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# Helping older adults sit less and walk more: pedometers, SitFIT™ and other devices

**'Get a move on'**  
London 27 June 2017  
Professor Nanette Mutrie MBE  
CPsychol FBASES FHEPA-Europe  
Director of Physical Activity for Health Research Centre  
University of Edinburgh  
Tweet: @nanettemutrie



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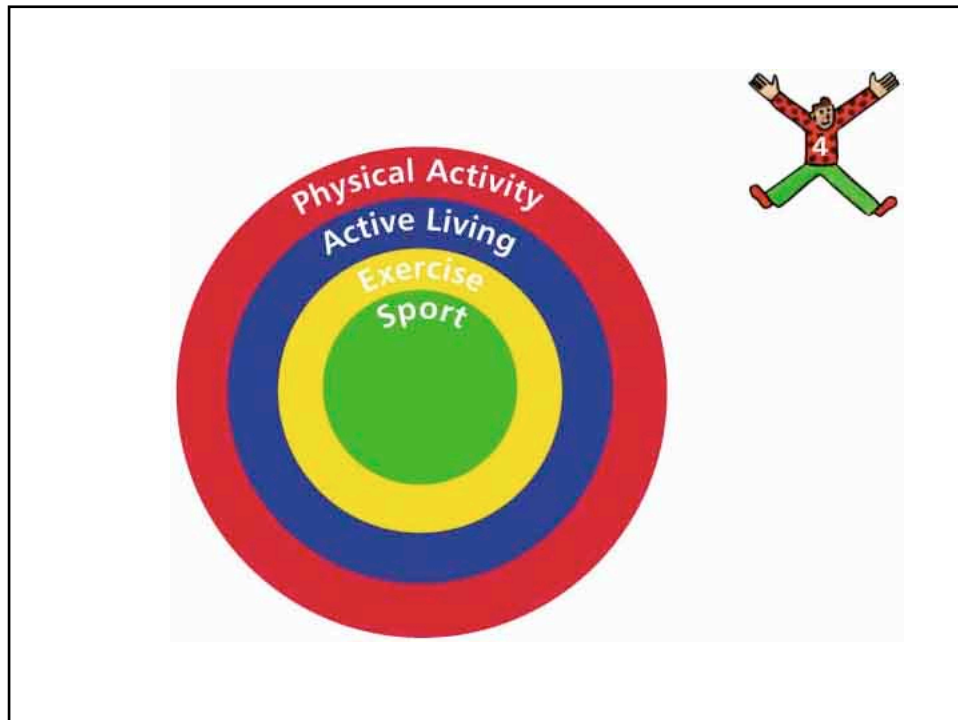
## The Conference challenge

- During the day stand as often as you can
- During the day try to accumulate at least 1,000 steps
- Conference guidance:
  - Please wear your activity tracker such as Fitbit if you have one. If not, please download an activity tracker onto your phone in advance of the workshop



- Physical inactivity has reached 'Pandemic' proportions
- Interventions are needed!
- July 2012
- July 2016

The cover of 'THE LANCET' report features the title in large, bold, black letters. Below it, the subtitle 'Physical Activity 2016: Progress and Challenges' is written in a smaller, blue font. A vibrant, abstract illustration of people in motion is centered on the cover. At the bottom, a quote reads: "We urge all sectors of government and society to take immediate, bold actions to help make active living a more desired, affordable, and accessible choice for all population groups."



## Regular physical activity reduces risk of:

- All-cause mortality
- Coronary heart disease
- High blood pressure
- Stroke
- Falling
- Metabolic syndrome
- Type 2 diabetes
- Breast cancer
- Colon cancer
- Depression

Lee et al. , Lancet, July 2012



## Physical Activity Strategy for the WHO European Region 2016-2025

Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020

Physical activity strategy for the WHO European Region 2016-2025

**World Health Organization**  
REGIONAL OFFICE FOR Europe



## PAS 2016-2020: key highlights

- Coordinating mechanisms
- Promote alliances
- Pregnancy, early childhood, preschools and schools, recreational
- Car traffic, walking and cycling suitability
- Counselling, prevention, treatment and rehabilitation
- access for vulnerable groups, **advice to older people**
- Infrastructure and environment **older people**
- **Involve older people** in social PA
- Strengthen surveillance systems and evidence base



