

# Is a Light Hand on the Wheels Enough? Postural Sway in Standing with Different Methods of Walker use in Multiple Sclerosis and Controls

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## INTRODUCTION

- Individuals with Multiple Sclerosis (iMS) have increased postural sway and are at higher risk for falls.<sup>1,2</sup>
- Some iMS describe using light touch to enhance their balance. It is not known if light touch on a walker reduces postural sway in iMS.<sup>3</sup>
- Light touch, referred to as haptic input, may reduce postural sway in other neurological conditions.<sup>4, 5,6</sup>
- Here we report the preliminary results from a larger study exploring the effects of haptic input on standing and walking balance in iMS

## OBJECTIVE

To compare the effects of postural sway in standing with no walker (NW), with light touch on a four-wheeled walker (4WW), and with weight through a 4WW in iMS and controls

## METHODS

**Setting:** College of Kinesiology, University of Saskatchewan, Saskatoon, SK

**Design:** Repeated measure randomized control

**Inclusion criteria iMS:** Clinical definite iMS who were able to stand without a gait aid

**Inclusion criteria controls:** Age and sex match to iMS

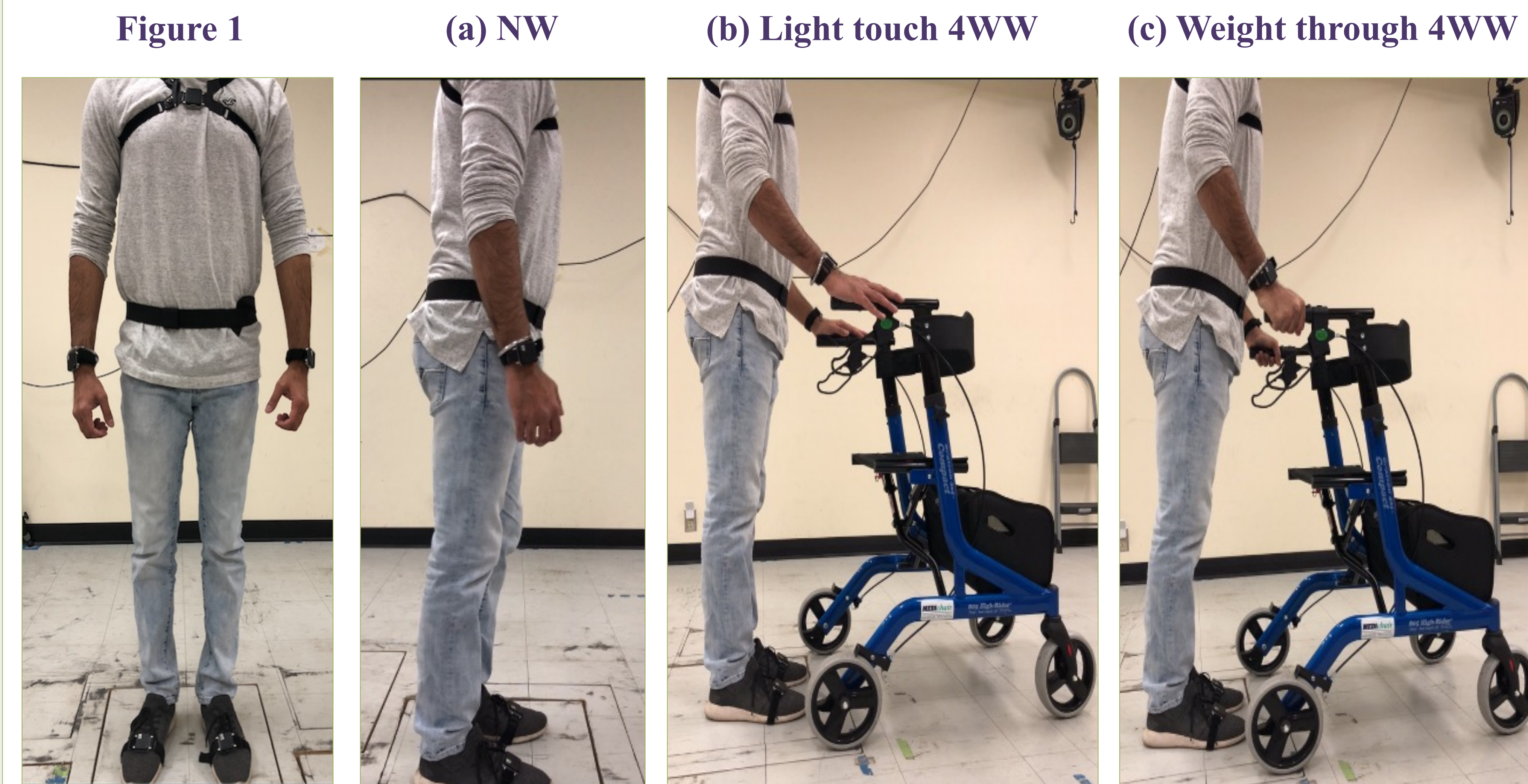
**Exclusion criteria:** Medically unstable, cognitive impairment, other condition affecting balance

