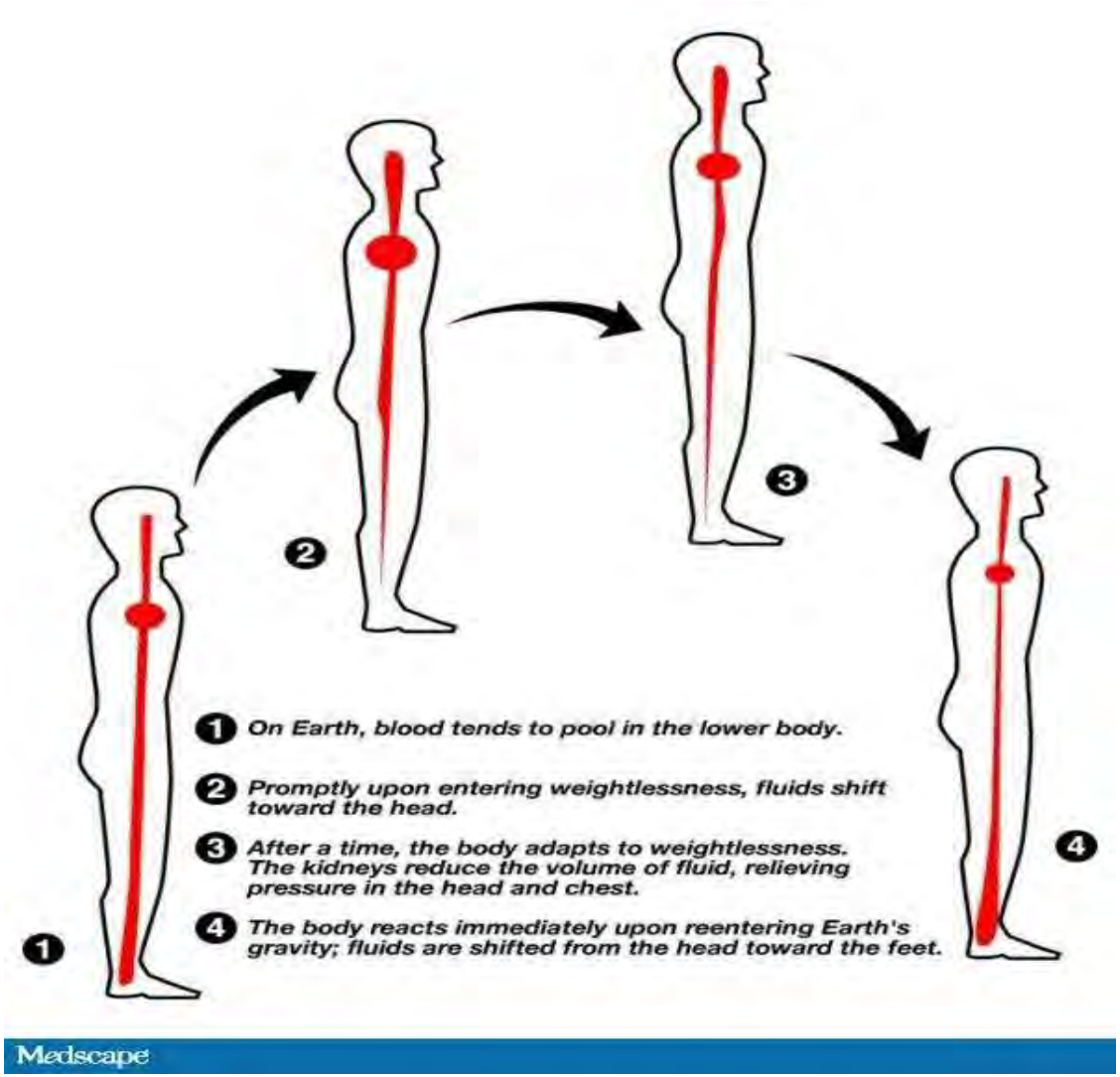
The Effect of Orthostasis on Endothelial Function: A Gender Comparative Study

