Patterns of Sedentary Behaviour and Physical Activity Accumulation in Sedentary, Ambulator, and Active Couch Potato Older Adults.

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Introduction

Sedentary behaviour (SB) is any **seated** or reclined posture that elicits **< 1.50 Metabolic Equivalent Tasks (METs)**.

SB independently **affects health** status [1] and is more prevalent in older adults (9.3±0.1 hrs ·24 hrs^{-1}) than in youth (6.1±0.1 hrs ·24 hrs^{-1}) [2].

However, the **patterns of SB** and **physical activity (PA)** accumulation have **not been described**.

The present study aimed to examine the **patterns of SB and PA** accumulation in a population of free-living **older adults**, **classifying** groups by **mobility level**.

Method

A **triaxial GENEActiv accelerometer** (GENEA, ActivInsights, Kimbolton, UK) was **thigh-mounted** anteriorly at 50% of femur length using 2 Tegaderm patches (3M Health Care, St. Paul, USA).

Participants (*n*=90, age: 73.7±6.3 years, 48 females) **completed 7 continuous days** of habitual mobility before returning the GENEA.

The **Cheshire Algorithm of Sedentarism** (CAS) [3] was used to analyse 10 s epoch data. CAS first compared the axes' G values to determine posture (**Figure 1**). CAS then estimated the intensity of the mobility through an algorithm that matched Residual G [4] (GENEA output) to known older adult MET values for a given task.

The GENEA cut-point between SB and **Light Intensity PA** (LIPA) (1.50 METs) was **0.057 G** while the GENEA cut-point between LIPA and **Moderate to Vigorous Intensity PA** (MVPA) (3.00 METs) was **0.216 G**.

The **GENEA recorded** the amount of **time spent performing** the basic mobilities (**Table 1)** and then classified participants into a mobility group based on these basic mobility levels (**Table 2**). Advanced GENEA mobility outcomes are in **Table 3**.

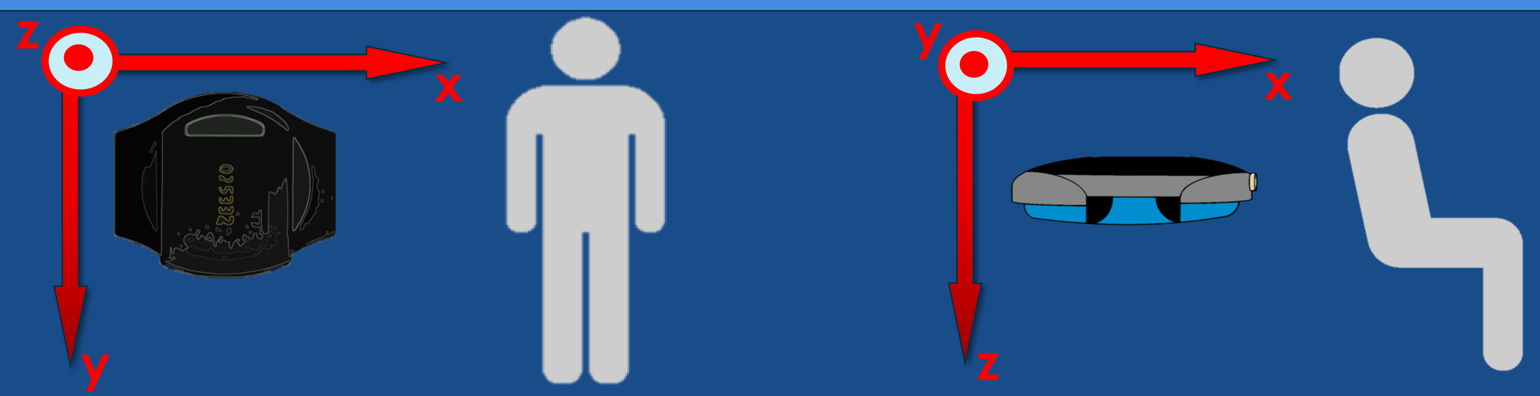

Figure 1 The orientation of the thigh-mounted GENEA axes when the participant is standing (left) and seated (right). GENEA recorded the pull of gravity and therefore measured -1 G through the *y*-axis when standing or the *z*-axis when seated (in most cases).

