

# Deficits in fine motor function and postural stability are linked in cancer survivors at risk of neurotoxicity

*J. Matt McCrary • Susanna Park • David Goldstein*  
*On behalf of the IN FOCUS investigators*

## INTRODUCTION

Chemotherapy-induced peripheral neuropathy (CIPN) is a prominent side effect of the treatment of cancer and has been associated with numbness, reduced postural control, and increased falls risk (odds ratio 1.8 – 2.67). Increased postural sway, a correlate of postural instability and balance difficulties, has been related to the presence of CIPN symptoms, but has never been correlated with objective neurophysiological parameters, fine motor function, or patient reported neuropathy.

**AIMS:** 1) Assess postural sway in cancer survivors 2) investigate relationships between postural instability, CIPN severity, patient reported outcomes, and fine motor skills assessments

## METHODS

### Study design

Cross-sectional functional and neurophysiologic assessment

### Inclusion criteria

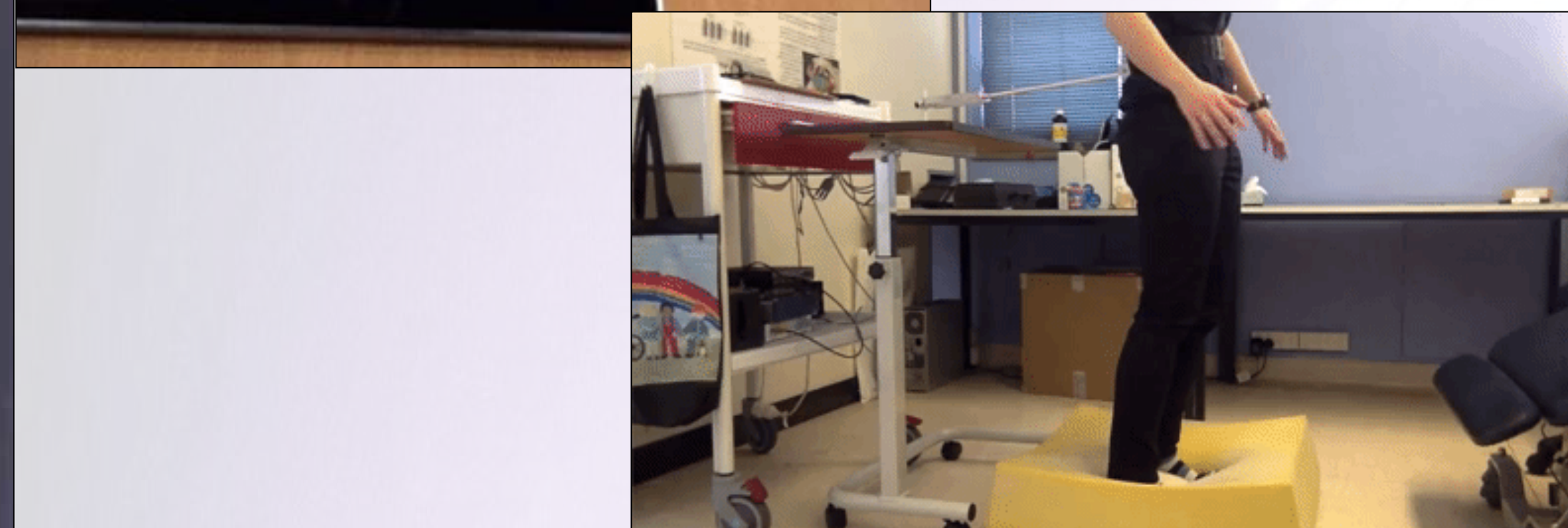
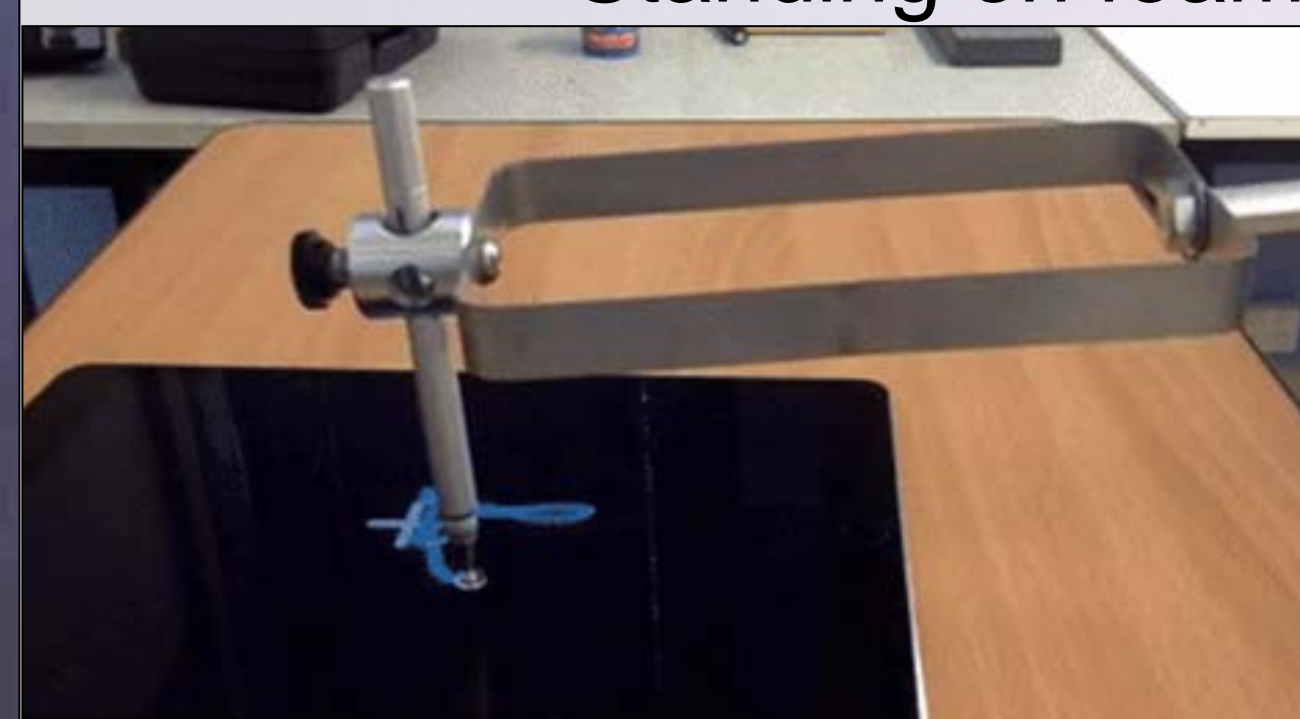
- Cancer survivors  $\geq 3$  months post-treatment with any neurotoxic chemotherapy