Paavan Gorur

paavan.gorur@gmail.com

SAFE Europe Symposium, April 2013

Introduction



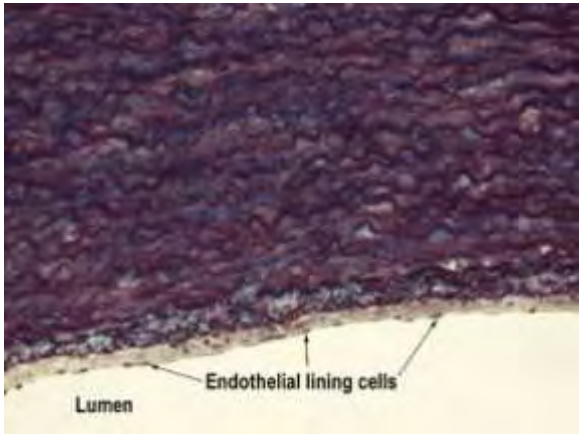
Introduction

- Orthostatic intolerance : clinical and spaceflight problem

- Females > men
  - 27% females, 7% males presyncopal after short duration space flight (Fritsch-Yelle et al 1996)

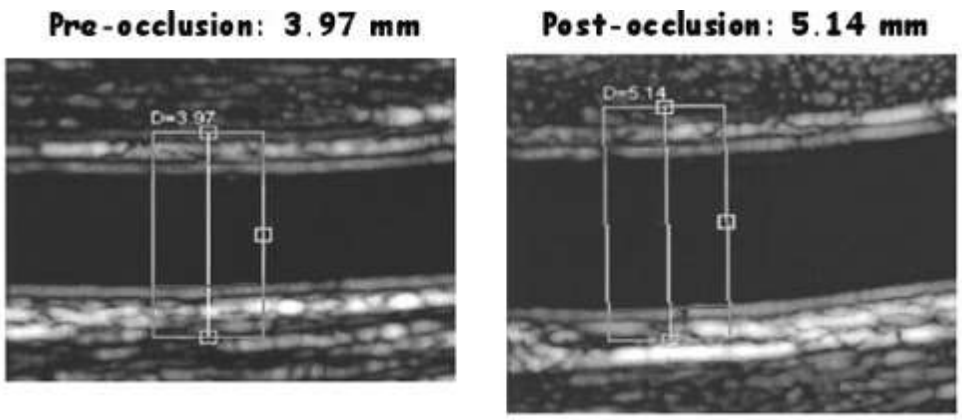
- Potential role of vascular endothelium: Unclear

- Endothelium pivotal for vascular tone control



Background

- Endothelial nitric oxide (NO) – causes vasodilatation
- Sex hormones influence NO production/response
- Brachial artery flow mediated dilatation (BAFMD)
- EndoPAT: non-invasive, user independent method



Aims

- Effect of orthostasis on endothelial function
- Potential effect of sex hormones on this response
- Effect of menstrual cycle phase on endothelial function
- Endothelial responses with and without oral contraceptive

Hypotheses

1. Endothelial function affected by 20 minutes of orthostasis
2. Response would differ between males and females
3. Response would differ across menstrual cycle phase
4. Response would differ between OCP group vs non-pill group

