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# **IN-SHOE PLANTAR LOADING DURING ADL**

# Foot Pain – Prevalence and Causes

- **Foot pain** affects 10% to 28% adults aged 18 years and over, around the world and has a negative impact on health-related quality of life.  
*(Hannan et al. 2006)*
- **Elevated plantar loading** has been related to the development of tissue breakdown and pain in vulnerable populations .  
*(Mueller and Maluf, 2003)*

# Clinical Relevance

- Elevated plantar loading may be used as a ***diagnostic marker of severity / progression*** of the underlying pathology
- Plantar loading may be used to assess ***efficacy of intervention*** (patients with 1<sup>st</sup> MTP joint osteoarthritis / patients with venous ulcer)

# However

- Plantar loading
  - Varies by region
  - Varies by activity

- **Purpose**

To assess peak pressure in different ADLs, across different regions of the foot

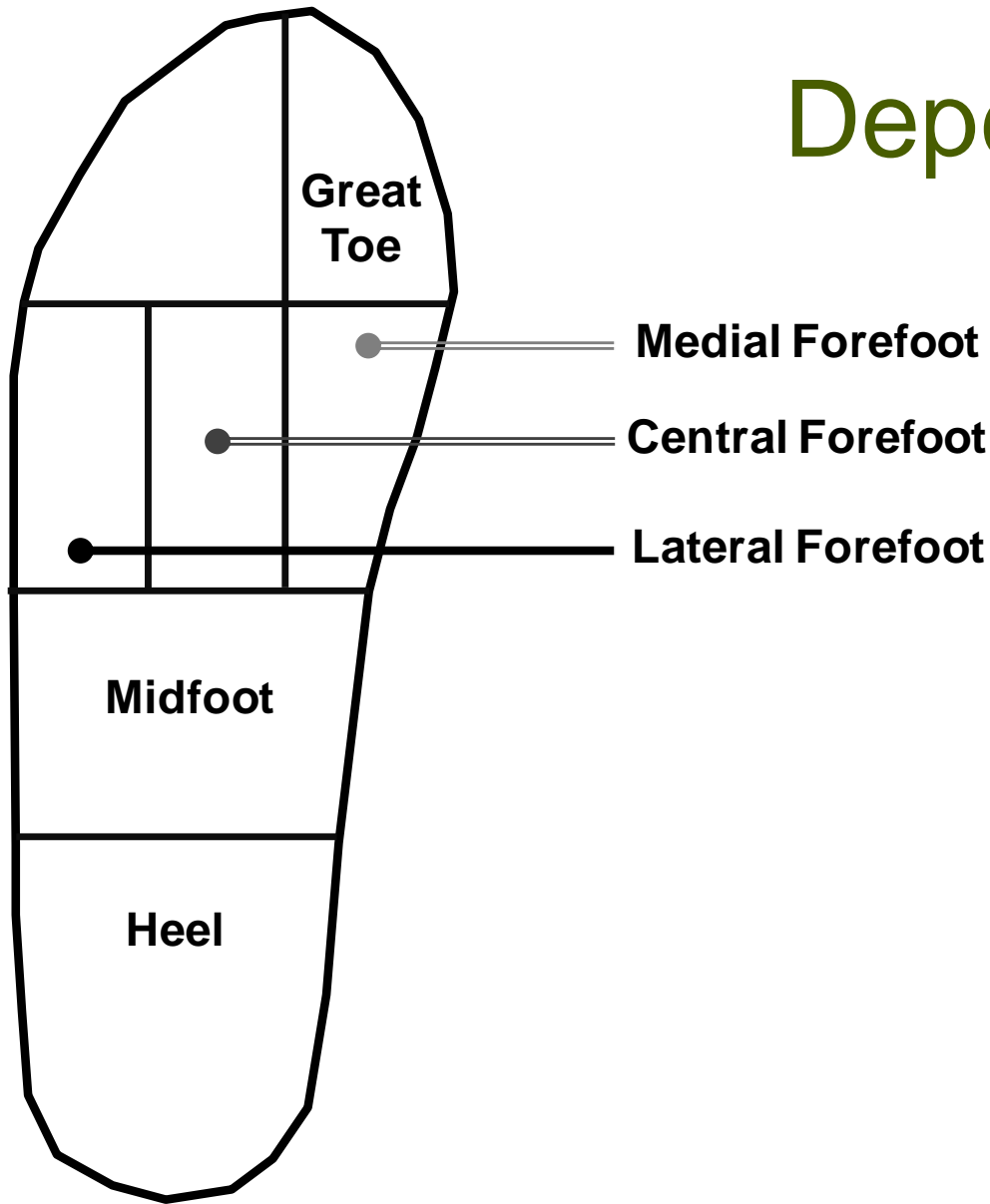
# Methods

- Subjects:
  - 15 asymptomatic individuals
  - 7 males : 4 females
  - 24-43 yrs,
  - BMI: 26.4 – 21.2 kg/m<sup>2</sup>
  - All subjects were free from any musculoskeletal and neurological disorders.

