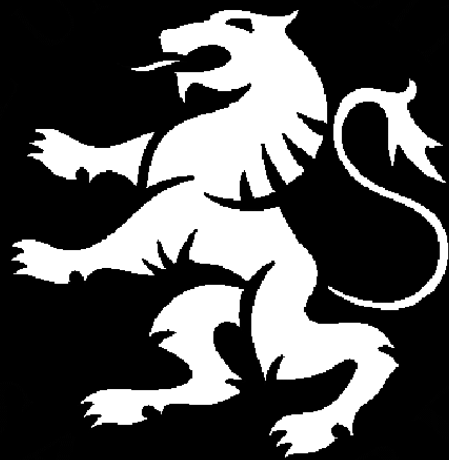


Biomechanics of Gait on Irregular Surfaces



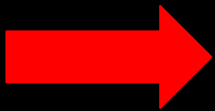
University of Salford

Sibylle Thies
University of Salford

- Centre for Rehabilitation & Human Performance Research
- Built & Human Environment

Motivation: Fall Prevention

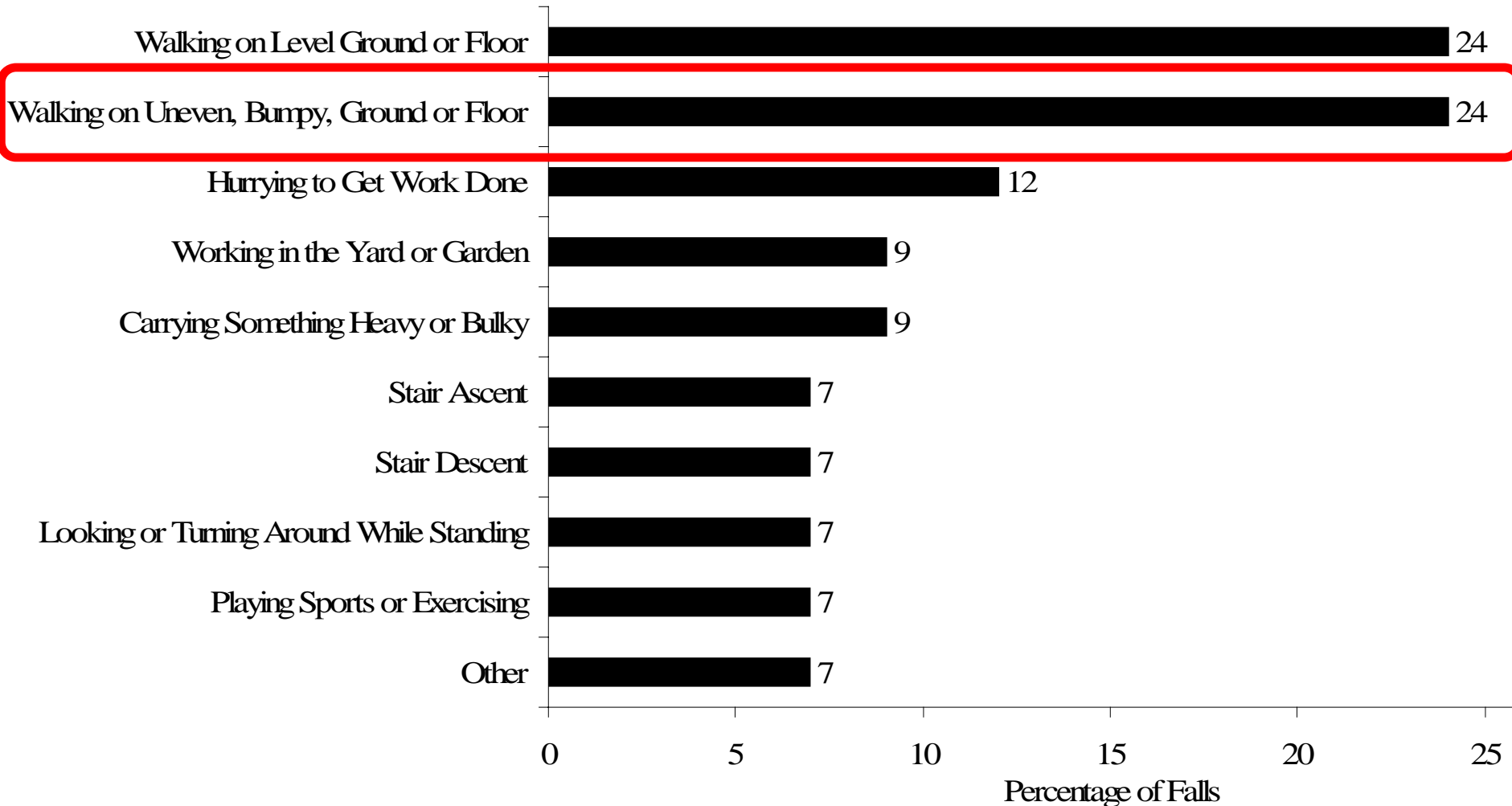
- 30% of older adults fall each year (Tinetti et al. 1988)
- 24% of falls lead to serious injury (Tinetti et al. 1988)