Methods

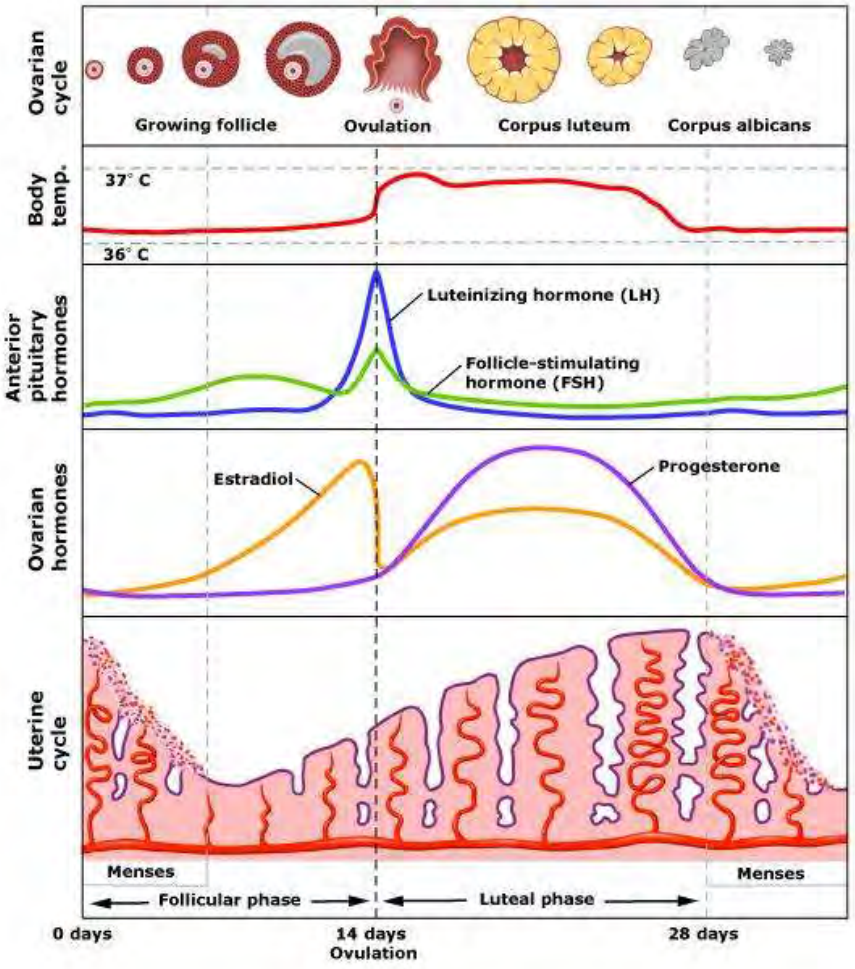
- n = 31

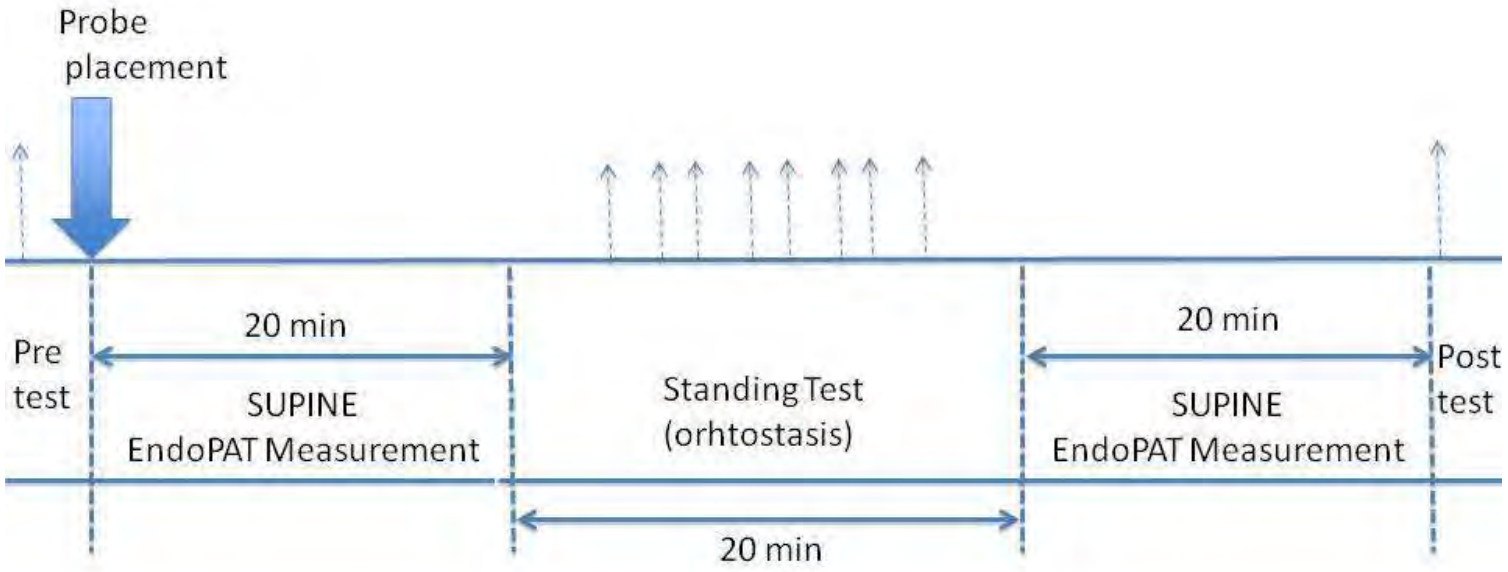