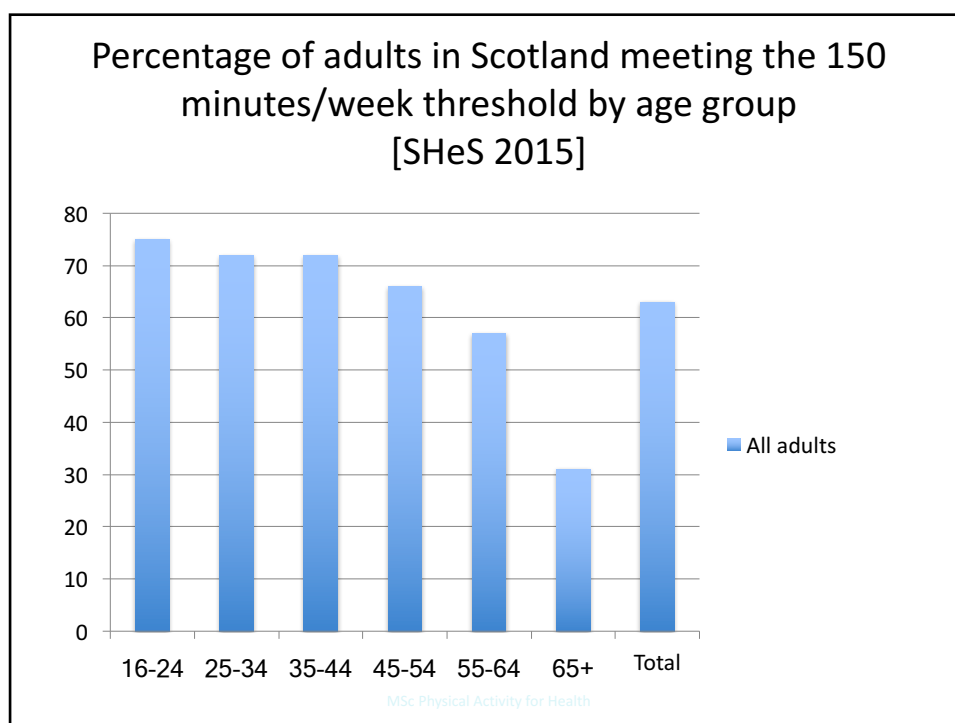
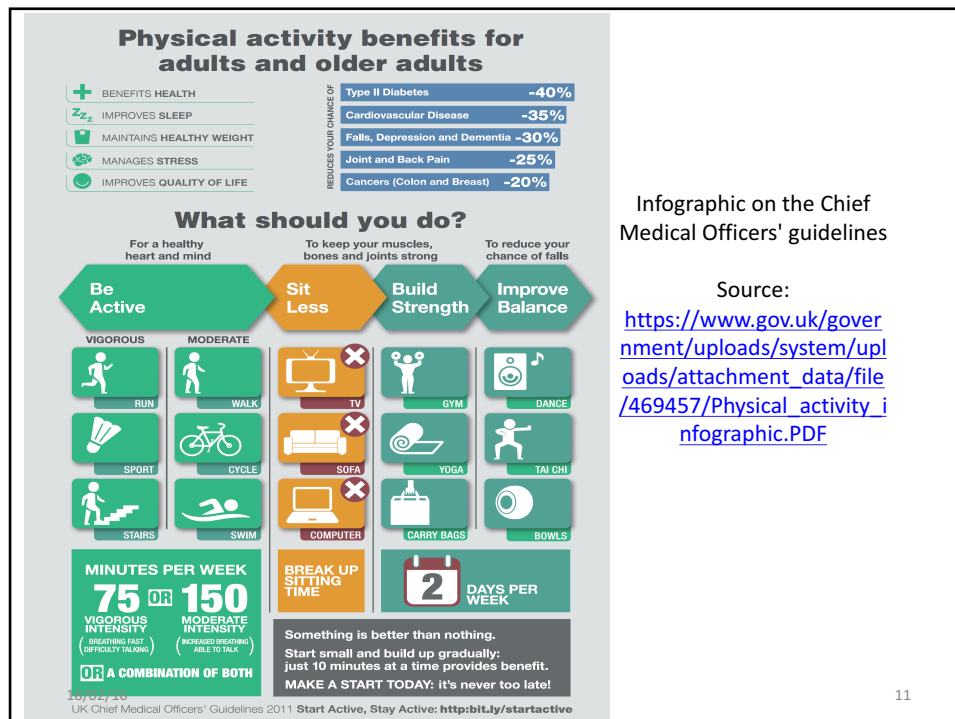
## Physical Activity Recommendations



- What are the current recommended types and amount of physical activity for health gain?

For those over 65 years





## Nearest activity to perfect exercise –

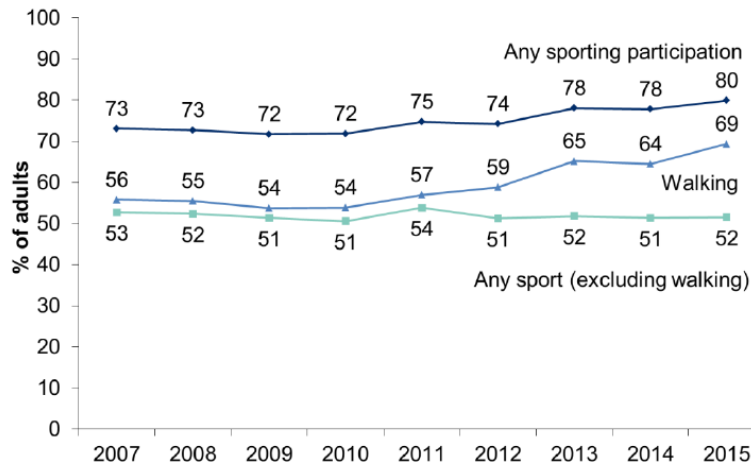
Morris 1997

- Free
- No equipment
- Accessible to almost everyone
- Safe & low risk of injury
- Popular activity
- Social
- Incorporate into daily lives
- Physiological and psychological benefits established
- Good start point for the inactive
- Can build self efficacy for other PA



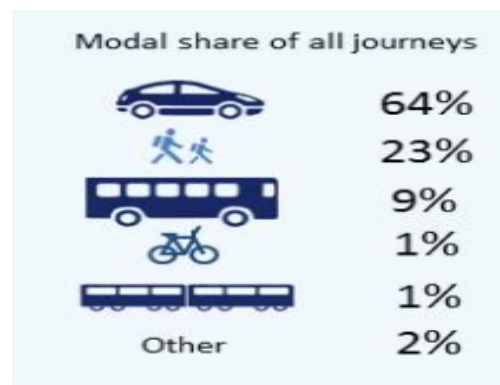
## 2015 Scottish Household Survey (SHS)

**Figure 9.2: Participation in sport and exercise in the last four weeks**  
Percentages, 2007 to 2015 data (minimum base: 9,130)



MSc: Physical Activity for Health

## Scottish Transport Statistics 2014



## Active transport - data from Scottish Household survey 2014

- Around one quarter of all journeys are active journeys [26%]
- Of these 4% are by bike and 96% on foot
- Those in older age groups were less likely to report an active journey stage than those in the 16-to-24 age group
- People living in the most deprived areas were more likely to report an active journey stage than those in the least deprived area

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## WEST END WALKERS 65+:

Mutrie, et al., (2012). *Family Practice*.