**Study protocol:**

- Demographics (sex, age, disease duration, self reported history of falls)
- Cutaneous pressure sensation in upper and lower extremity (UE / LE) was collected using monofilaments. Correct responses were recorded and expressed over a total score of 36 for each upper limb (six trials x six monofilaments x one location / limb) and 72 for each lower limb (six trials x six monofilaments x two locations / limb).
- Standing Protocol was completed using the Mobility Lab, APDM Inc., which is a set of inertial-based sensors that include accelerometers, gyroscopes, and magnetometers. (Figure 1)

## METHODS

**Standing Protocol:** Postural sway was recorded for 30 seconds while standing for each condition: (a) no walker (NW), (b) light touch on 4WW, (c) weight through a 4WW, in random order



**Outcomes Measured:** Acceleration (Acc) total path length, velocity and total cutaneous sensory score for UE and LE

**Analyses:** Data was evaluated for normal distribution. Condition effects were examined within or across groups using Friedman's ANOVA and group differences (iMS and controls) were examined with non-parametric Mann-Whitney U test. Significance was set at .003 to accommodate multiple comparisons. Spearman's rank coefficient was used to analyze the correlation between cutaneous sensation and each condition.

## RESULTS

### Demographics:

- Of the 28 iMS recruited to date, 13 (46%) were female, mean age 52 years (y) ( $\pm 10.2$ ), mean disease duration from onset 11y ( $\pm 8.8$ ) and 57% reported  $\geq 1$  fall in the last year.
- Of the 14 controls, 7 were female and the mean age was 47y ( $\pm 10.7$ ).

### Cutaneous pressure sensation:

- LE cutaneous pressure for iMS was 74/144 compared to 96/144 for controls.
- UE cutaneous pressure for iMS was 56/72 compared to 65/72 for controls.

### Standing Protocol:

- Total path length was reduced with light touch on a 4WW ( $p < .001$ ) and also with weight through a 4WW ( $p < .001$ ) compared to NW for iMS.
- Total Path length was greater in iMS compared to controls for NW condition only ( $p = .001$ ).
- Total path length was not significantly different for controls between conditions ( $p = .004$ ).
- Velocity decreased with light touch on a 4WW ( $p < .001$ ) and with weight through a 4WW ( $p < .001$ ) conditions compared to NW in both iMS and controls.
- No significant correlations identified for cutaneous sensation.