- 11 males,

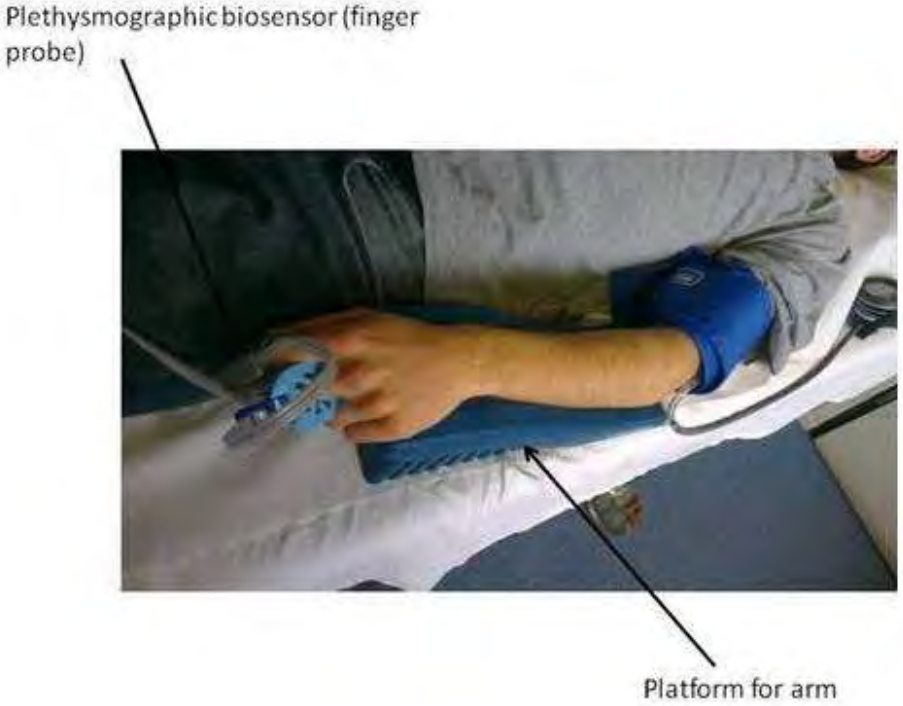
- 11 females having normal menstrual cycles