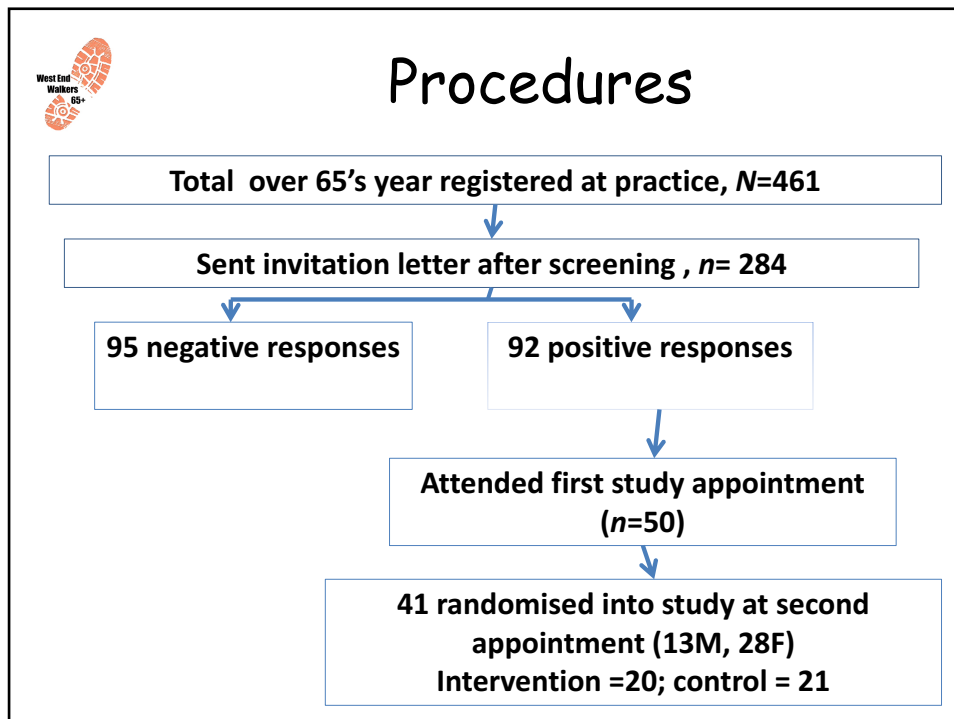
## Objectives

- Assess the feasibility of a pedometer-based walking programme in combination with physical activity consultations for older adults
- Use a primary care setting
- Train a practice nurse to deliver the intervention
- An alternative to exercise referral
  - Pavey, et al. (2011). Effect of exercise referral schemes in primary care systematic review and meta-analysis. *BMJ*, 343.



## Methods



- *Design:*
  - Two-arm (intervention/control) 12-week randomised controlled trial
  - with a 12-week follow up for the intervention group.
- *Setting:*
  - One general practice in Glasgow, UK
- *Participants:*
  - Were aged  $\geq 65$  years.



**West End Walkers 65+**

# Intervention

- The intervention group
  - received two 30-minute physical activity consultations from a trained practice nurse
  - a pedometer and a walking programme.
- The control group
  - continued as normal for 12 weeks and then received the intervention.
- Both groups were followed up at 12 and 24 weeks.

**West End Walkers 65+**

**Walking Programme - Week 1**

Aim: To walk at least 1,000 steps on at least 3 days of the week.

Baseline daily step count: \_\_\_\_\_

Target for at least 3 days: \_\_\_\_\_

- Extra walking time can be broken up into 10 minute chunks.
- Walking should be done at a pace that is comfortable. It should not be at a pace where you feel breathless, uncomfortable and may need to stop.

**Walking Guide**

Day of Week	How often and when	Steps achieved
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		

**Daily step counts:** Some people find it helpful to note their daily step counts, when they wake up or come to bed. If you find this useful, please bring your diary to the next session.

Day	1	2	3	4	5	6	7
Steps walked							



## Selected outcome measures

- Step counts and activity patterns over one week
  - Recorded with The *activPAL*™ monitor (PAL Technologies Ltd, Glasgow, Scotland)
  - The *activPAL* is worn continuously throughout the monitoring period but has no visible display.



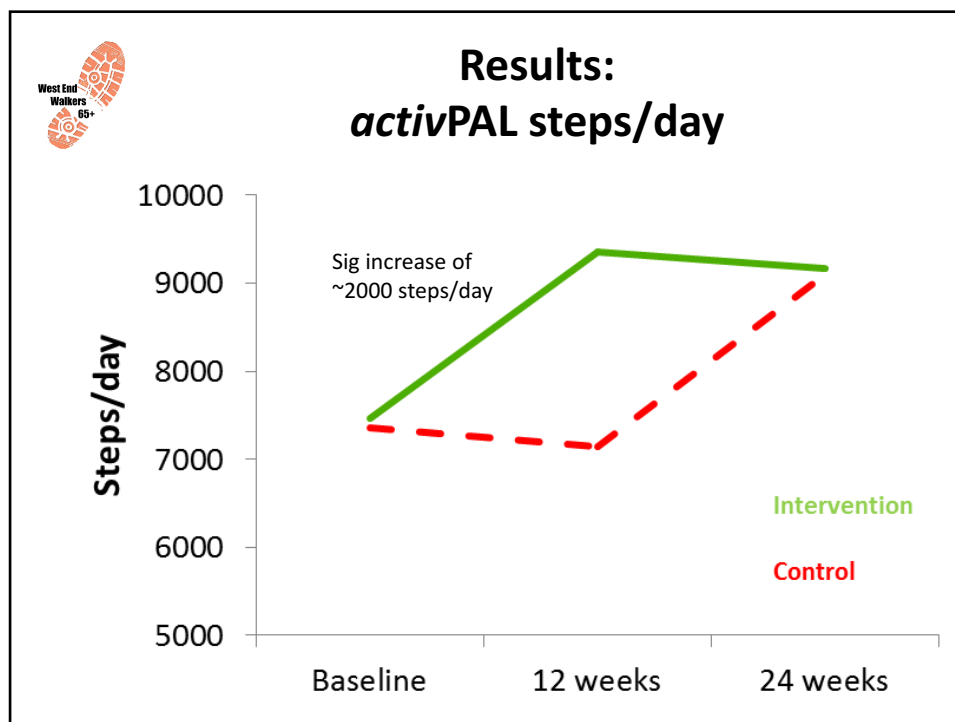
## What is sedentary behaviour?

