

Physical Activity and Obesity

Prof. Alan Donnelly
Faculty of Education
and Health Sciences



PE PAYS Research Centre



- formally **launched** in October of 2005
- **Goal:** to become recognized nationally and worldwide for the quality and impact of its research and service to Irish teachers, teacher educators, coaches, coach educators, and policy makers in support of an inclusive physically active culture in Ireland's schools and communities.
- PE PAYS **mission** is to advance the physical and social wellbeing of Irish children and youth through the creation and dissemination of knowledge on physical education, physical activity, and youth sport that informs both policy and practice.

Centre for Physical Activity and Health Research C-PAHR

- Established 2011
- **Aim:** to bring together a multidisciplinary group of researchers to undertake research convergent translational research on physical activity and health.
- **Multidisciplinary** team of 19 academics and researchers;
 - Physiologists.
 - electronic engineers.
 - Biomechanics.
 - Ergonomists,
 - Psychologists.
 - Clinical therapists.
 - Nurses and medics.

Research includes:

- Physical activity intervention in **clinical populations.**
- Research on the application of **biosensors** and technology in physical activity.
- **Physical activity and health in children and adolescents.**

C-PAHR: Adolescent physical activity and sedentary behaviour research.

- **Research Team Members/collaborators**
- Prof. Alan Donnelly
- Prof. Clodagh O’Gorman
- Prof Niall Moyna (DCU)
- Dr. Ciaran MacDonncha
- Mr Phelim Macken (CLLSP)
- Ms Elaine Barry (LCSP)
- Dr Alan Bourke
- Ph.D. Researchers:
 - Kieran Dowd
 - Deirdre Harrington
 - Sarah Hughes (DCU)
- **Key aims:**
 - To objectively quantify physical activity behaviour in female adolescents.
 - To objectively quantify sedentary behaviour.
 - To determine the relative influence of these factors on health.
 - To evaluate interventions that change behaviour.

Physical activity in female adolescents

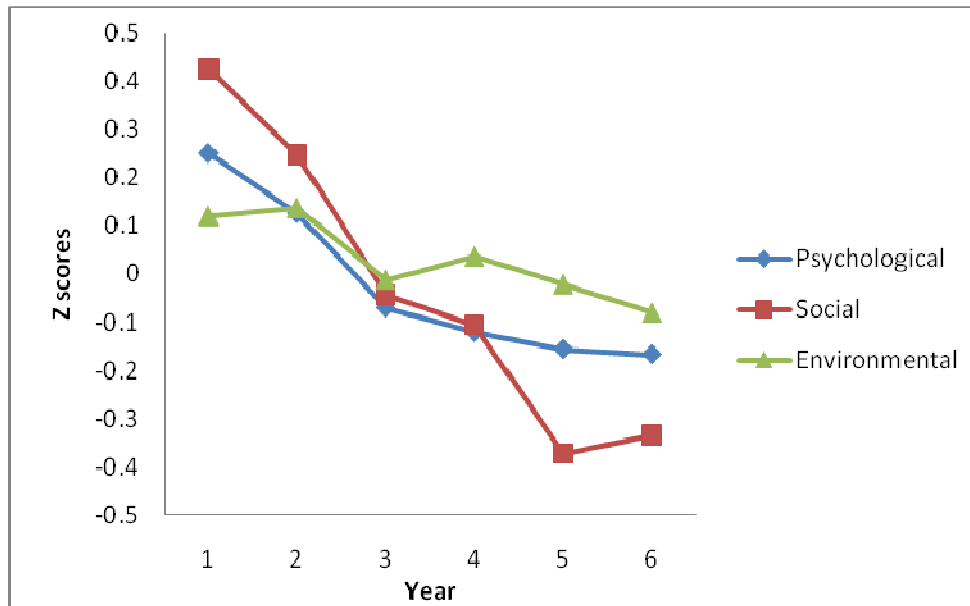
CSPPA Study, 2010: Table shows the % of primary and post-primary boys and girls who meet national minimum physical activity guidelines (wood *et al*, 2010).