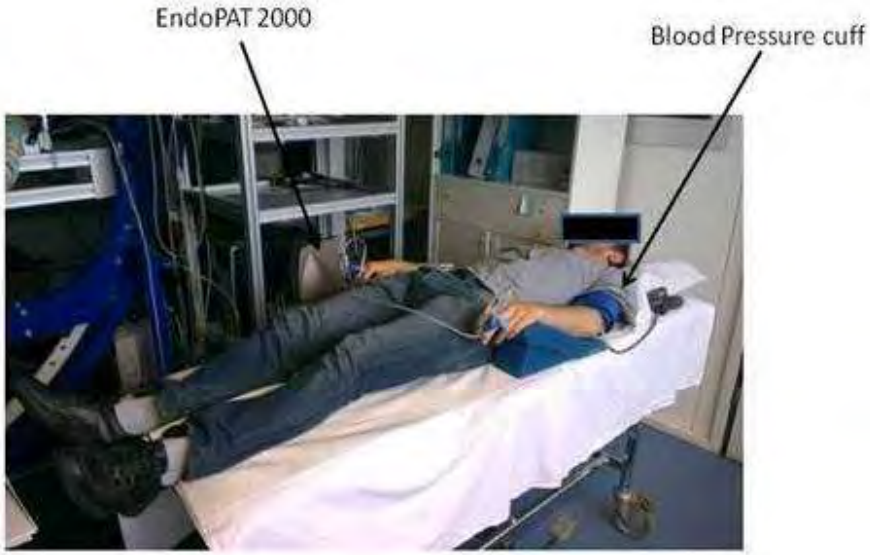
- 9 females on OCP

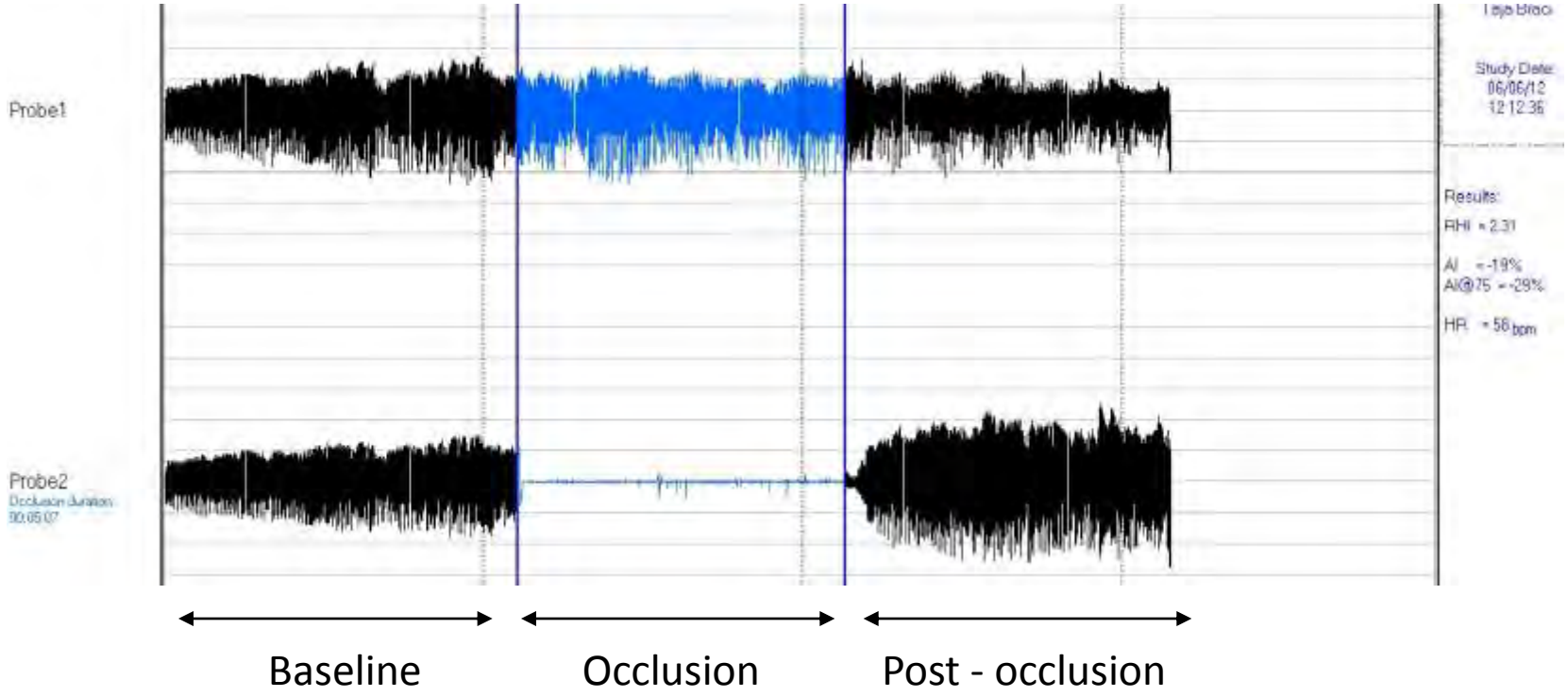
- Two visits per subject
- Normal menstrual cycle group – early follicular/mid luteal