# Procedures

- Activities
  - Walking (self-selected and fast speed)
  - Heel Raises and Sit to stand
  - Stair ascent and Stair descent
- Instrumentation
  - In shoe pressure measurement (Pedar, Novel Inc)





# Dependent Variables

- Peak Pressure (kPa)

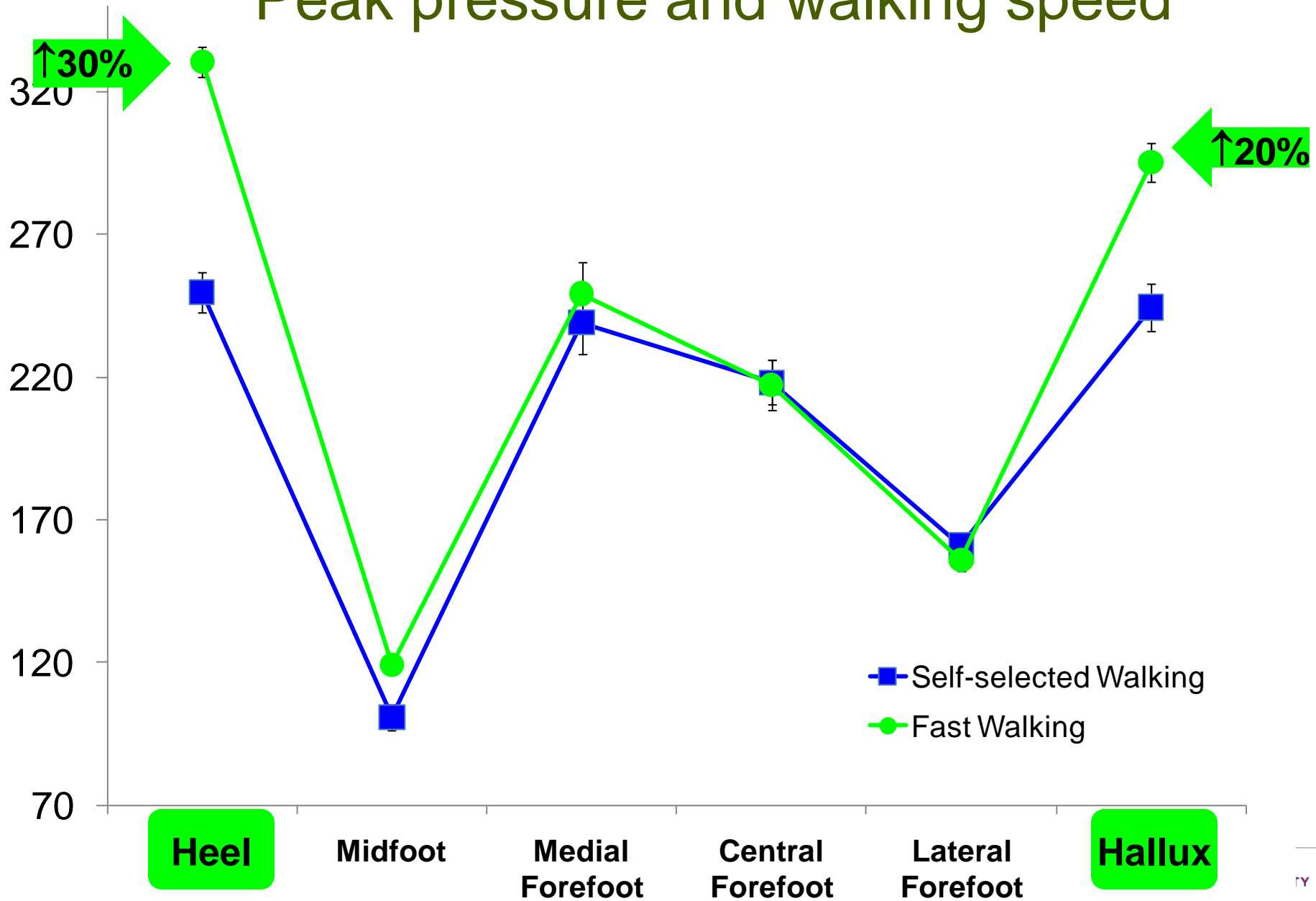
# Statistical Analysis

A two way repeated measures ANOVA was used to assess the effect of activity and region on peak pressure.