(National sample of 1275 primary and 4122 post primary students. Measurement tool: physical activity questionnaire)

Age (Years)	% Males meeting guidelines	% Females meeting guidelines
10-12	27	13
12-13	24	13
14-15	16	8
16-18	7	6

International studies confirm that adolescent females are a particularly sedentary group

Determinants of physical activity in female adolescents (n=871)

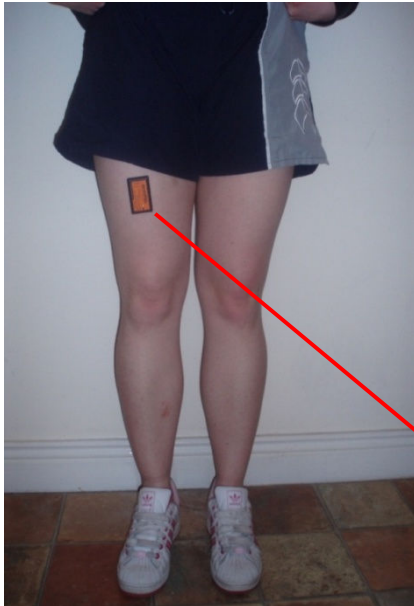


Females in more senior years in school reported significantly less positive physical activity correlate profiles (e.g. perceived competence, social support structures, facility access) than females in junior years.

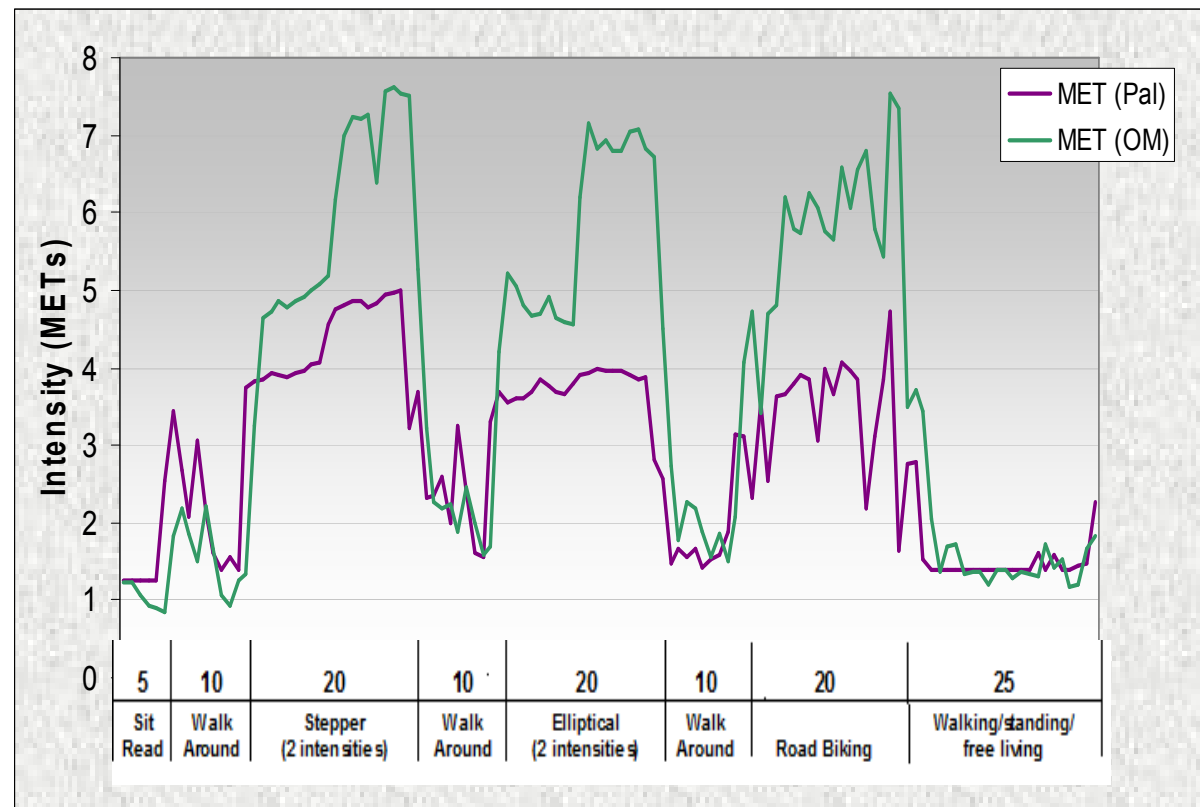
Objective measurement of physical activity: validating and using the ActivPAL accelerometer in female adolescents