Probe placement
Pre test
20 min
SUPINE EndoPAT Measurement
Standing Test (orhtostasis)
20 min
20 min
SUPINE EndoPAT Measurement
Post test
20 min


Plethysmographic biosensor (finger probe)
Platform for arm


EndoPAT 2000
Blood Pressure cuff

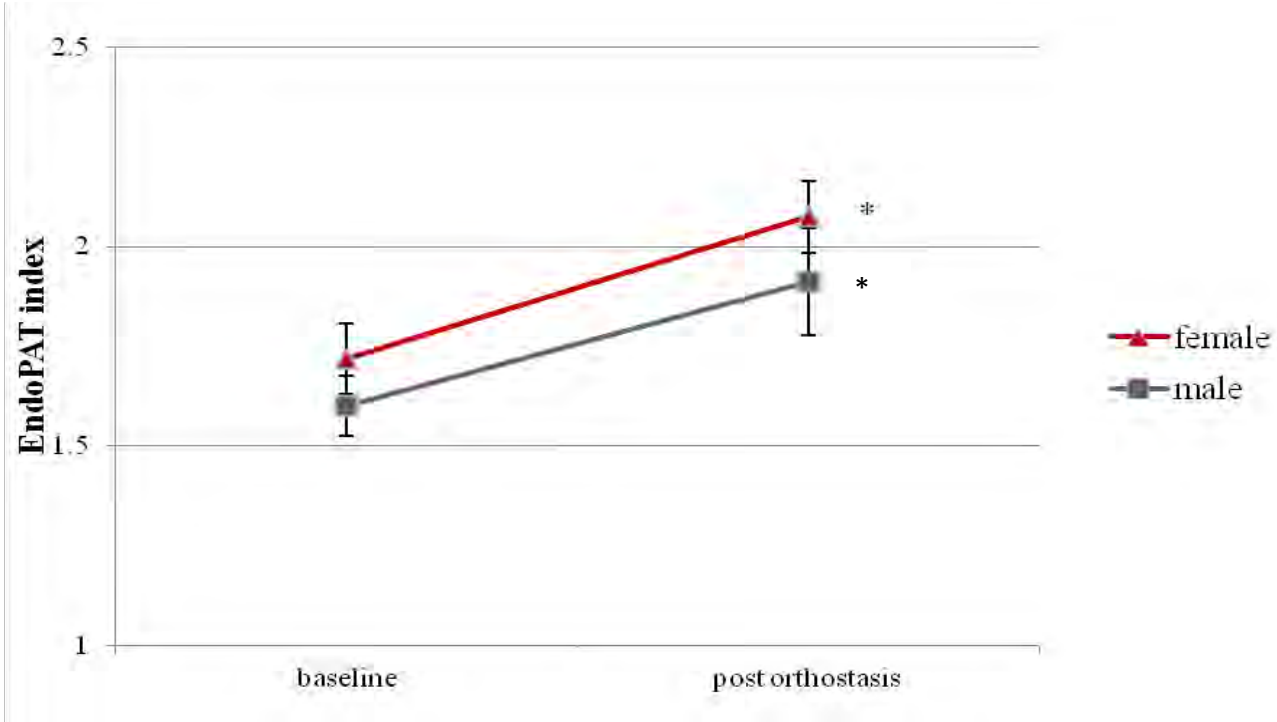


- The EndoPAT index : ratio of the post occlusion PAT signal to the baseline signal