### Assessments

- Total neuropathy score (*comprehensive objective neurophysiologic assessment*)
- Grooved pegboard test (*fine motor function*)



- Patient reported outcome questionnaires: CIPN-20 (*patient-reported neuropathy*), CIPN-R-ODS (*patient disability*)
- Clinical neuropathy grading (NCI-CTCAE)
- Postural sway (Swaymeter, 4 conditions of increasing balance challenge):
  - Standing on floor, eyes open
  - Standing on floor, eyes closed
  - Standing on foam, eyes open
  - Standing on foam, eyes closed



## Statistical Analyses

- T-tests comparing outcome measures in patients with and without CIPN symptoms
- Bivariate linear regression analyses (Bonferonni-Holm correction for multiple comparisons) between postural sway and all other outcome measures

N = 57 participants	
Mean age (SD)	59.0 (12.4) years
Female	29
Male	28
Neuropathy severity (NCI-CTCAE)	
Grade 0	15
Grade 1	12
Grade $\geq 2$	30

## RESULTS

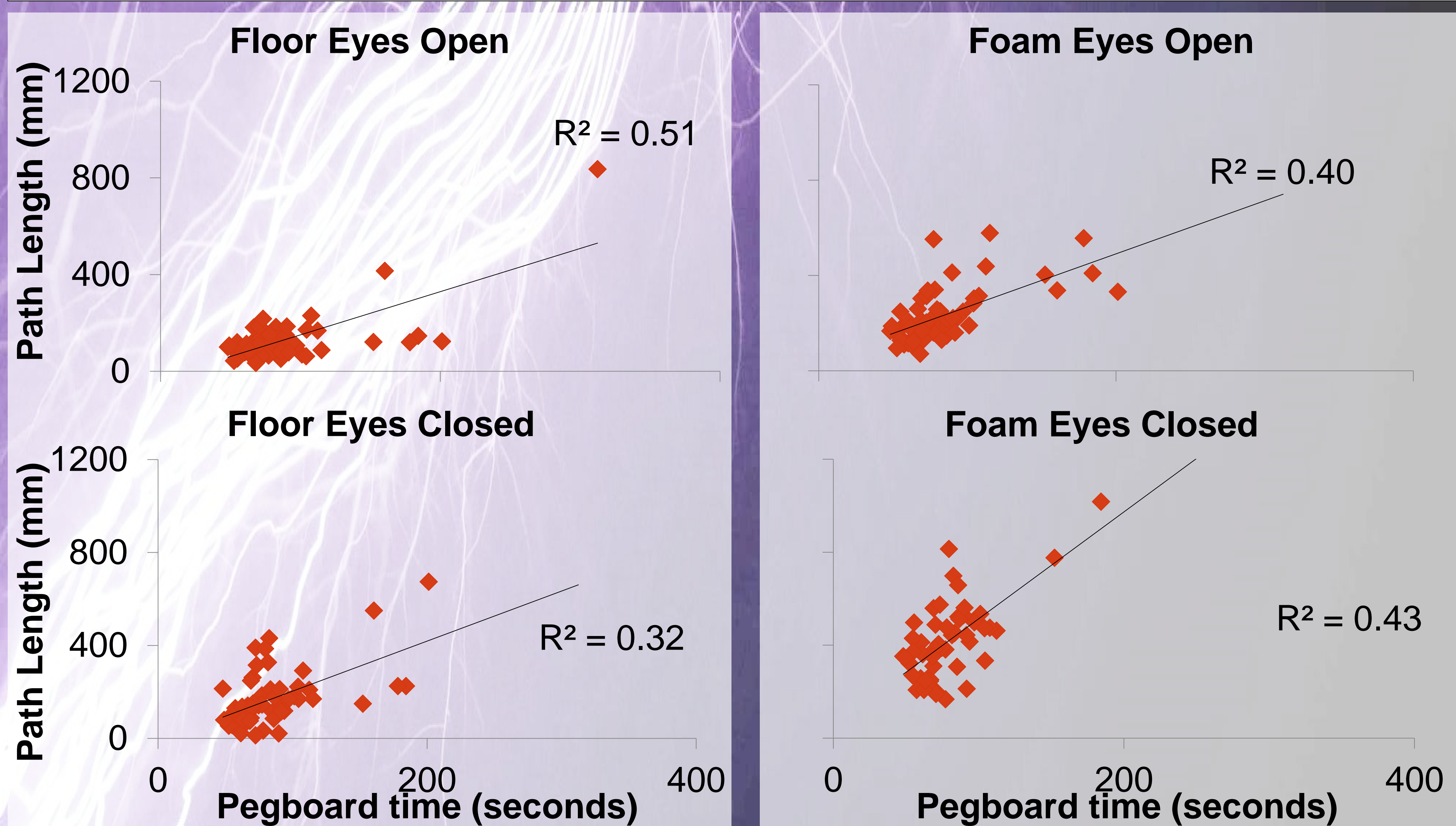
	CIPN+	CIPN-	p
Maximal sural nerve conduction amplitude (mV)	7.3(7.7)	13.4(8.8)	0.019*
Maximal tibial nerve conduction amplitude (mV)	8.8(3.3)	7.9(3.9)	0.46
Postural sway – floor, eyes open (mm)	140.3 (126.5)	104.6(45.2)	0.29
Postural sway – floor, eyes closed (mm)	190.5 (139.1)	118.3 (62.9)	0.06