Accelerometers give objective data on physical activity; working with ActivPAL device*

Accelerometer is validated using mobile expired gas analysis; overall correlation with metabolic measurement is **r = 0.92**



(*We also validated against actigraph device: Harrington et al., J. Sport Sciences, 29:627-633,2011)

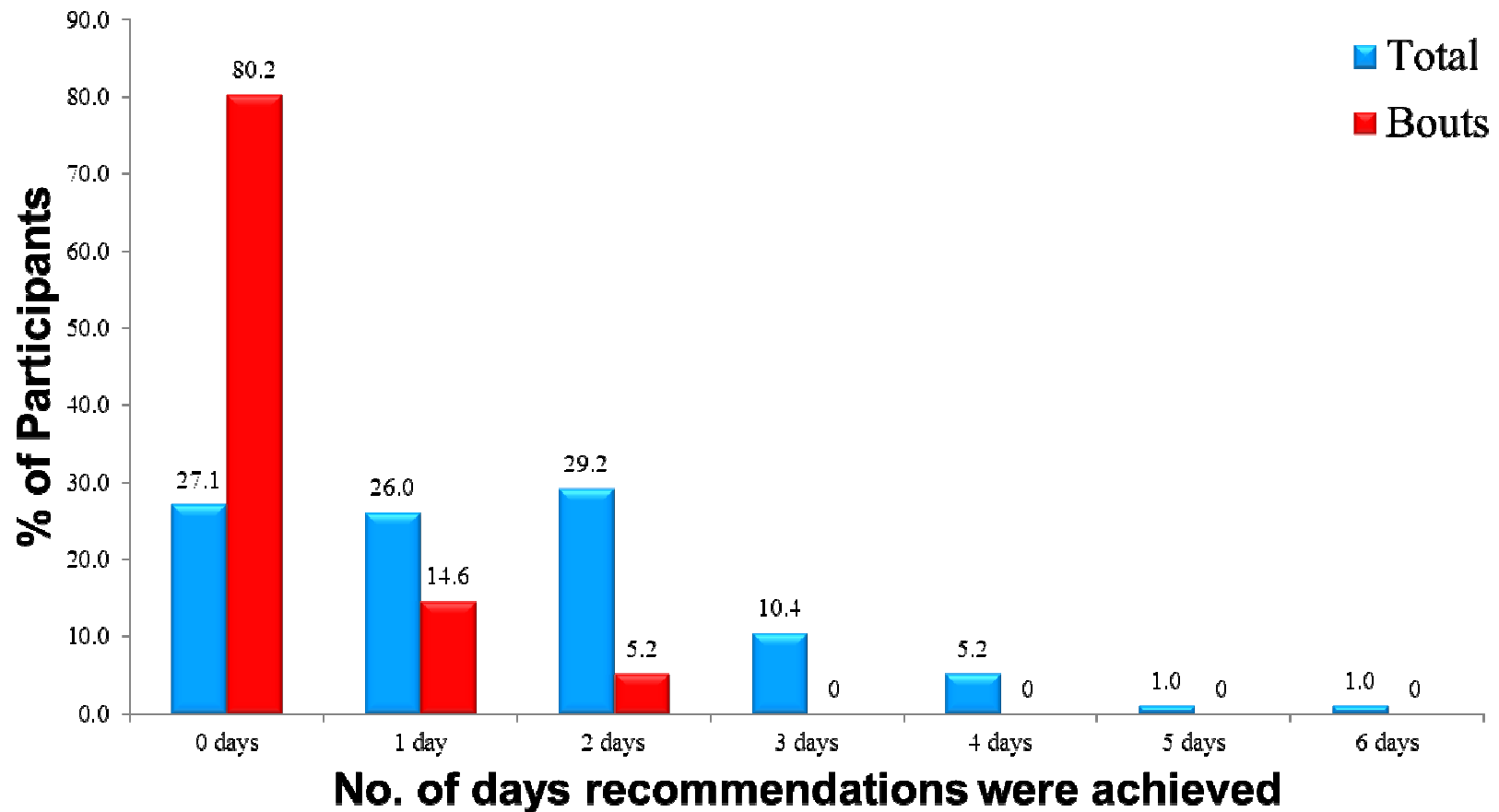




Physical Activity recommendations: Ireland

- **Dept. of Health & Children / HSE 2009**
 - **Children:** 60 minutes/ day moderate or vigorous activity per day.