## CONCLUSION

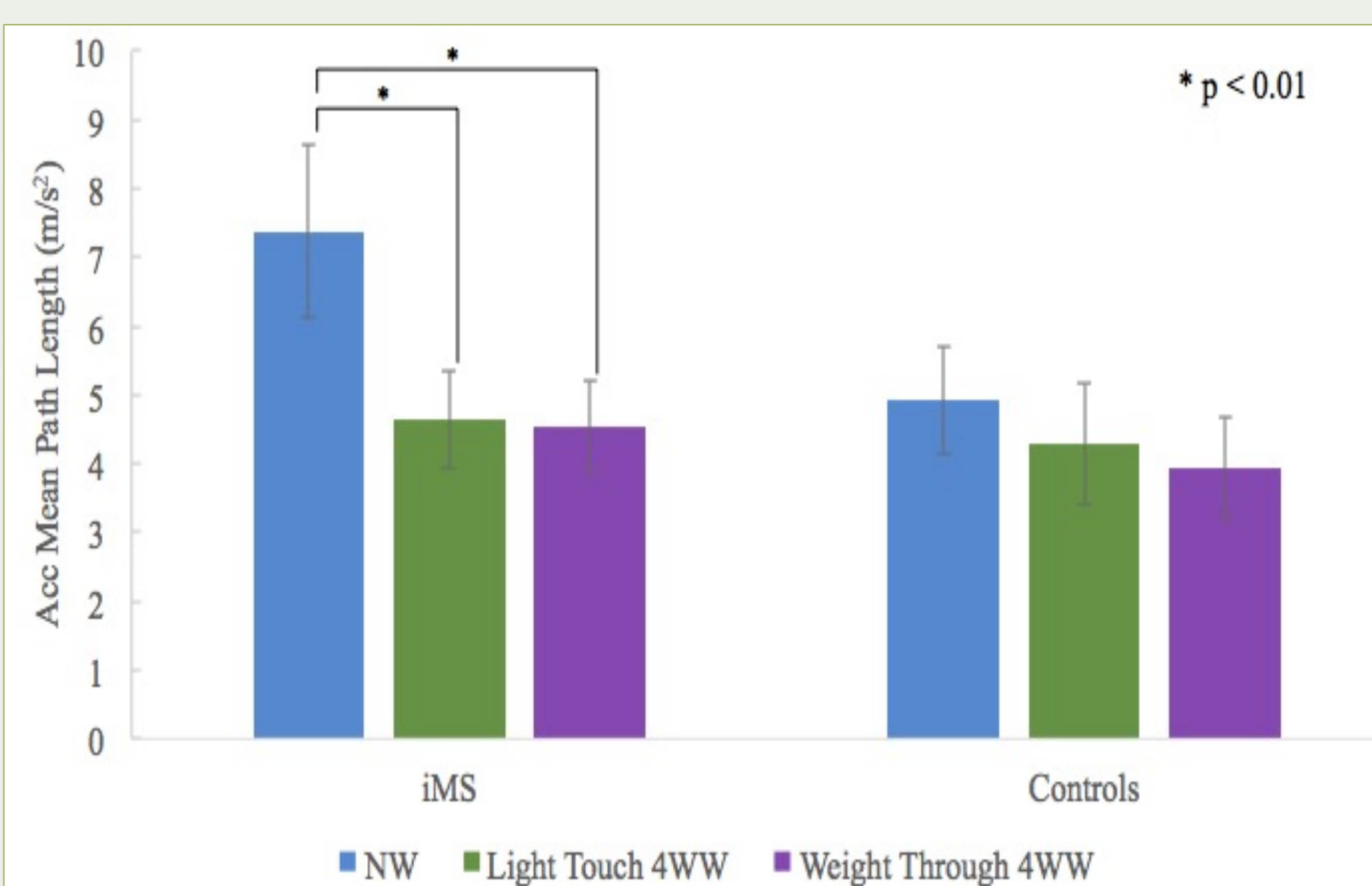
- Postural sway is significantly reduced with either light touch or with weight through a 4WW compared to no walker in iMS.
- When using a walker, even with just light touch, postural sway in iMS was comparable to controls.
- The potential for haptic input to improve balance and reduce falls in iMS warrants further research.