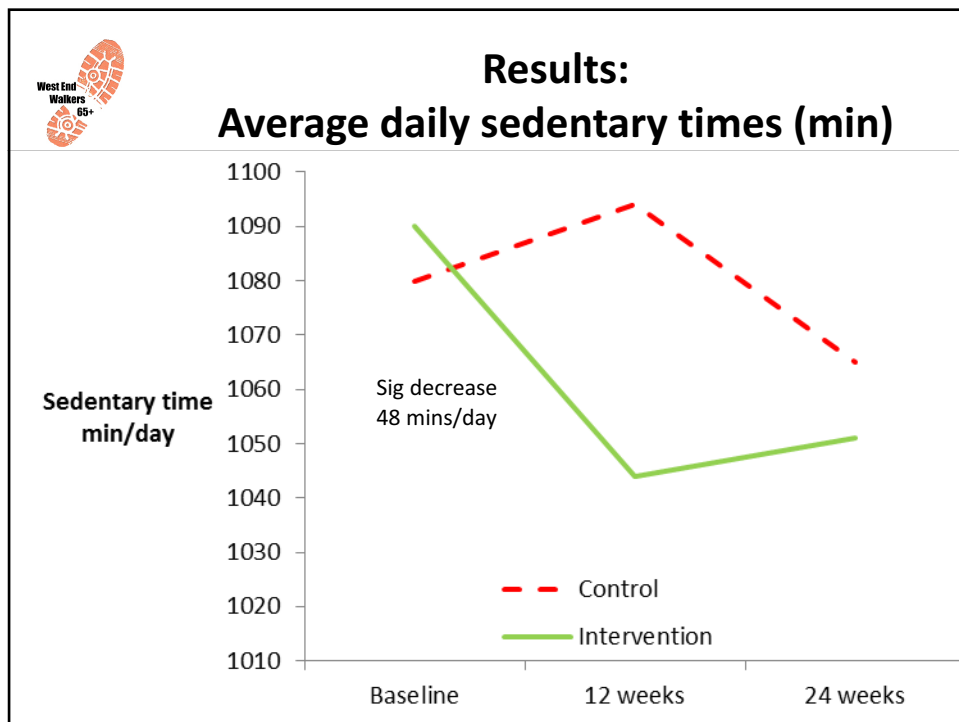
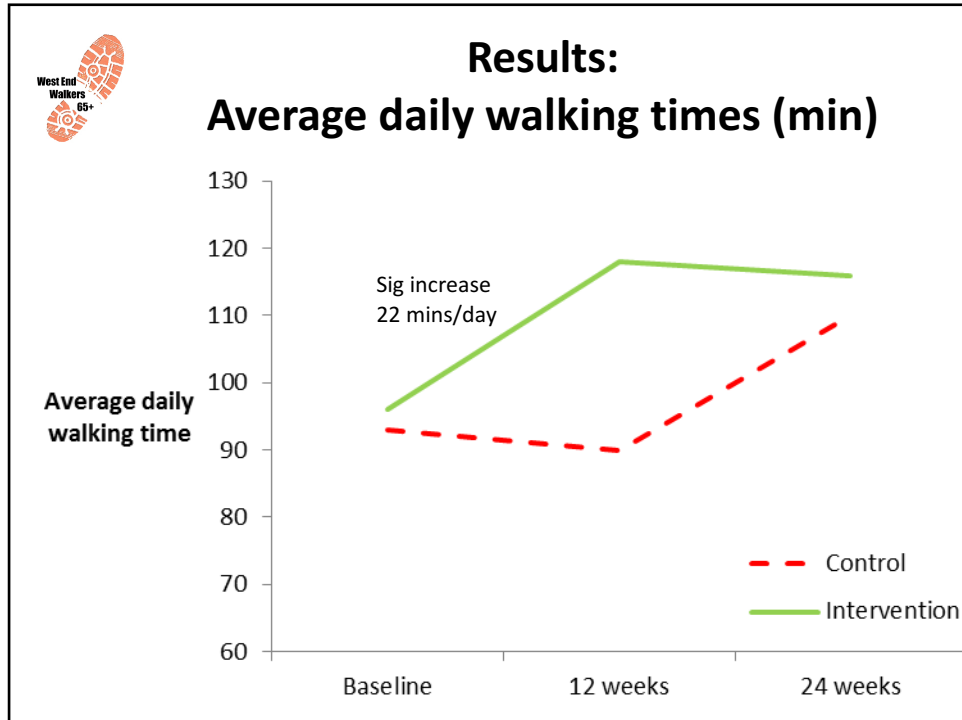
- Any waking behaviour where sitting or lying is the dominant mode of posture
- Energy expenditure is very low
- Screen-time (TV viewing, computer use), motorised transport, sitting at work, sitting to read, talk, or listen to music



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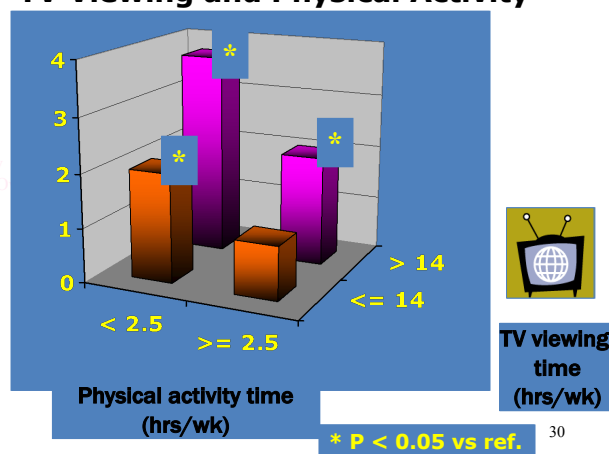
## Why is sitting bad for us?

- Human beings are designed to move
- PA guidelines 150 min per week of MVPA
- Only 1.5% of a total week (or ~ 3% of the time we spend awake)

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### Odds of Metabolic Syndrome in Women – TV Viewing and Physical Activity

Dunstan et al. (2005).  
*Diabetologia*  
48, 2254-2261.