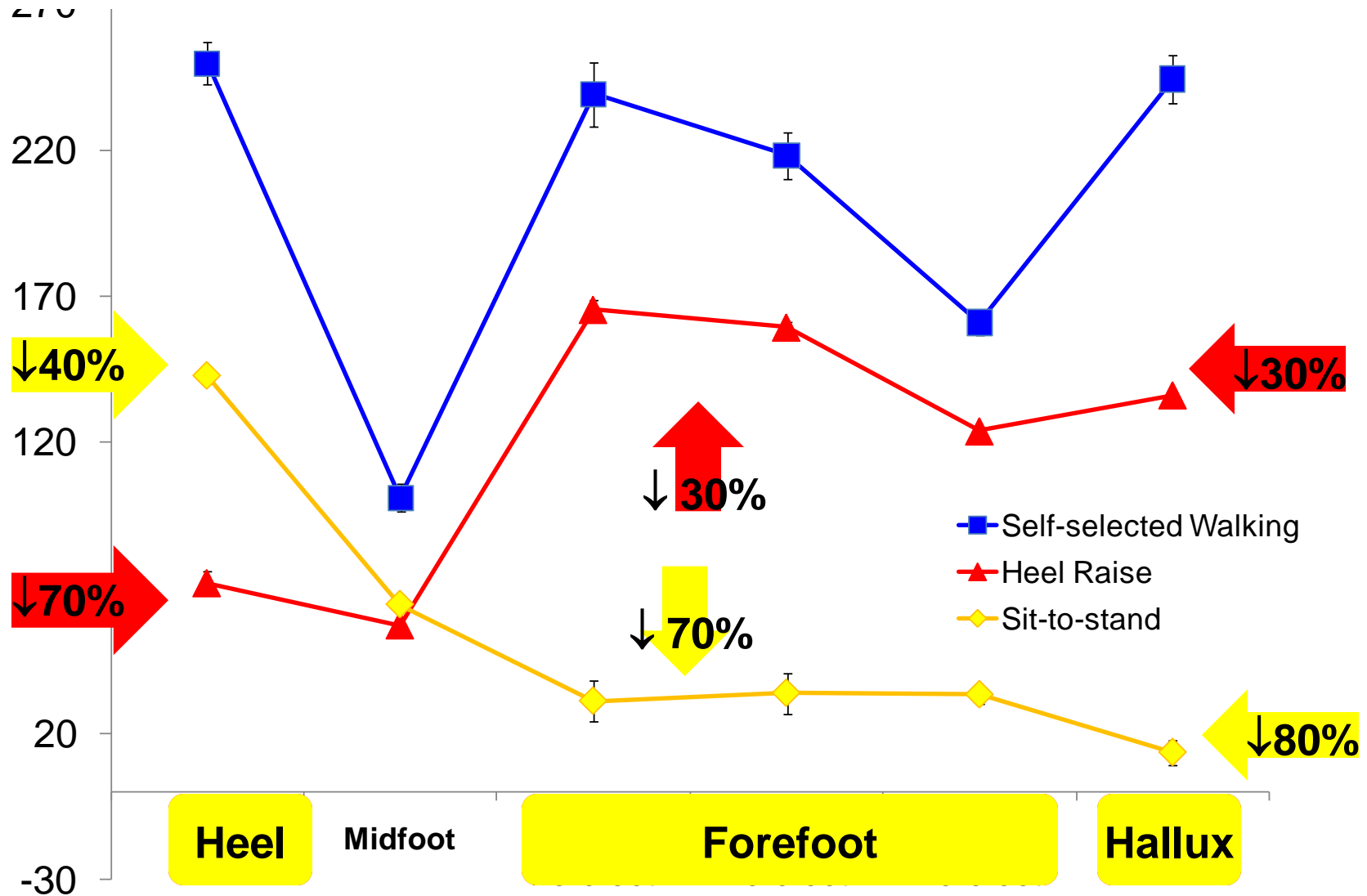
If the interaction effect (activity x region) was significant ( $\alpha < 0.05$ ), simple effects of activity on each foot region were assessed subsequently. Bonferroni adjusted pair-wise comparisons were applied for post-hoc tests.

Simple linear regression was used to predict peak forefoot pressure during stair ascent and descent using peak pressure during walking.

