

**Real world, real people:
Can we assess walking on a treadmill to
establish step count recommendations
in an adolescent population?**

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Outline

- Background to the study
- Study design and methods
- Findings
- Conclusions

New Physical activity guidelines

Adults: 150mins week of at least moderate intensity activity
Youth (5-18yrs): At least 60minutes of moderate to vigorous activity every day

Walking

Steps /day
Adults: 8-10,000 steps
Youth:12-16,000 and 10-13, 000
for boys and girls respectively

Steps/min
Step rate required to achieve
moderate intensity walking?

Rationale

- Characteristics of walking are frequently assessed on a treadmill
 - Advantages: Space is not limited, Control of speed and environmental condition.
- Walking in general is adopted overground
- Evidence to suggest that treadmill walking may overestimate the oxygen cost of walking overground (Dal et al 2010)
- Important to establish that treadmill walking accurately estimates energy cost and step rate required to promote health enhancing PA

Aim

- Compare the energy cost of walking and corresponding step rates when walking on a treadmill and overground in adolescent girls.

Design

- Participants
 - 56 girls age 12-15 years
- The study was conducted at two separate locations
 - Local secondary school (N=30)
 - University exercise laboratory (N=26)
 - All recruited through the local secondary school

Resting measures

- Anthropometric measures: Height and Weight
- Resting metabolic rate: indirect calorimetry
- Individual determination of 1 MET

Warm up

- Incremental warm up \approx 4 mins
- Practice stepping on and off the treadmill

Treadmill

- Three 6 min trials at 1% of 0% incline
- Walking speed: 2, 3 and 4 mph
- VO_2 / EE: indirect calorimetry last 2 mins, converted to METs
- Step rate: handtally

Overground

- Three 4+ mins
- Walking speed: Prescribed by treadmill step rate and metronome guided
- VO_2 / EE: indirect calorimetry, last 2 mins, converted to METs
- Step rate: Handtally

Data Analysis

- Where there was a difference in step rate between TM and OG of ± 8 steps the girls were excluded from data analysis
- Difference in treadmill and overground response variables (VO_2 and METs) were explored using paired sample t-tests.

Main findings

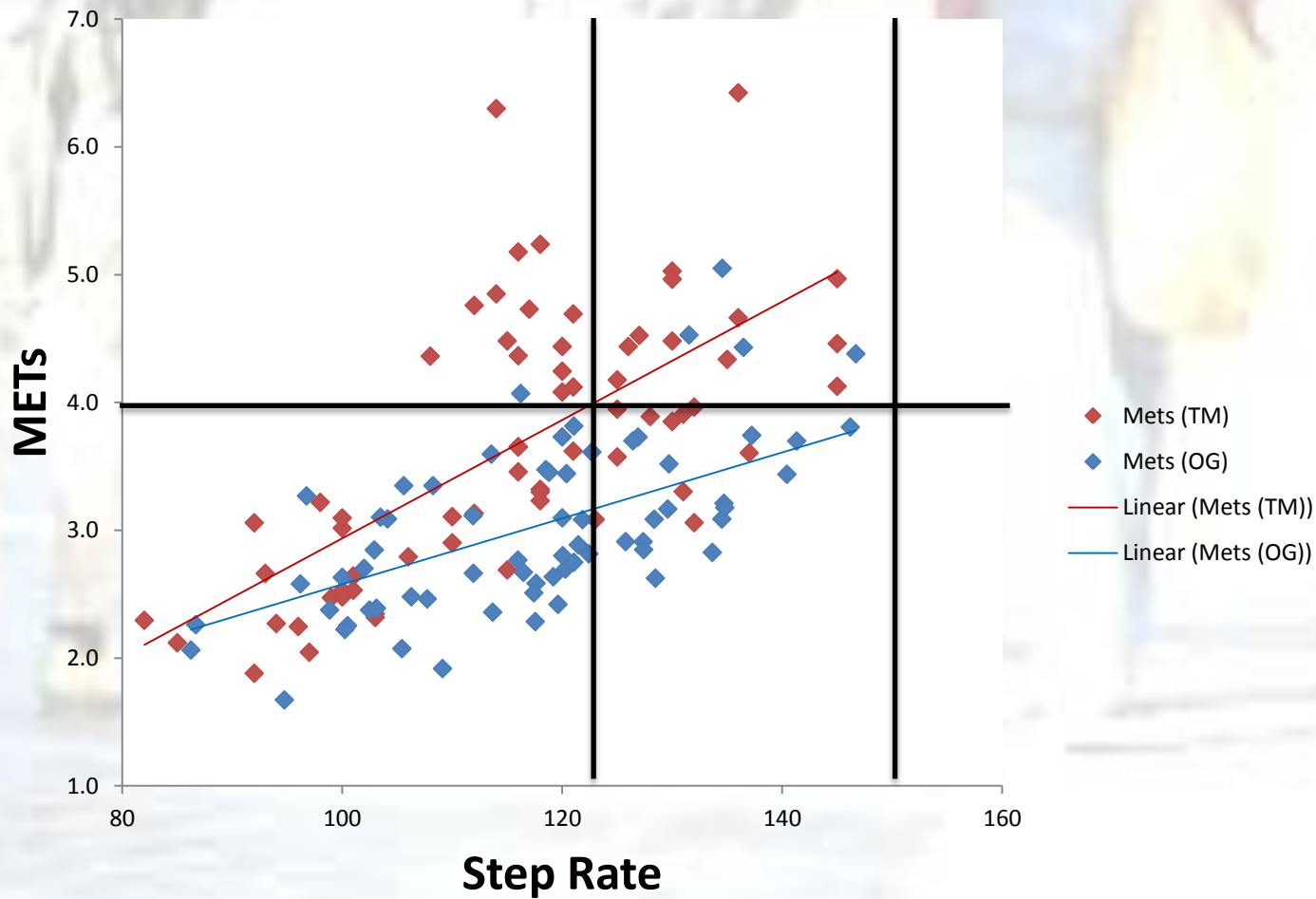
- **Energy cost**

- Treadmill walking required greater energy cost when compared to overground walking at moderate 3 mph,(1%) and fast walking speeds 4mph (0 and 1%), $p < 0.001$.

METs			
Speed	2mph	3mph	4mph
TM 1%	2.91±0.55	3.49±0.71**	4.72±0.98**
OG	2.67±0.67	3.08±0.70	3.55±0.90
TM 0%	2.63±0.35	3.15±0.54	4.23±0.79**
OG	2.66±0.42	3.08±0.50	3.46±0.68

** Significantly higher than overground ($p < .01$)

Treadmill (0%) Vs. Overground Regression Comparison



Conclusions

- The relationship between step rate (cadence) and energy expenditure was different when walking on a treadmill compared with walking overground.
- Reason for this may be that treadmill walking speed is not self selected (participants are forced into an unnatural rhythm).
- At step rates (cadences) representative of moderate to vigorous intensity activity, treadmill walking overestimates the metabolic cost of walking overground.
- Step count recommendations translated from treadmill walking may therefore underestimate the step rate required to promote health enhancing overground walking.

A blurred background image showing three people walking away from the camera on a paved path. The person on the left is wearing a dark blue long-sleeved shirt and olive green shorts. The person in the middle is wearing a dark blue long-sleeved shirt and dark shorts. The person on the right is wearing a red long-sleeved shirt and blue jeans, carrying a yellow bag. The text "Email: mm450@hw.ac.uk" is overlaid in the center of the image.

Email: mm450@hw.ac.uk