- Loss of independence (Dunn et al. 1992)
- Morbidity (Gryfe et al. 1977)
- Death (Sattin 1992)

Motivation: Fall Prevention

Activities in which fallers were engaged at the time of fall (Berg et al. 1997)

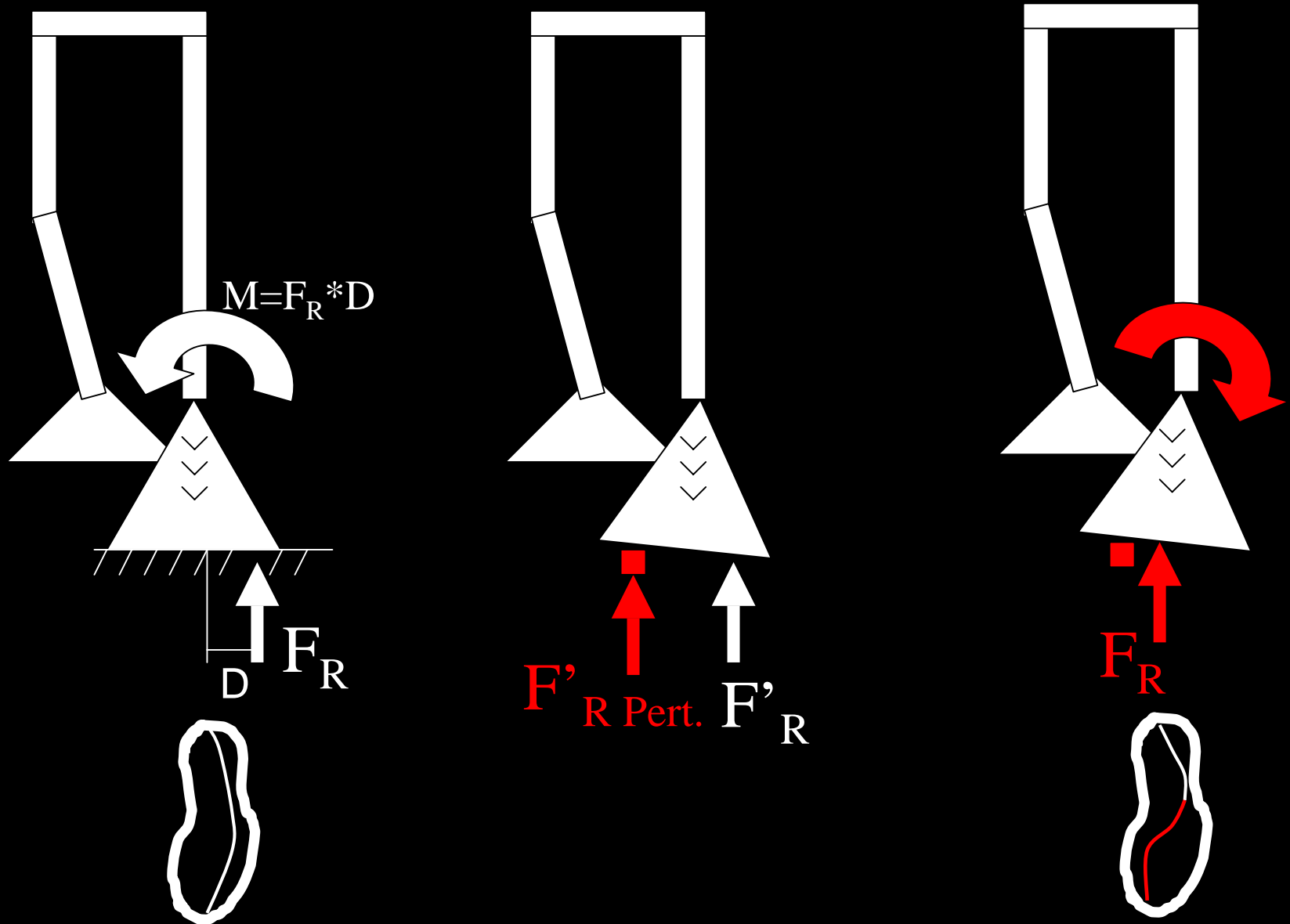




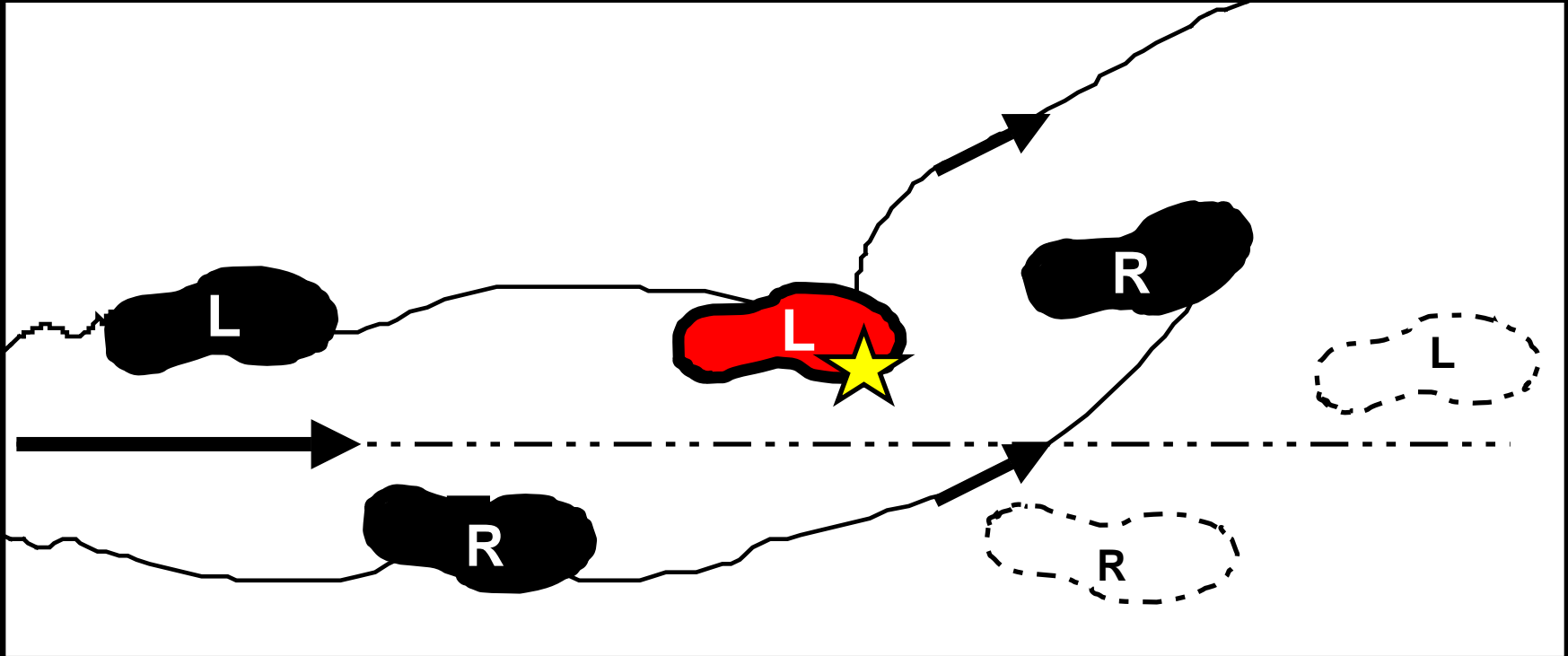
So, we need a better understanding of how humans safely cross irregular surfaces