 - **Adults:** At least 30 minutes per day moderate intensity endurance 5 days /week **OR** 75 minutes vigorous intensity/ week
 - “You can count shorter **bouts** of activity towards the guidelines. **These bouts should last for at least 10 minutes.** Add activities which increase muscular strength and endurance on 2–3 days per week.”
 - Source: www.getirelandactive.ie

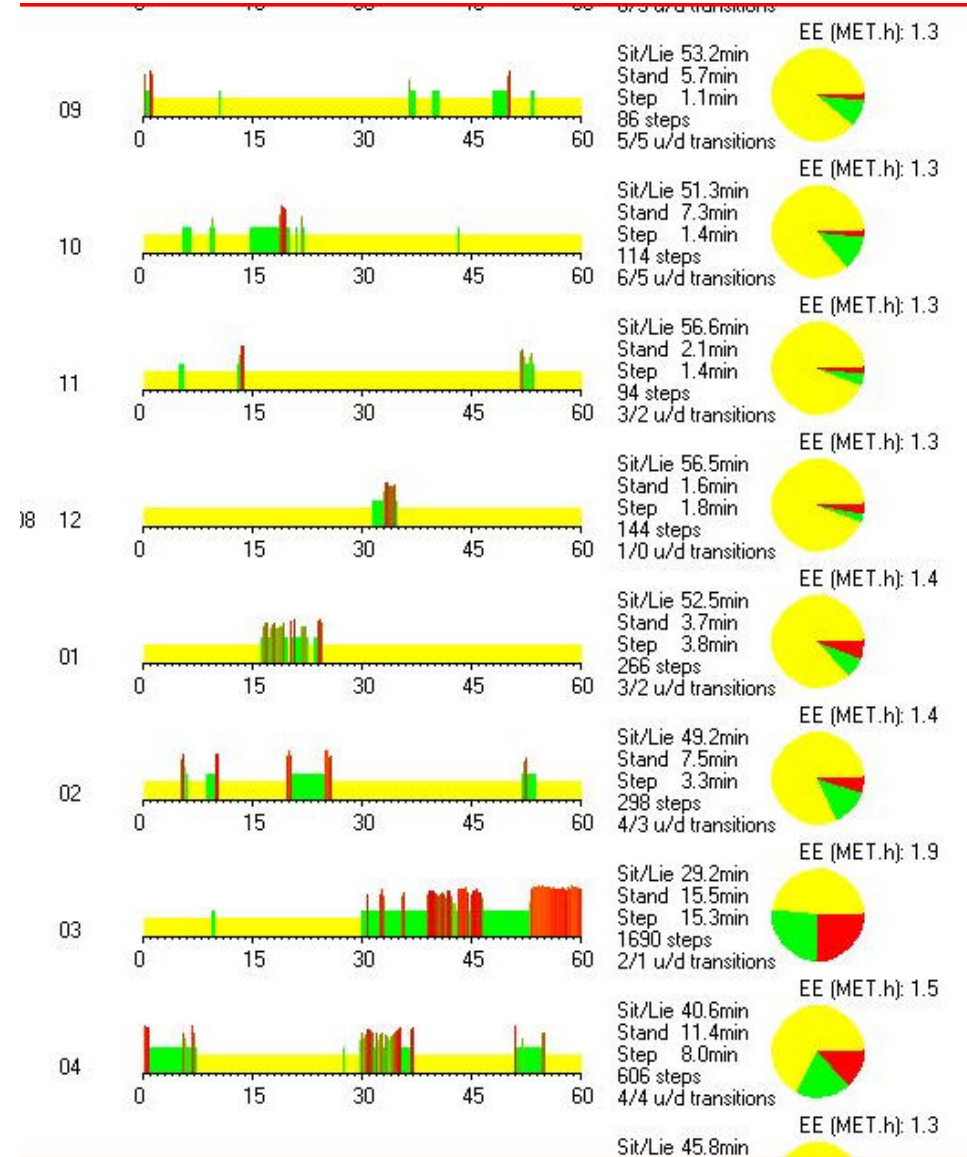
**Physical Activity in 15-18 year old adolescent girls:
no of days in a 6 day recording when physical activity
guidelines were met.
(n=96; accelerometer data collected in 2009, Limerick)**