Table 1 Basic GENEA mobility outcomes.

Mobility	Definition
Sleeping (hrs)	Self-Reported sleeping hours, not including naps.
SB (hrs)	Any seated or reclined posture that elicits < 1.50 METs.
Standing (hrs)	Any standing posture that elicits < 1.50 METs.
LIPA (hrs)	Any standing posture that elicits 1.50 – 3.00 METs.
sMVPA (hrs)	Any standing posture that elicits ≥ 3.00 METs, carried out in bouts < 10 continuous mins.
cMVPA (hrs)	Any standing posture that elicits ≥ 3.00 METs, carried out in bouts ≥ 10 continuous mins.

Table 2 Mobility Classification criteria.

	cMVPA < 2.5 hrs ·7 days^{-1}	cMVPA ≥ 2.5 hrs ·7 days^{-1}
SB ≥ 8 hrs ·1 day^{-1}	Sedentary (n = 65, 37 female)	Active Couch Potato (ACP) (n = 13, 5 female)
SB < 8 hrs ·1 day^{-1}	Ambulator (n = 11, 6 female)	Active Ambulator (n = 1, 0 female, removed from further analysis)

Table 3 Advanced GENEA mobility outcomes.

Mobility	Definition
SB Break (*n*)	2 mins or more of PA that follows 1 min or more of SB.
W50% (mins)	50% of Daily SB Time is accumulated by SB bouts of this specific length or shorter.
cMVPA Bouts (*n*)	The amount of cMVPA bouts.

Results - presented as mean ± standard deviation. $p \leq 0.05$

Kruskall-Wallis (Mann-Whitney U *post hoc*) revealed that older adults of different mobility classifications accumulate SB and PA in unique ways to one-another (**Figure 2**).

Although group differences for SB time were found (**Figure 2**), no group differences were present for SB Breaks (**Figure 3**).