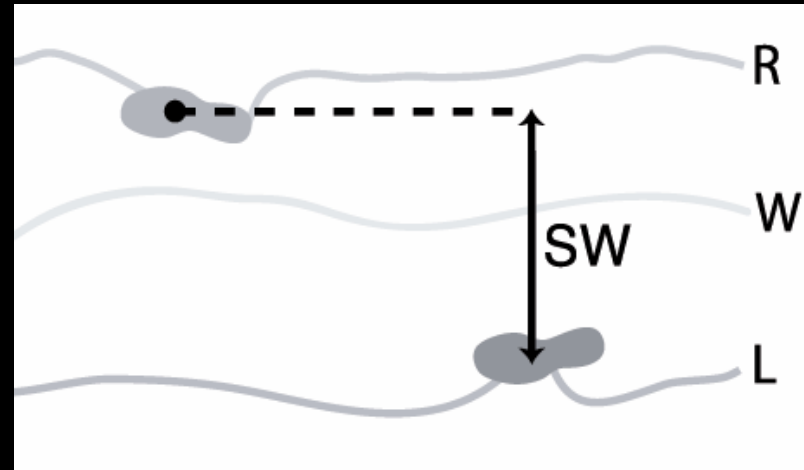
Biomechanics of Perturbed Gait 5



Effects on Step Pattern



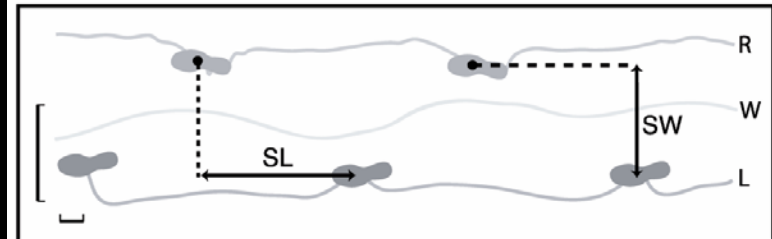
Parameters of Interest



- Step width – a key factor in controlling frontal plane stability (Bauby et al. 2000),
- Stride time variability - a predictor of fall risk (Hausdorff et al. 2001)