Sedentary Behaviour and Health

- **Sitting** for long periods has been linked to type 2 diabetes and cardiovascular health risk.
- Research suggests that **sitting time** as a risk factor is independent of moderate to vigorous physical activity^{1,2}
 - ¹Healy et al., 2008; Diabetes care 31:661-666
 - ²Jakes et al., 2003; J Clin Nutr 57: 1089-1096
 - ³Hamilton et al., 2007: Diabetes 56:2655-2667.
- **Prolonged sitting** (in bouts greater than 20 minutes) may contribute to **obesity**, cardiovascular disease and type 2 diabetes as a result of metabolic changes within leg muscles when they are unloaded during sitting³.
- There is a need to **objectively** measure sitting/lying time in addition to physical activity time.

Objective measurement of sedentary behaviour: ActivPAL

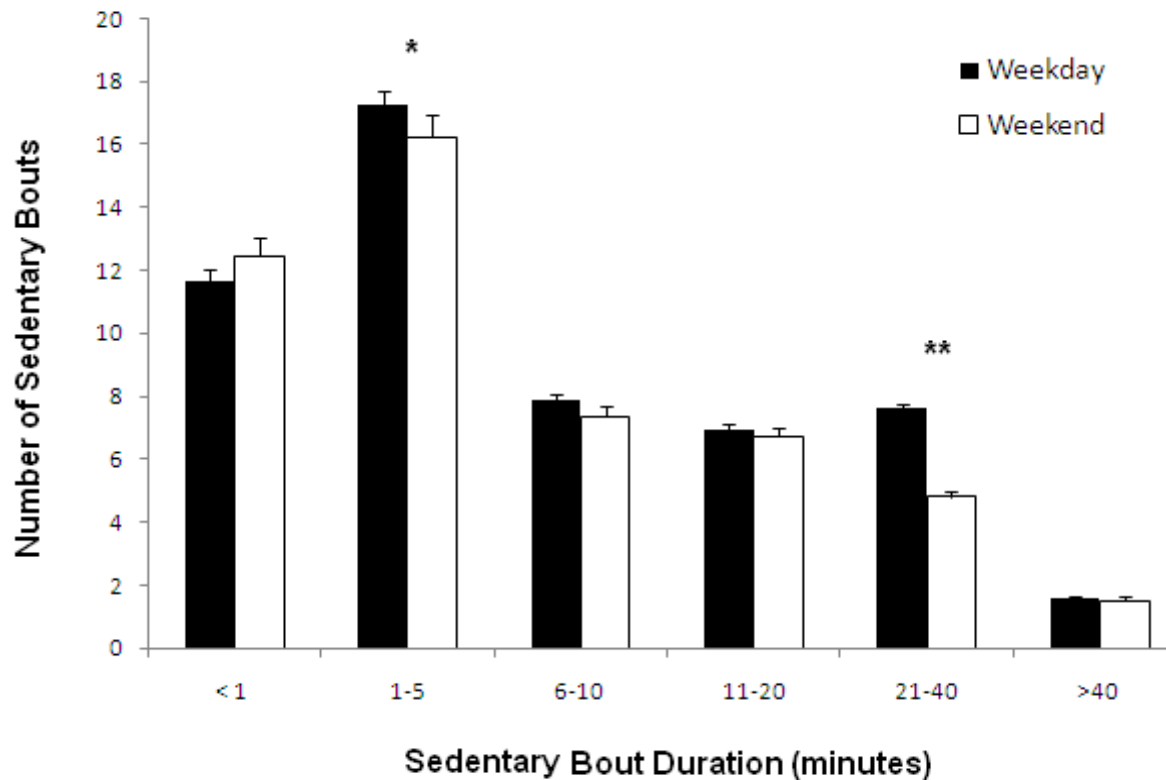


Sedentary patterns in adolescent girls.