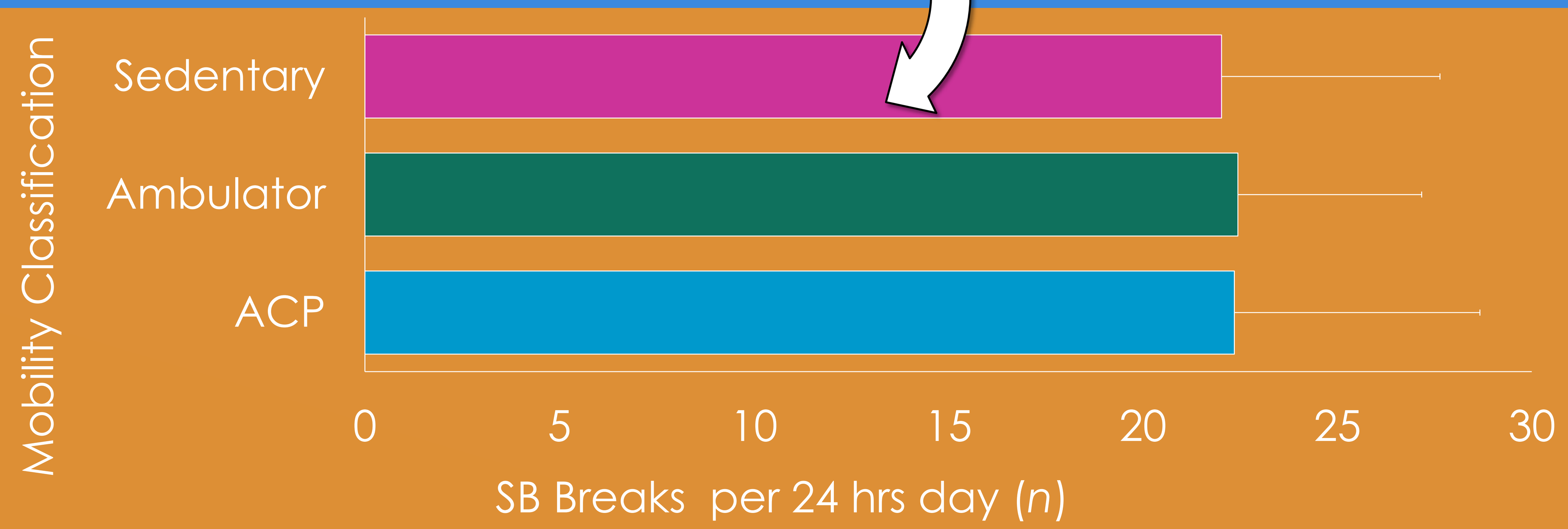

Figure 3 The number of SB breaks accumulated throughout an average 24 hr day according to mobility classification.

Ambulators accumulated 50% of their daily SB time using shorter SB bouts compared to Sedentary and ACP groups (**Table 4**). This was due to Ambulators accumulating more Standing, LIPA, and sMVPA than ACP and Sedentary populations (**Figure 2**).

Interestingly, Sedentary and ACP had similar W50% results (**Table 4**).

ACP performed more cMVPA bouts per 24 hrs day (**Table 4**), which resulted in a higher amount of cMVPA (**Figure 2**) than Sedentary and Ambulator groups.

Table 4 Group differences in W50% and cMVPA Bouts for an average 24 hrs day.

	W50% (mins)	cMVPA Bouts (*n*)
Sedentary	58.5±22.9	**0.39±0.80***
Ambulator	**39.2±13.3***	**0.41±0.78***
ACP	49.2±20.5	2.04±1.98

† Significantly different from Ambulator. * Significantly different from ACP. $p \leq 0.05$.