TV viewing  
time  
(hrs/wk)

30

## Why is sitting bad for us?

- Sedentary behaviours account for ~55% of a typical day
- Supporting the mass of the body in combination with spontaneous movement or very slow ambulation (1 mph) raises whole-body energy expenditure 2.5-fold more than when seated still

Hamilton, Hamilton, Zderic  
*Diabetes* 56:2655–2667, 2007

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## Why is sitting bad for us?

- More time spent sedentary, less time spent in light intensity activity
- Energy expenditure decreases
  - Increased likelihood of overweight/obesity
  - Increases the risk of diseases like cancer

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## Why is sitting bad for us?

- Lack of muscle contraction during sitting has been shown to suppress activity of an enzyme (lipoprotein lipase)
  - reduces the ability of the body to remove harmful fats from the bloodstream
  - significantly decreases 'good' HDL cholesterol

Hamilton, Hamilton, Zderic  
*Diabetes* 56:2655–2667, 2007

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## Why is sitting bad for us

### LPP1 expression

- Suppression of a key gene (LPP1) by over 50 %
- LPP1 regulates blood clotting and controls inflammation
- After 12 hours of sitting in humans
- Exercise was relatively ineffective at counteracting this effect

Zderic T, Hamilton M: *Lipids in Health and Disease* 2012,  
11(1):137.

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## Problems with too much standing!

- Varicose veins
- Circulatory issues: swelling in the feet and ankles, possible joint pain
- Pregnancy problems
- Need to find a balance and not demonise sitting!

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## Focus group discussions

- Conducted with each study group (intervention and control) upon completion of the 12-week programme.

## Support & monitoring - pedometer



- 121 (FG2): Yes I think the pedometer's pretty essential, just walking in vacuum would be pretty difficult.
- 107 (FG2): Walking before was alright, I enjoy walking, but I think when you've got your meter on you try to get a wee bit better you know.
- 122 (II): If I was near the target I would, march up and down the hall about 20 times to make it right [group laughs].



## Behaviour change techniques [BCTs] in relation to walking



- The most frequently used BCTs in walking studies were:
  - “Prompt self-monitoring of behavior”
  - “Prompt intention formation”
- In terms of walking
  - the pedometer offers a perfect tool

- Bird EL, Baker G, Mutrie N, Ogilvie D, Sahlqvist S, Powell J. Behavior Change Techniques Used to Promote Walking and Cycling: A Systematic Review. *Health Psychol.* 2013 Mar 11. PubMed PMID: 23477577.



## Conclusions and future directions

- It is possible to persuade older adults to walk more
  - Pedometers and graduated programmes seem key
  - Such programmes may also reduce sitting time
- Walking should be considered as a preventative opportunity for older adults to maintain functionality
  - primary care good setting
  - potential population reach good
  - Larger trials needed

Mutrie, et al.,  
(2012). *Family Practice*.



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### PACE-Lift

- **Harris T**, et al. A Primary Care Nurse-Delivered Walking Intervention in Older Adults: PACE-Lift Cluster Randomised Controlled Trial. *PLoS Med* 2015 12(2):
- *This pedometer trial showed increases in objectively measured physical activity*



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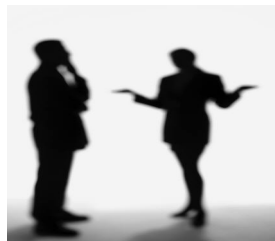


## PACE-UP

- **Harris T, et al.** Effect of a primary care walking intervention with and without nurse support on physical activity levels in 45 to 75 year olds: the Pedometer And Consultation Evaluation (PACE-UP) cluster randomised clinical trial. *PLoS Med.* 2017; 14 (1):
- *This primary care pedometer trial showed significant increases in steps at 12 months, with no difference between nurse and postal groups.*

## Stand up [if you want to] and discuss with neighbour

- Does your GP practice offer activity advice via the practice nurse?
- What are the barriers to having this available in every practice?





## Football Fans in Training: a gender sensitised weight loss, physical activity and healthy lifestyle programme for men



Hunt, K et al. (2014). *Lancet*. (13) 62420-4



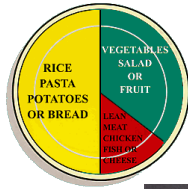
## Men and weight loss

- 5-10% weight loss can produce significant health benefits (NICE 2006; SIGN 2010)
- Traditional weight management services do not reach many men

- Less than 15% of referrals to commercial sector (Jebb et al Lancet 2011)
- Only 23% of attendees at NHS weight management services (Counterweight Br J Gen Pract 2008)