Data from 111 adolescent females aged 15-18

Mean % of 24 hour day sedentary: **78.4%** (SD 6.3%)

Conclusion from graph: **more long periods of sitting during weekdays.**



(Values are mean + SEM)

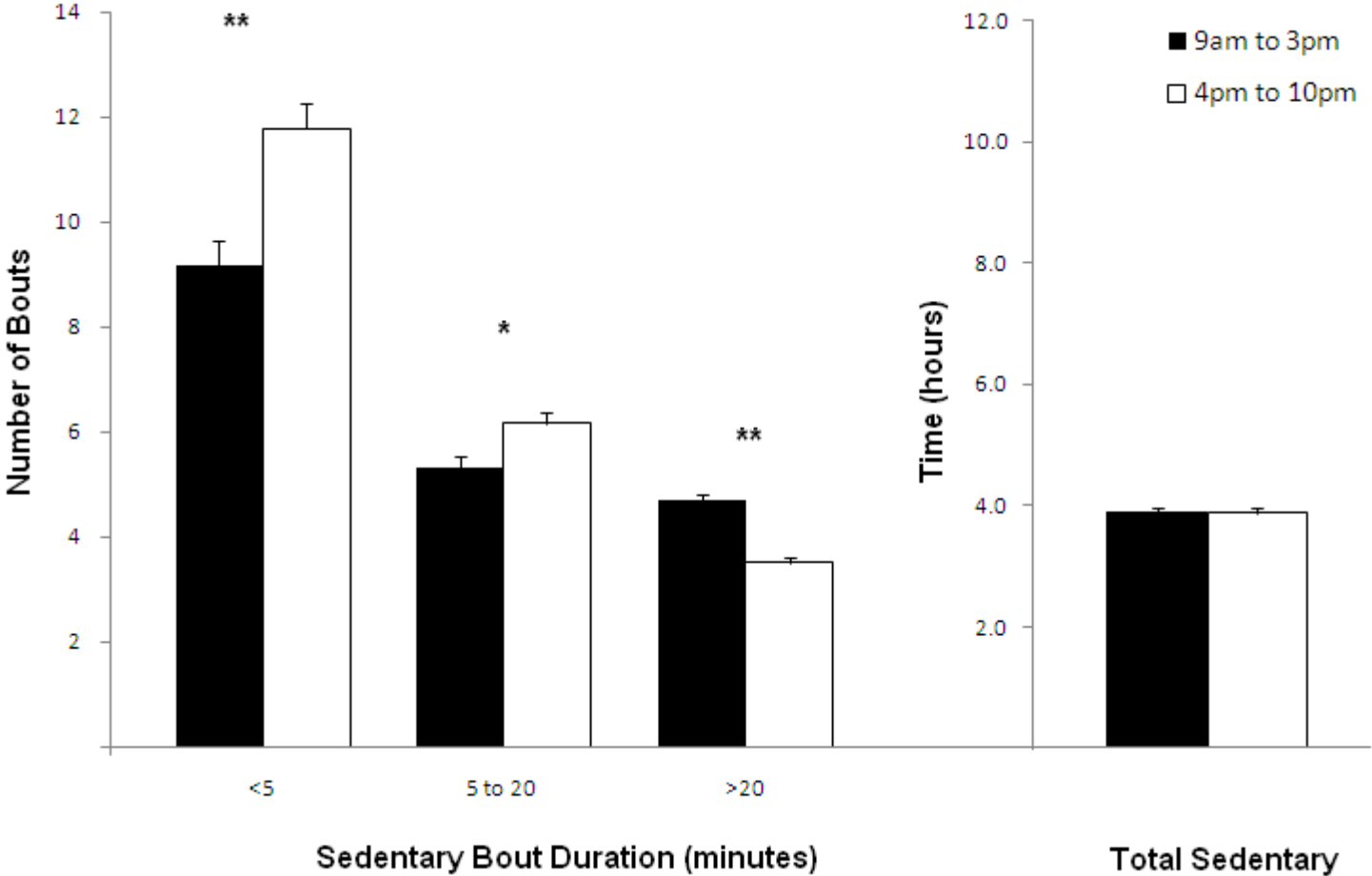
(Accepted for publication,
International
Journal of Behavioural
Nutrition and Physical
Activity).