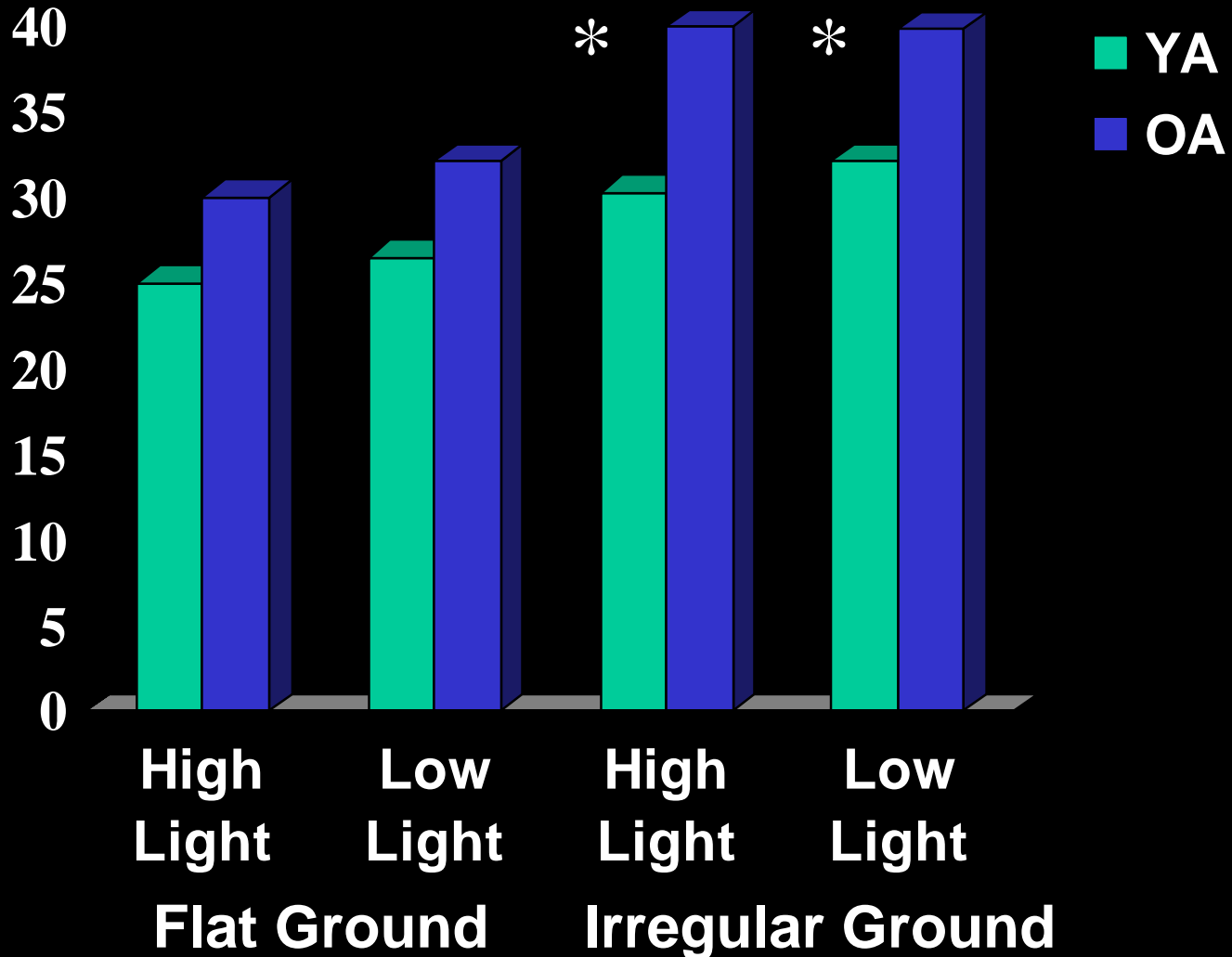
Experiment

- Irregular surface
- Motion capturing system
- Statistics



Age Effect

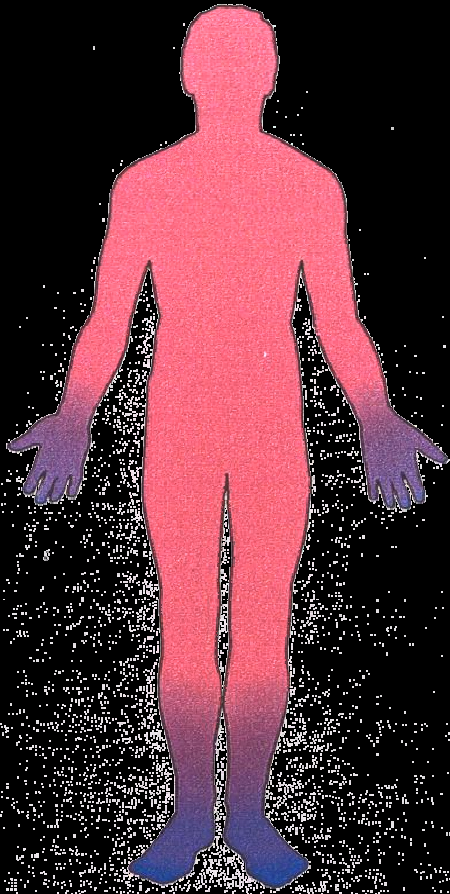
Step Width Variability [mm]



Diabetic Neuropathy

Gradient loss of sensory function in typical patient with neuropathy

- 20-fold risk for falls (Richardson et al. 1992)