Results

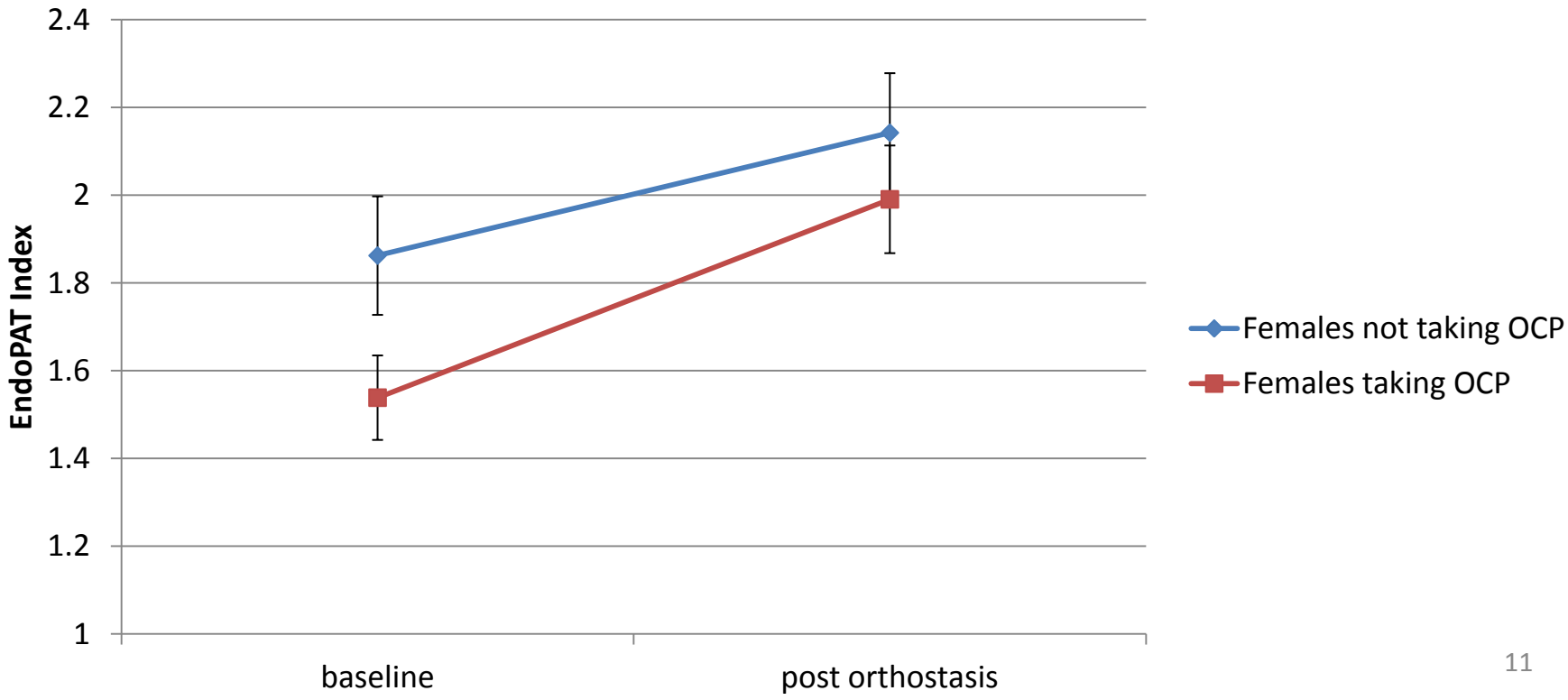
Post orthostasis

- In females : EndoPAT index ↑ 1.71 to 2.07 ($p<0.05$)
- In males: EndoPAT index ↑ 1.60 to 1.94 ($p<0.05$)



Results

	Difference in EndoPAT index post orthostasis early follicular phase	Difference in EndoPAT index post orthostasis in mid luteal phase
Mean	+0.36	+0.31
SEM	0.11	0.10



Summary

- Increased vasodilatatory endothelial response following orthostasis in both sexes
- EndoPAT device capable in showing changes
- No difference in response between the sexes
- Limited role of sex steroids in endothelial response to orthostasis

Implications for Space

- Endothelial response (NO production) may modulate sympathetic response to standing
- Could this be affected after space flight?
- Animal studies on rats - increase in endothelium driven vasodilatation following simulated microgravity (hind limb unloading) (Sangha et al., 2000; Vaziri et al., 2000).

Future Directions

- Microgravity / analogue studies
- Post menopausal women
- Studies with blood sampling

Acknowledgments

Dr. Nandu Goswami
Prof. Helmut Hinghofer-Szalkay

Dr. David Green

Sarah Day
Keith Wilson
Chris Pugh-Bevan