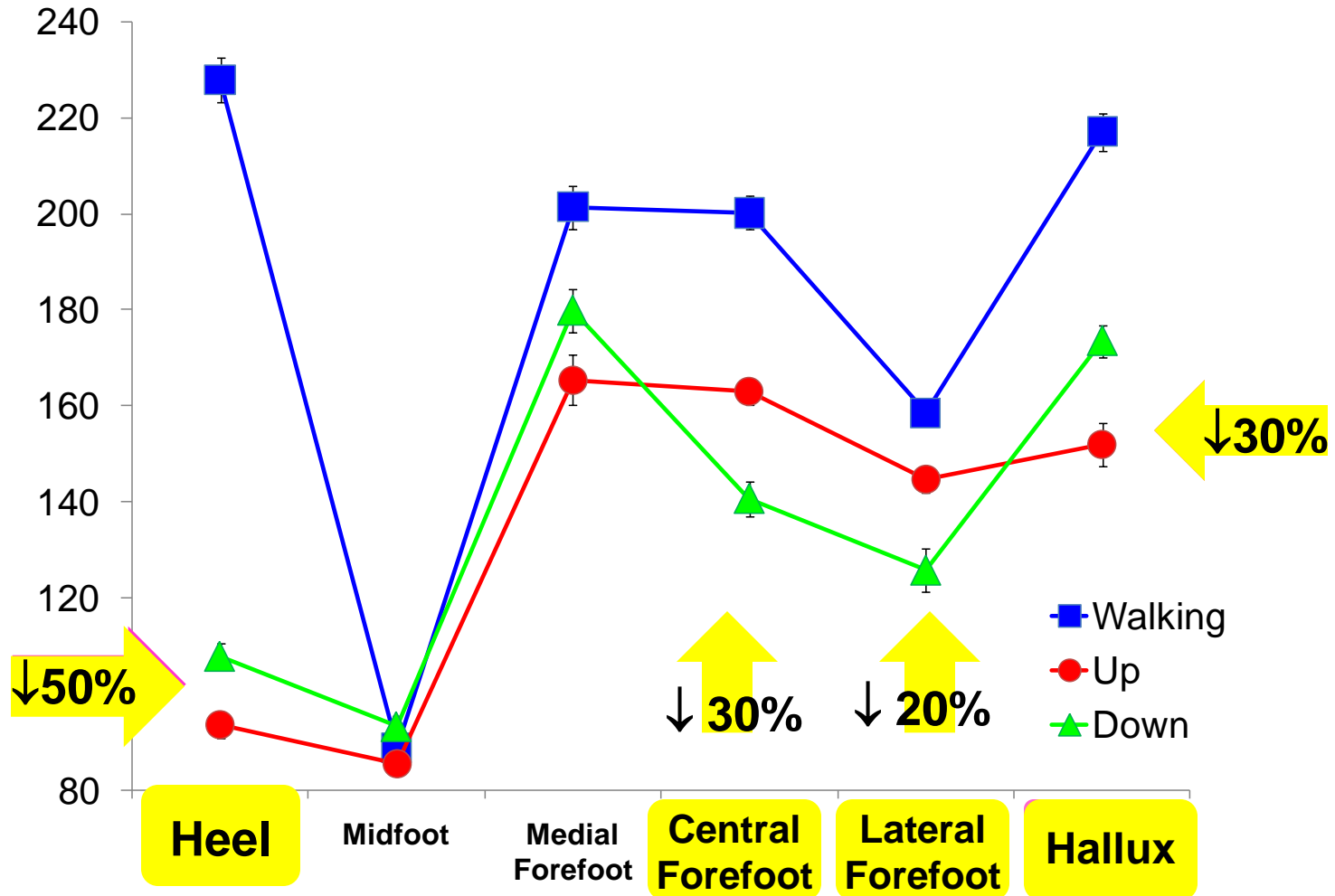
# Peak pressure and walking speed



# Peak pressure in bilateral activities



# Peak pressure in stair negotiation



# Can we predict peak pressure?

Region	Activity	<i>b</i>	Constant	<i>Adjusted R<sup>2</sup></i>	<i>P value</i>
Medial forefoot	stair ascent	0.728	18.74	<b>0.506</b>	< 0.001
	stair descent	0.943	-10.10	<b>0.623</b>	< 0.001
Central forefoot	stair ascent	0.745	13.73	<b>0.499</b>	< 0.001
	stair descent	0.509	38.69	<b>0.368</b>	< 0.001
Lateral forefoot	stair ascent	1.519	-95.93	<b>0.721</b>	< 0.001
	stair descent	0.890	-15.34	<b>0.611</b>	< 0.001

# Discussion

1. Highest loads sustained during fast walking
2. Highest loads sustained at heel and hallux
3. Plantar loads sustained in walking explain about 36-72% of the variance in plantar loads sustained during stair negotiation

# Clinical Relevance

- Normative database to compare patients' data
- Clinical decision-making and surgical planning

# Acknowledgements

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