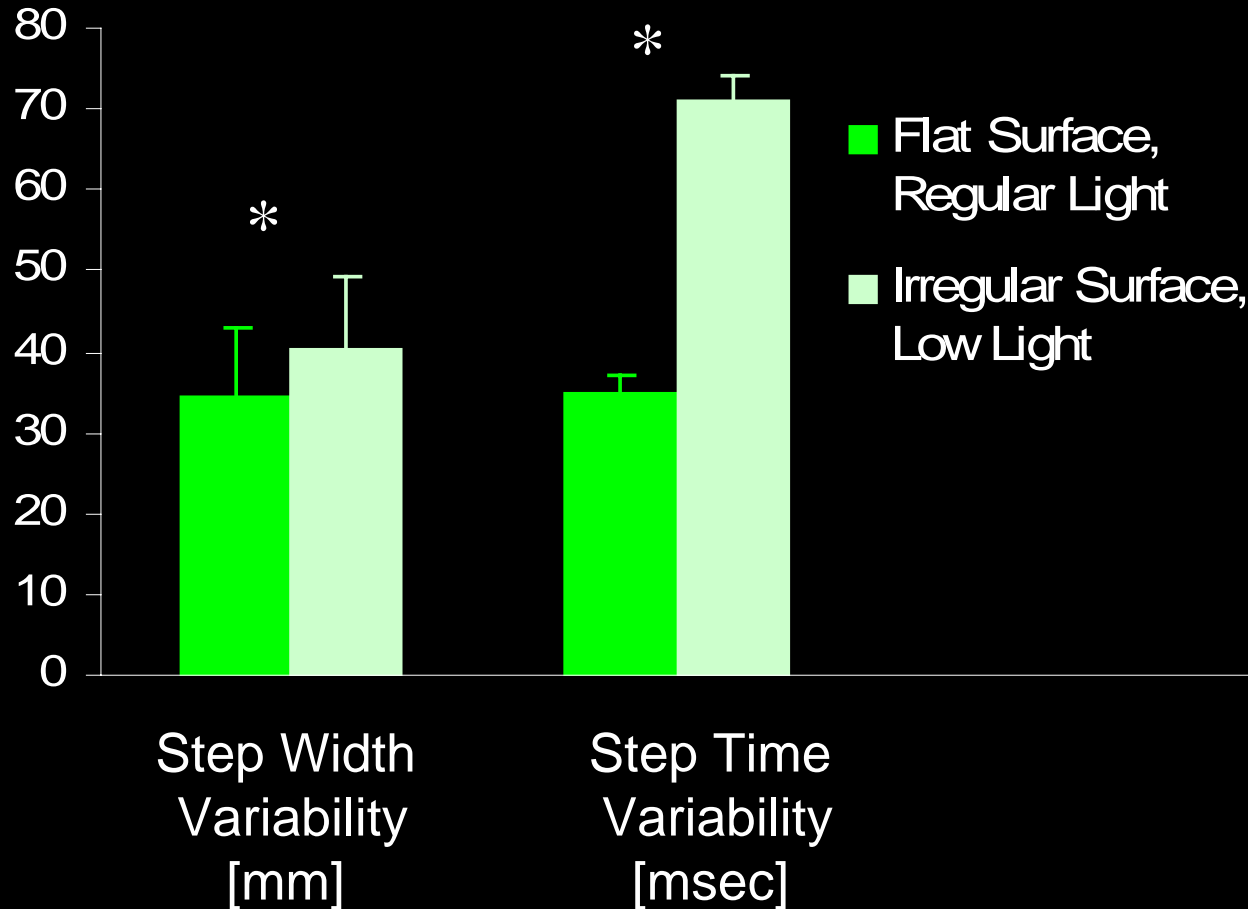


Skin with healthy nerves



Skin with sick nerves

Neuropathic Gait on Irregular Surface



- Speed decreased

Irregular surfaces affect

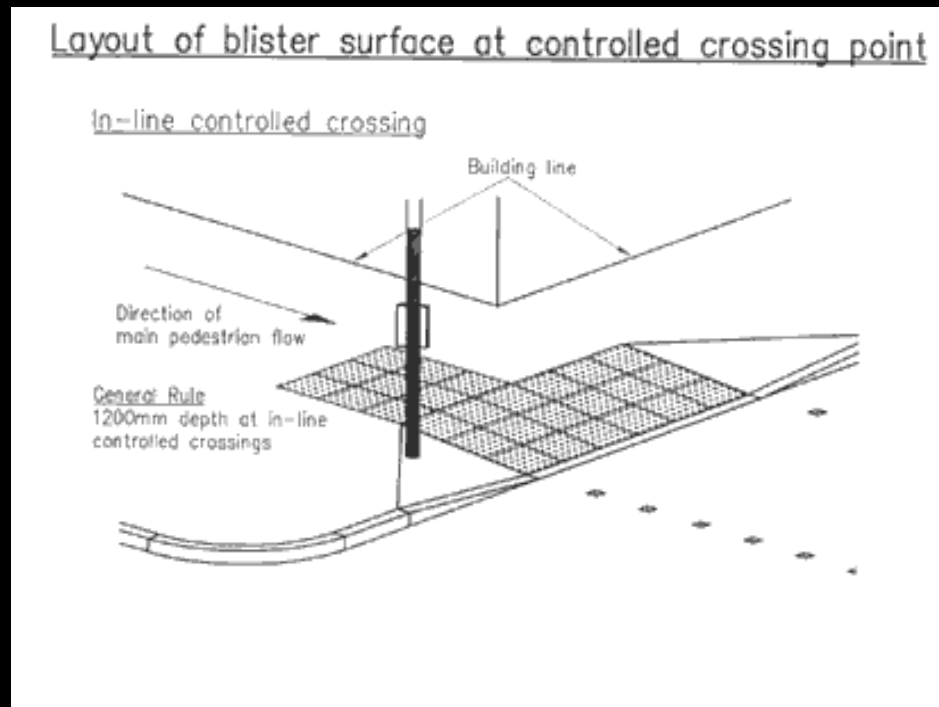
- Step width variability, key factor in the control of frontal plane stability
- Step time variability, associated with fall risk
- Speed, associated with fear of falling

New Emerging Irregular Surfaces



 We are concerned!