## ACKNOWLEDGEMENT

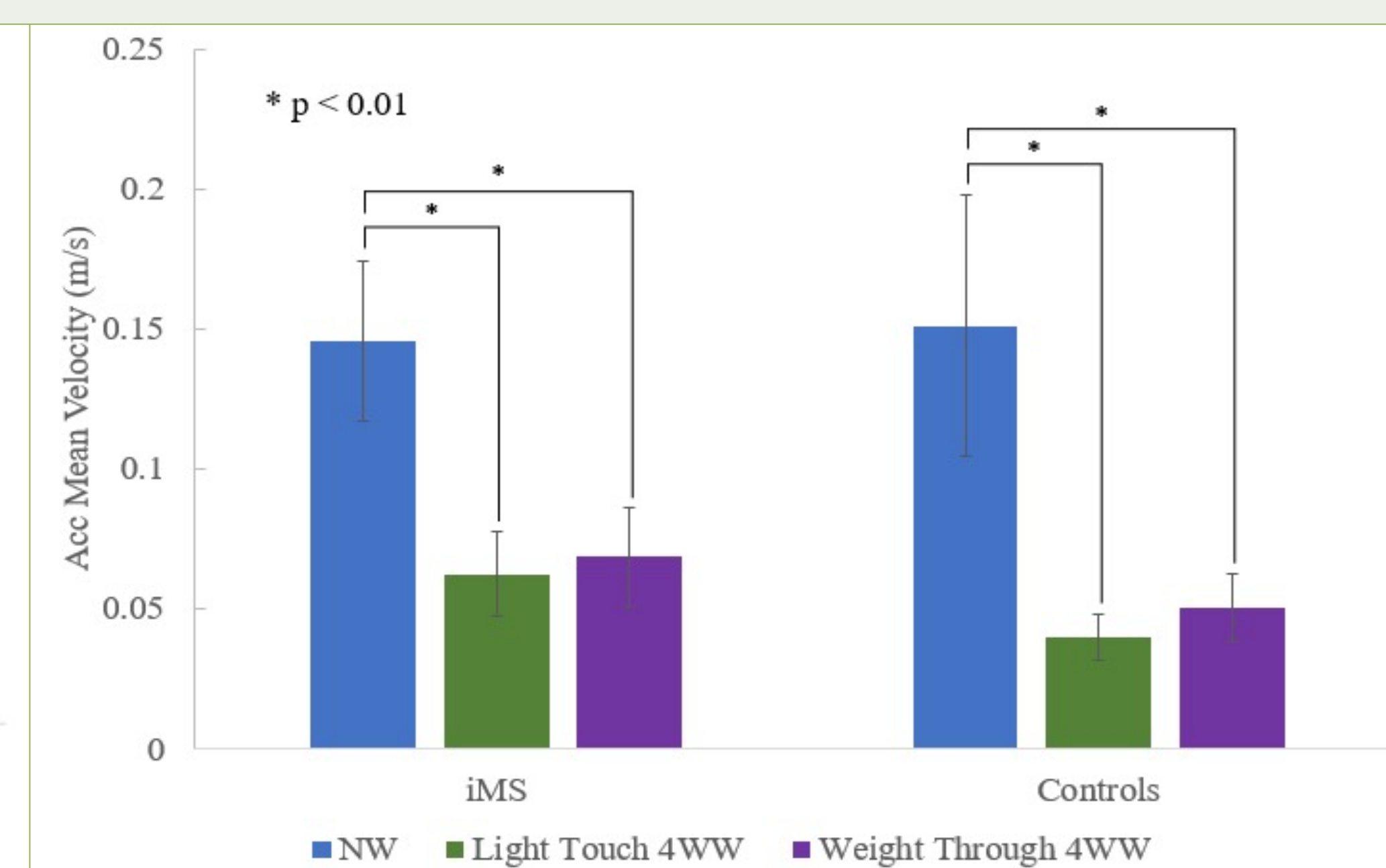
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## RESULTS

Postural Sway in Stance – Path Length – iMS vs. Controls



Postural Sway in Stance – Total Velocity – iMS vs. Controls



### References:

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