## FFIT weight loss components



### Food

- Portion sizes
- Healthy, balanced diet

### Alcohol awareness



### Long-term behaviour change strategies



**BANTER**



### Weight loss

Goal 5-10% weight loss

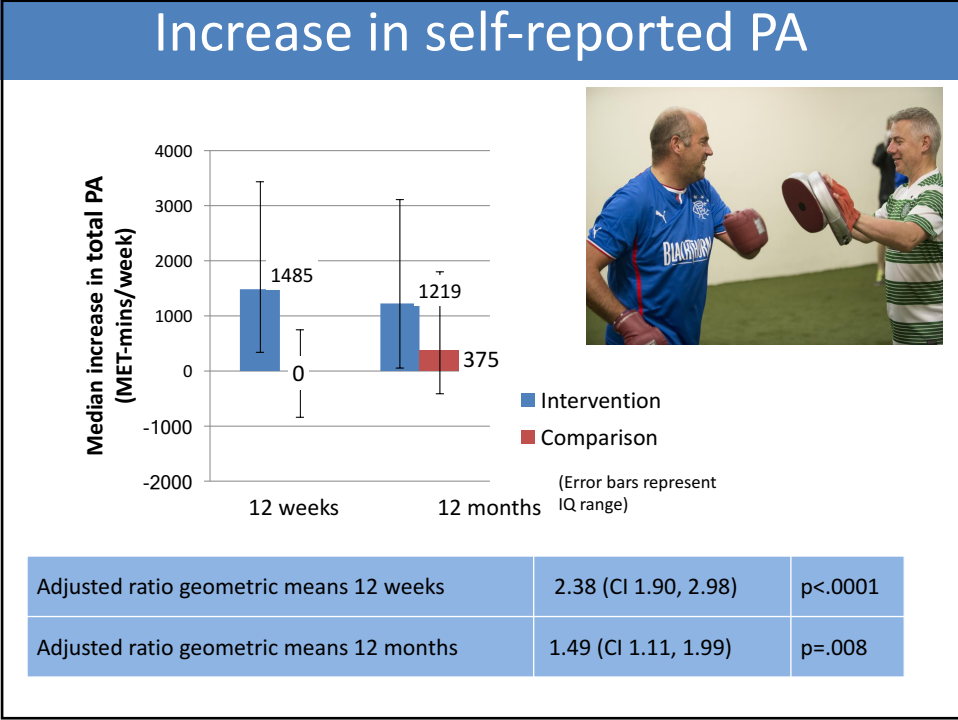
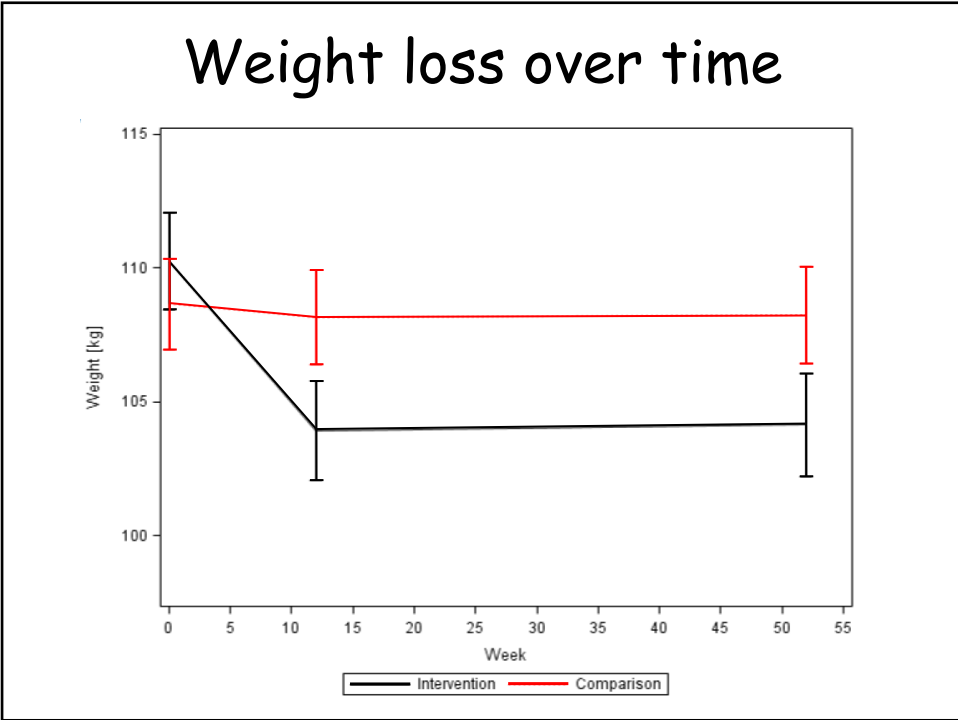


**INCREASED PHYSICAL ACTIVITY**

## What makes men want to attend FFIT?



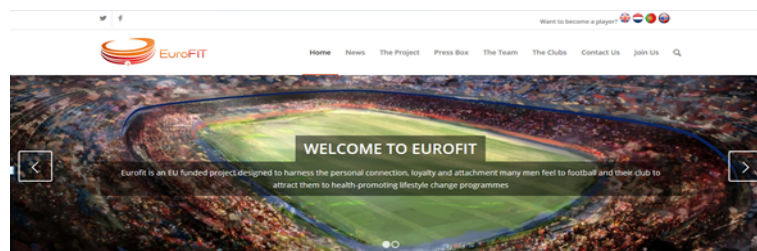
Hunt et al, 2014, *BMC Public Health*



## The value of the pedometer and walking

- The **pedometer** was widely accepted and its use quickly became **routinized** in men's daily lives
- A valued technology for **motivation, self-monitoring, and goal-setting**

It's given me a good kick up the backside... every day after I've had my shower and got dressed, the first thing that I do is put my pedometer on...it's made me consciously go out of my way to walk more. (T1-6)



EuroFIT: Social innovation to improve physical activity and sedentary behaviour through elite European football

Social innovation to improve physical activity and sedentary behaviour through elite European football clubs

FP7-HEALTH.2013.3.3-1-  
GA602170; **5.957.168€**

Principal Investigator: **Sally Wyke,**  
**Ph.D.**

<http://eurofitfp7.eu/>

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 602170.







**WELCOME TO EUROFIT**

Eurofit is an EU funded project designed to harness the personal connection, loyalty and attachment many men feel to football and their club to attract them to health-promoting lifestyle change programmes

**AIM:**

(...) to develop a **programme** that engages *inactive men* aged **30-65**, with **BMI  $\geq 27$**  in becoming *more active*, *sitting less* and *eating a healthier diet*.

England



The Netherlands



Portugal



Norway



## SitFIT – the package



18/07/2016

<http://eurofitp7.eu/>

## Testing the feasibility of SitFIT™

- The aim of this study was to evaluate the feasibility of a new pocket-worn sedentary time and physical activity real-time self-monitoring device (SitFIT™).