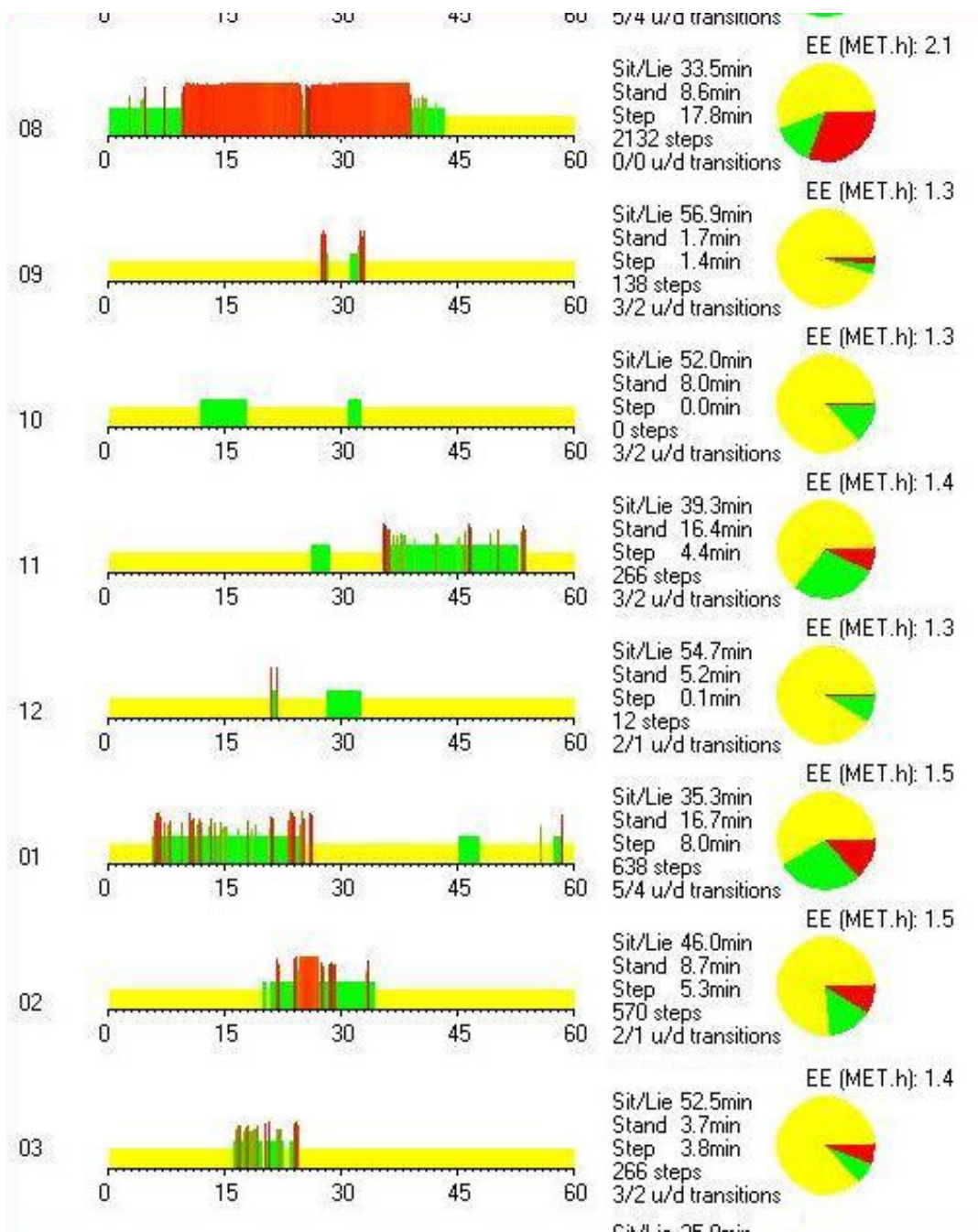
What part of weekdays is most sedentary?