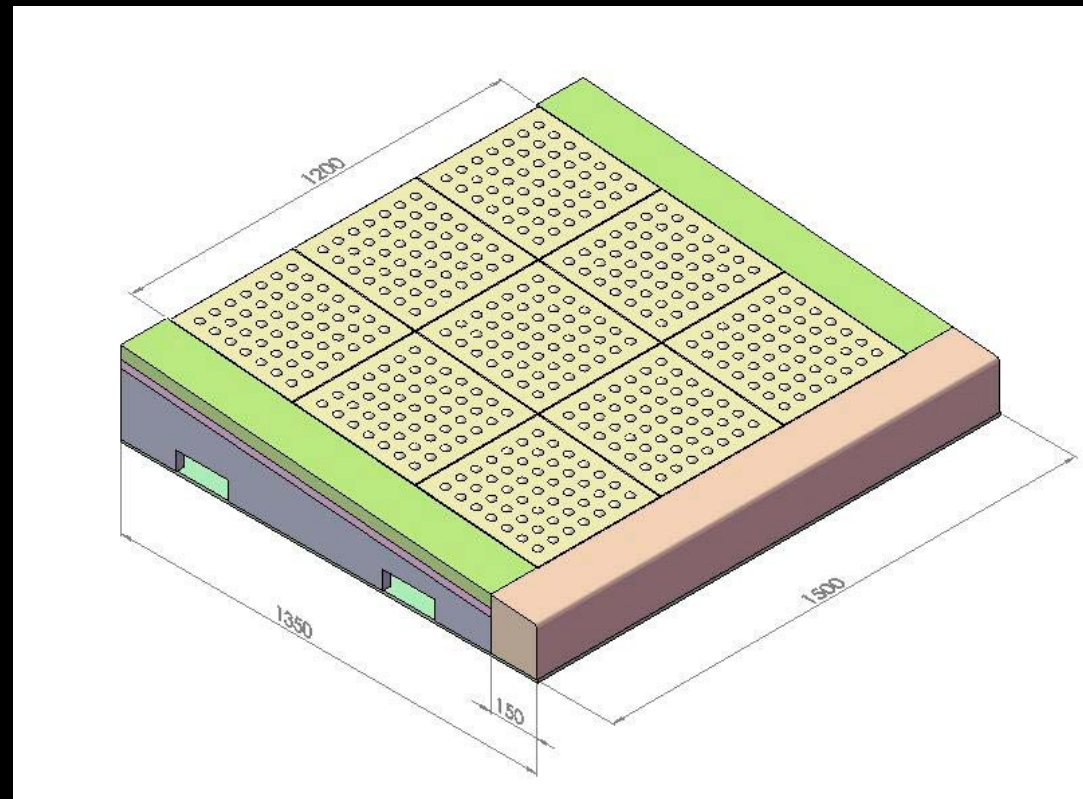
New Experiment



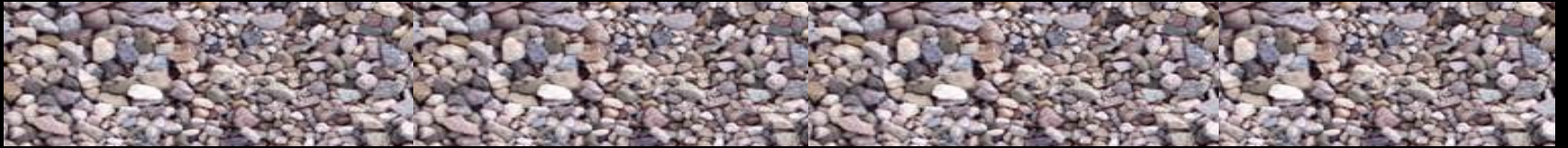
- Frontal plane stability (i.e. step width)
- Fall risk (i.e. step time variability)
- Time to stop, # of steps to stop
- Balance control during quiet standing (pelvis acceleration)
- Time to accelerate to comfortable speed

New Experiment

- Instrumented indoor 'street crossing'
- Testing of older and balance impaired people



Thank you!



Questions?