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<http://eurofitfp7.eu/>

## SitFIT - sed time +steps

<http://eurofitfp7.eu/>



## SitFIT – upright time +steps



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## SitFIT – % time sedentary



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<http://eurofitp7.eu/>

## SitFIT – 7 day record



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<http://eurofitp7.eu/>

## Methods

- 40 sedentary men
- Randomized into two intervention groups
  - One group received a SitFIT™ providing feedback on steps and time spent sedentary (lying/sitting)
  - the other group received a SitFIT™ providing feedback on steps and time spent upright (standing/stepping).
  - 4 weeks with 6 week follow-up

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<http://eurofitp7.eu/>

## Results + conclusion

- The SitFIT™ was reported as acceptable and usable, and seen as a helpful and motivating tool to reduce sedentary time by both groups.
- Both groups decreased sedentary time and increased upright time.
- SitFIT™ is a feasible device
  - Upright time on front display



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<http://eurofitp7.eu/>


# SENIORS USP

## UNDERSTANDING SEDENTARY PATTERNS


 UNIVERSITY OF  
BIRMINGHAM

 University of  
**Salford**  
MANCHESTER

## Study Overview:



### What?

- 7 day objective measurement of SB - activPAL monitor
- self-report measures of SB
- previous and current wave cohort data
- interviews with sub-sample



### Who?

#### Lothian Birth Cohort 1936:

n=271 aged ~ 79 years

age 11 general cognitive ability

4 cohort waves aged 70- 79

general cognitive ability; detailed cognitive battery; personality questionnaires;  
physical function; biomarkers (blood and urine); brain imaging (MRI scan)



#### West of Scotland Twenty-07 cohorts:

n= 310 aged ~ 63 years

n= 119 aged ~ 83 years

5 cohort waves aged 35-55 or 55-75

self-reported health; physical health measures; cognition; life circumstances;  
behaviours (e.g. diet, exercise); beliefs, attitudes and values; biomarkers (blood)



## Expected Outcomes:



### Measurement of Sedentary Behaviour

- Taxonomic framework to classify self-report SB questionnaires
- Calibration of self-report vs. objective SB
- Sensitivity to change of self-report AND objective SB
  - Recommendations to surveys regarding optimal self-report measures

### Determinants of Sedentary Behaviour

- Exploration of current SB with respect to previous behaviour:
  - Socio-economic position & Neighbourhood environment
  - Physical function, Obesity & Biomarkers of ageing
  - Cognition & Brain function
  - Attitudes to ageing

### Attitudes and Beliefs towards Sedentary Behaviour

- Perceptions, understandings and experiences of SB:
  - What older adults do while they are sitting or not sitting
  - Reasons for sitting and value placed on sitting activities
- Perceived barriers and facilitators to changing sitting

## Qualitative findings:



- Data from 44 men and women from the cohorts, with varying socioeconomic (SES) backgrounds and sedentary behaviour (SB) levels

### What did older adults do when they were sitting and not sitting?

#### Sitting

- Older adults reported a wide variety of sitting activities
- Most common were leisure-based sitting in the home (e.g. TV viewing, reading)



#### Not sitting

- Household tasks (e.g. Hoovering, dishes, ironing) and walking were the most common non-sitting activities
- Household tasks were integrated into daily routines by:  
*'just pottering around the house doing bits and pieces'*  
 F, late 70s, High SES\_Low SB
- 'Pottering' around the house broke up long periods of sitting in the home



## Qualitative findings:



### Why did older adults spend time sitting?

#### Being busy or not busy

- Focused on the importance of being busy, rather than whether the activity was sedentary or not



*'I mean, I'm not sitting staring into space, so I'm doing something, you know. I'm active, mentally, as well. So I don't sit there being bored'*

M, mid 60s, High SES\_Low SB

#### Value of sitting activities

- Sitting activities were often valued - particularly reading, doing puzzles and some (purposeful) TV viewing

*'between 8:00pm and 9:00pm is the point at which we [my husband and I] say, right, are you free, am I free, right, let's watch some of the programmes I've got recorded which I'm increasingly aware is not necessarily good use of our time, but it's how we relax I suppose in the evenings'*

F, mid 60s, High SES\_High SB

- 'Passive' sitting activities such as passive TV viewing, dozing, some types of computer use, were less valued

## Qualitative findings:



### Social Influences

- Doing things (sitting or not) with other people was also highly valued
- Other people often had a positive influence on sedentary behaviour
  - Older adults who sat less reported doing more with family, neighbours, friends and wider social networks
  - Some who had higher sitting had fewer opportunities to do things with other people

*'I lived here 14 years and I can honestly say, I've no friends, I've nowhere to go ...So I've nothing to do so I just sit about'*

F, mid60s, Low SES\_High SB



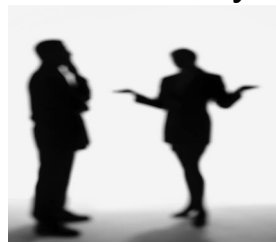
### Conclusions

Interventions to reduce older adults sedentary behaviour could work with older people to:


- Identify periods of low-value sitting and replacing these with meaningful 'busy' activities
  - 'Pottering' i.e. spreading small household tasks throughout the day may be one way to do this
- Find ways to maintain existing or create new social networks

## Stand up [if you want to] and discuss with neighbour

1. Consider your normal week day – where could you reduce sedentary time?



2. What about the weekend days?



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## Providing feedback on sedentary behaviour in stroke survivors

Claire Fitzsimons (PI), Susan Loh (RA), Nanette Mutrie, Gillian Mead, Frederike van Wijck, Janet Hanley and Brian McKinstry

Edinburgh & Lothians Health Foundation

NHS Lothian


THE UNIVERSITY of EDINBURGH



The University of Edinburgh


## AIMS

To validate and assess acceptability of devices providing feedback on sedentary behaviour with ambulatory stroke survivors to select the optimum device for future interventions.

