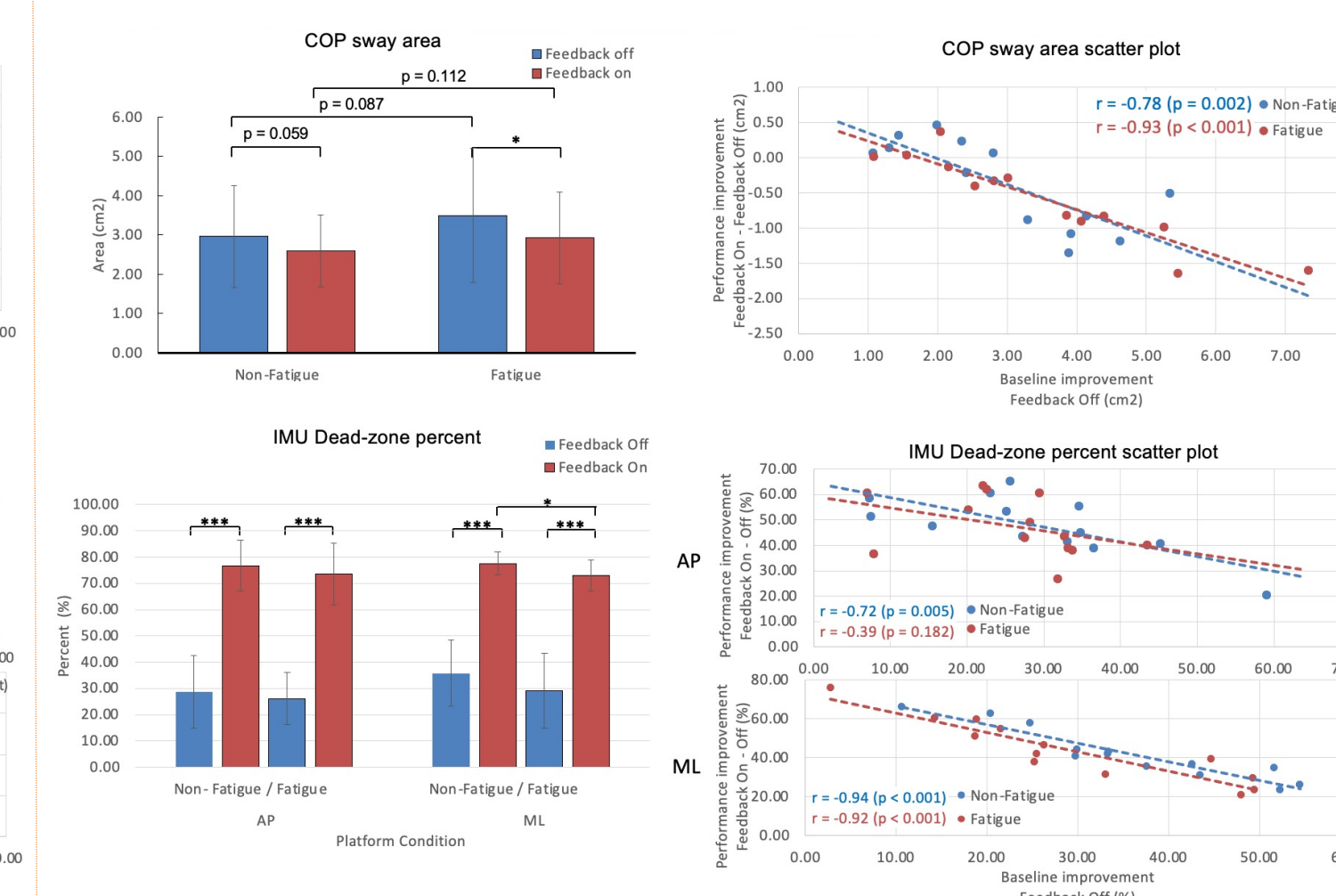
Results

Result of Study 1



- The vibrotactile feedback had a significant effect in decreasing COP area and controlling COM in a smaller region.
- The feedback had a higher effect of performance improvement for those with worse baseline performance.

Result of Study 2



- The vibrotactile feedback under the fatigue condition was as effective as without fatigue condition.
- Even under the fatigue condition, the vibrotactile feedback has a higher effect of performance improvement.

Implications

- The results suggest that the waist vibrotactile feedback device can be used to improve one's posture balance under challenging condition.
- The results also revealed that subject can effectively use the assistive device even under fatigue condition.

Future Work

- Perform the experiment with a waist vibrotactile feedback device using accelerometer data and validate the vibrotactile device for improving the postural balance control.

Acknowledgements

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