Postural sway – foam, eyes open (mm)	257.0 (120.3)	175.1 (86.5)	0.019*
Postural sway – foam, eyes closed (mm)	453.5 (187.5)	329.3 (77.0)	0.017*

CIPN+ = patients with CIPN grade  $\geq 1$ ; CIPN- = patients with CIPN grade 0; \*p<.05;

## MULTIPLE LINEAR REGRESSION

Significant correlations with postural sway:

- Patient disability (CIPN-R-ODS) – 3 of 4 test conditions ( $R^2 = 0.21-0.28$ ,  $p < .001$ )
- Patient reported neuropathy (CIPN-20) – 1 of 4 test conditions ( $R^2 = 0.21$ ,  $p < .001$ )
- Age – 2 of 4 test conditions ( $R^2 = 0.18 - 0.27$ ,  $p < .01$ )
- Fine motor function (grooved pegboard test time) – 4 of 4 test conditions ( $R^2 = 0.32-0.51$ ,  $p < .001$ )(Figures below)



**CONCLUSIONS:** A substantial proportion of survivors reported balance deficits. Fine motor function, as assessed by the grooved pegboard test, is significantly correlated to balance performance as assessed by postural sway techniques. Integration of assessment of fine motor function for patients and survivors who have or are receiving neurotoxic chemotherapies may provide an efficient aid in the identification and management of patients and survivors with balance deficits and increased falls risk.

**FUNDING:** This project was supported by a Cancer Institute NSW Translational Program Grant (14/TPG/1-05)