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## Devices

**SitFIT**




Worn in trouser pocket, displays upright time and steps, vibrates after 30 min of inactivity

**Polar Loop 2**



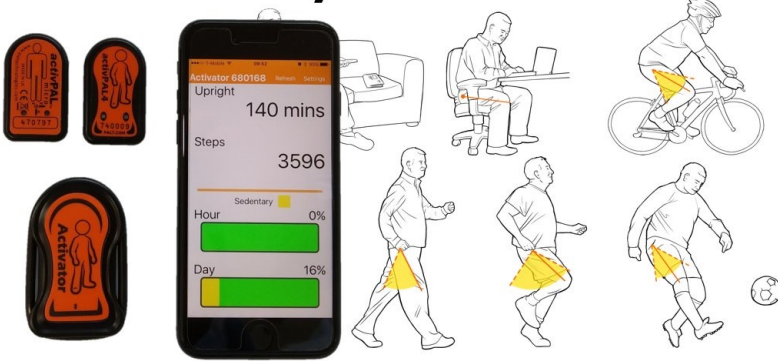
Wrist-worn, displays various information including active time and daily goal, vibrates after 55 min of inactivity, connects to web platform via USB

**Activ8 Professional**



Worn in trouser pocket, daily target indicator with "emoticon"


## The PAL family...



The image shows three PAL family devices: two small orange ones and one larger black one. In the center is a smartphone displaying the PAL app interface with the following data:

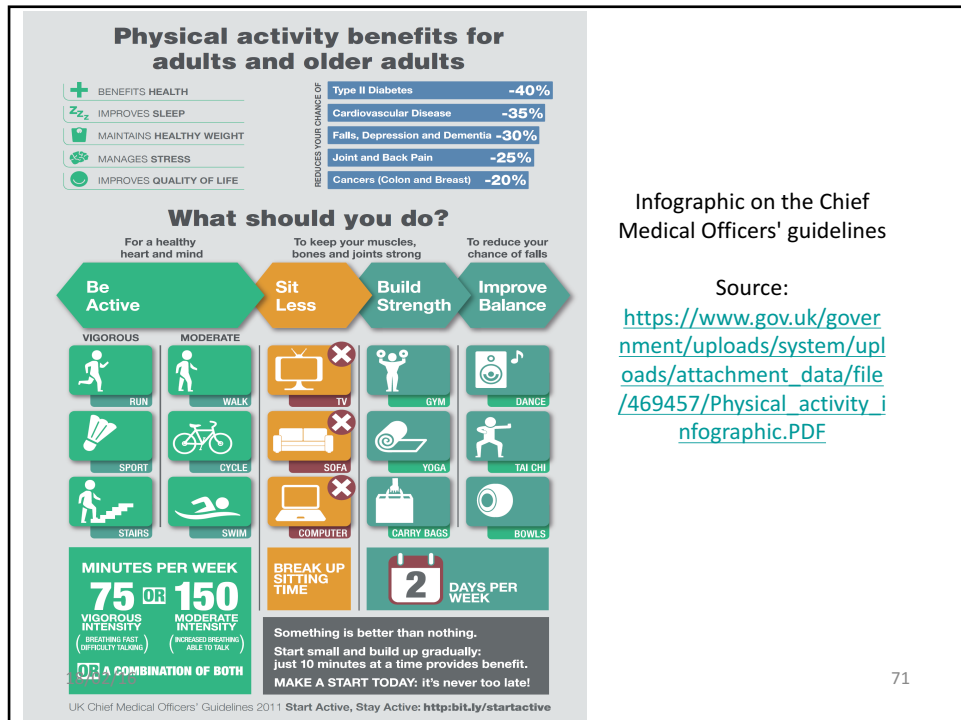
- Activator 650168
- Upright: 140 mins
- Steps: 3596
- Sedentary: 0% (Hour)
- Day: 16% (Day)

Surrounding the phone are illustrations of various activities: sitting on a sofa, sitting at a desk with a laptop, cycling, walking, and playing soccer.

 **PAL Technologies**  
PROVIDING THE EVIDENCE [www.pal5.com](http://www.pal5.com)

**#WNPC**



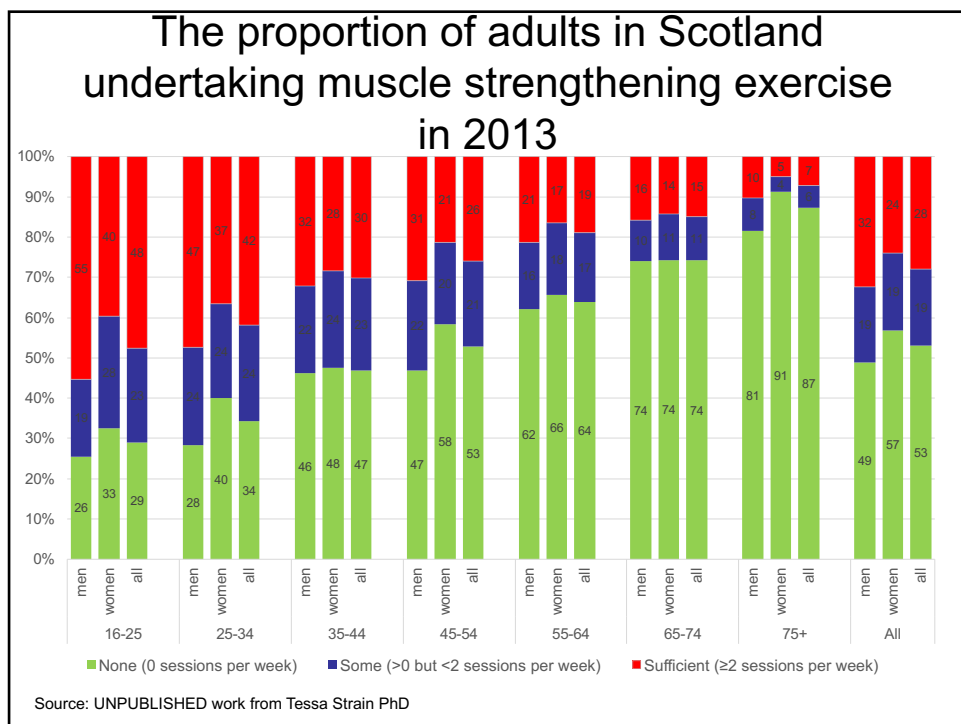


Infographic on the Chief Medical Officers' guidelines

Source:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/469457/Physical\\_activity\\_infographic.PDF](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469457/Physical_activity_infographic.PDF)

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## Paths for All Strength & Balance Programme



10 simple exercises that will improve strength and balance and reduce the risk of falls in older adults





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Do a short walk and talk with neighbour and discuss.....

- What questions do you have for me or for more general discussion to follow