Data from 111 adolescent females aged 15-18

Conclusion: though total is the same, there were

longer bouts of sitting during daytime than in the evening.





Sedentary behaviour in adolescent girls: Example ActivPAL output.

30 Minutes PA but Sedentary School Day

How do these different behaviours impact upon health?

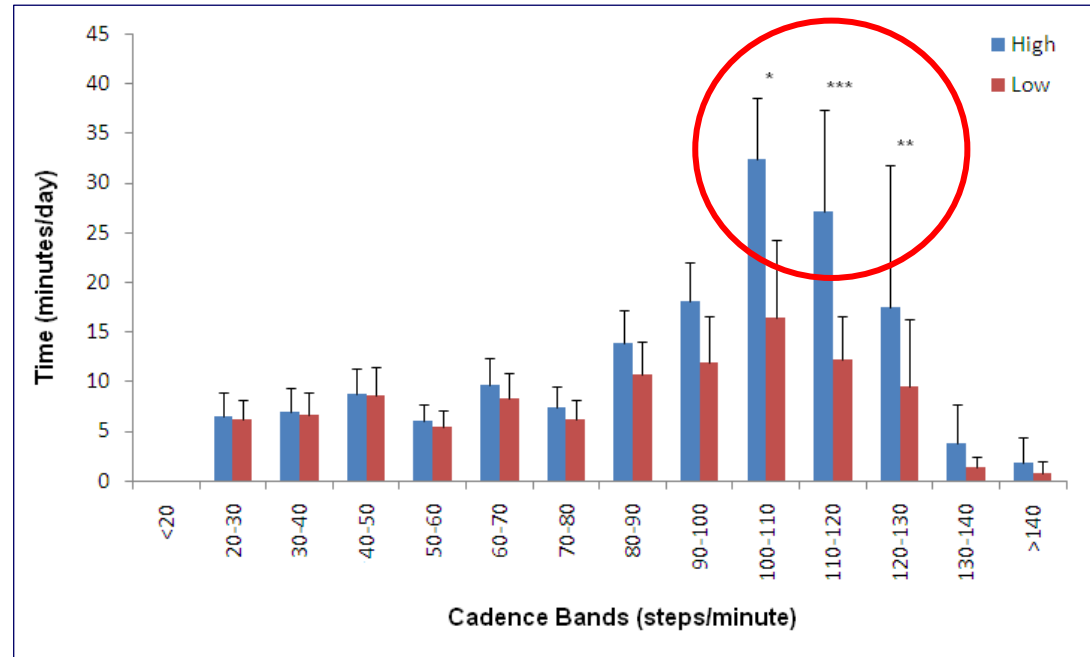
Current research study

(Supported by CLLSP, LCSP and BDO)

- What **relative effects** do **sedentary behaviour** and **physical activity behaviour** have on health?
- Correlative study, 100+ females tracked over a one year period.
- Physical activity and sedentary behaviour measured over the year using ActivPAL.
- Measurement of a range of health related markers, including:
 - body composition
 - aerobic capacity
 - blood pressure
 - pulse wave velocity
 - carotid artery medial layer thickness
 - blood cholesterol profile
 - fasted glucose and insulin

Inducing behavioural change.

- How can we persuade adolescents or adults to change behaviour?
- Interventions can be costly with rapid decline in gains after completion.
- Need simple solutions



One solution: encourage walking at 100 steps / minute or above.

Simple, easy to achieve and cheap to administer.

(Paper under review, Pediatric Exercise Science)

Thank
You!



GLASBERGEN

© Randy Glasbergen.
www.glasbergen.com

**“What fits your busy schedule better,
exercising one hour a day or being
dead 24 hours a day?”**



UNIVERSITY of LIMERICK
Ollscoil Limerick