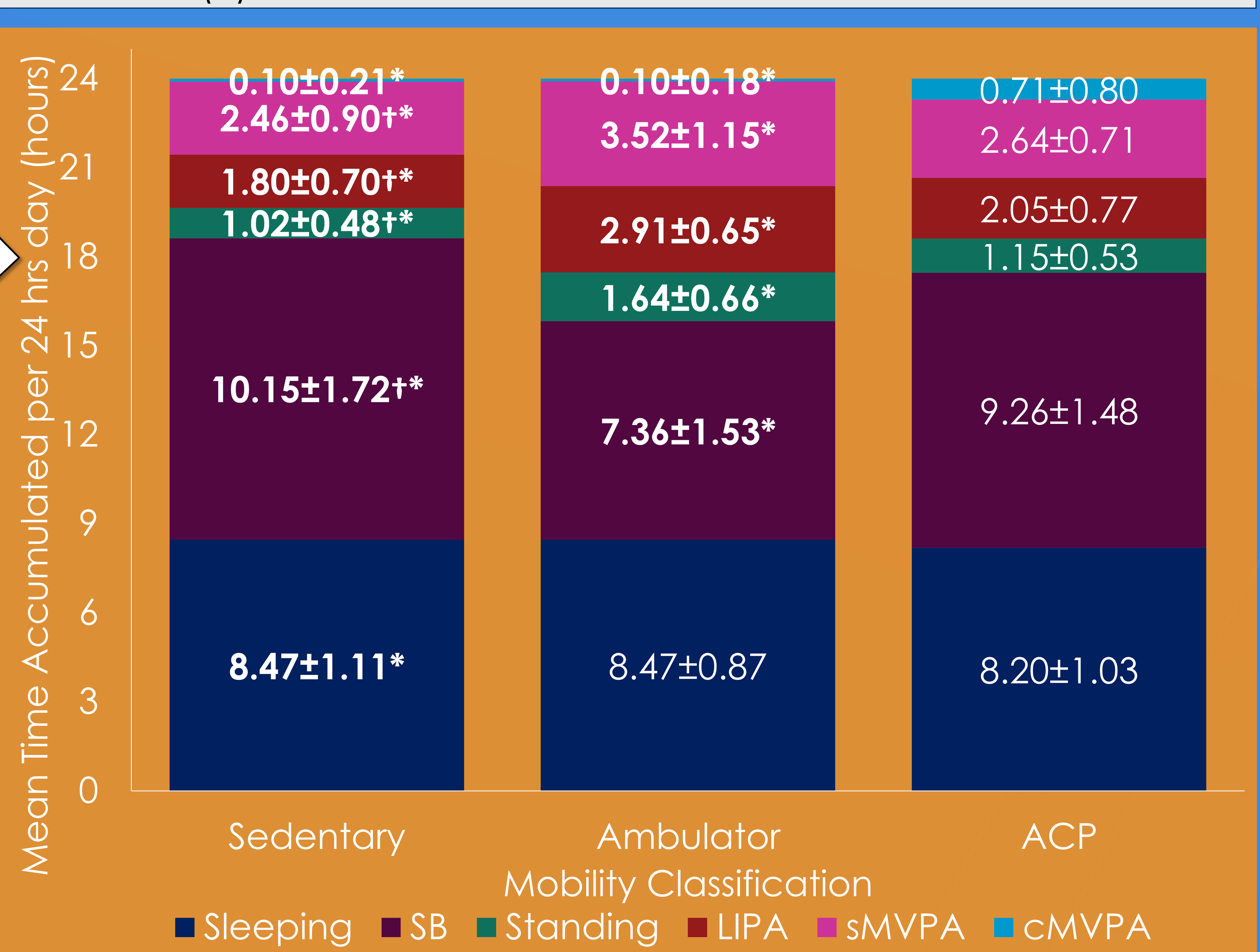

Figure 2 The distribution of an average 24-hour day across different SB and PA for Sedentary, Ambulator and ACP in a free-living older adult population.

† Significantly different from Ambulator. * Significantly different from ACP. $p \leq 0.05$.

Discussion & Conclusion

Our findings suggest that free-living **older adults use different patterns of SB/PA**. Thus, **1%, 12%, 14% and 72%** of the study population could be categorised as **Active Ambulator**, **Ambulator**, **ACP**, and **Sedentary**, respectively. Those who have **shorter SB bouts** and accumulate **the least amount of SB** appear to **substitute** this time **with Standing**, **LIPA and sMVPA as opposed to cMVPA**.

Using both W50% and SB break as a collective measure of SB patterns may be **sufficient** to highlight differences between older adults. Future research should aim to examine how these **multiple SB/PA patterns** affect health status.

References

[1]**Healy, G. N.**, Dunstan, D. W., Salmon, J., Shaw, J. E., Zimmet, P. Z. and Owen, N. (2008) 'Television time and continuous metabolic risk in physically active adults.' *Medicine and Science in Sports and Exercise*, 40(4) pp. 639-645.; [2]**Matthews**, C. E., et al. (2008). "Amount of time spent in sedentary behaviors in the United States, 2003–2004." American Journal of Epidemiology **167**(7): 875-881.; [3]**Onambele, G. L.**, Narici, M. V. and Maganaris, C. N. (2006) 'Calf muscle-tendon properties and postural balance in old age.' *Journal of Applied Physiology*, 100(6) pp. 2048-2056.; [4]**Wullems, J. A.**, Morse, C. I., Degans, H., Verschueren, S. V. P. and Onambele-Pearson, G. L. (2015) 'A novel triaxial accelerometer data algorithm for quantifying physical activity and sedentary behaviour in both young and older adults.' *In Healthy Ageing: From Molecules to Organisms*. Hinxton, Cambridgeshire, UK: