

Is the physical activity during transport of older adults compensated during other activities?

Ruben Brondeel, Université de Montréal

Main collaborators:

Yan Kestens, Université de Montréal

Basile Chaix, INSERM – Université Pierre et Marie Curie, Paris

Philippe Gerber, Luxembourg Institute of Socio-Economic Research

Introduction

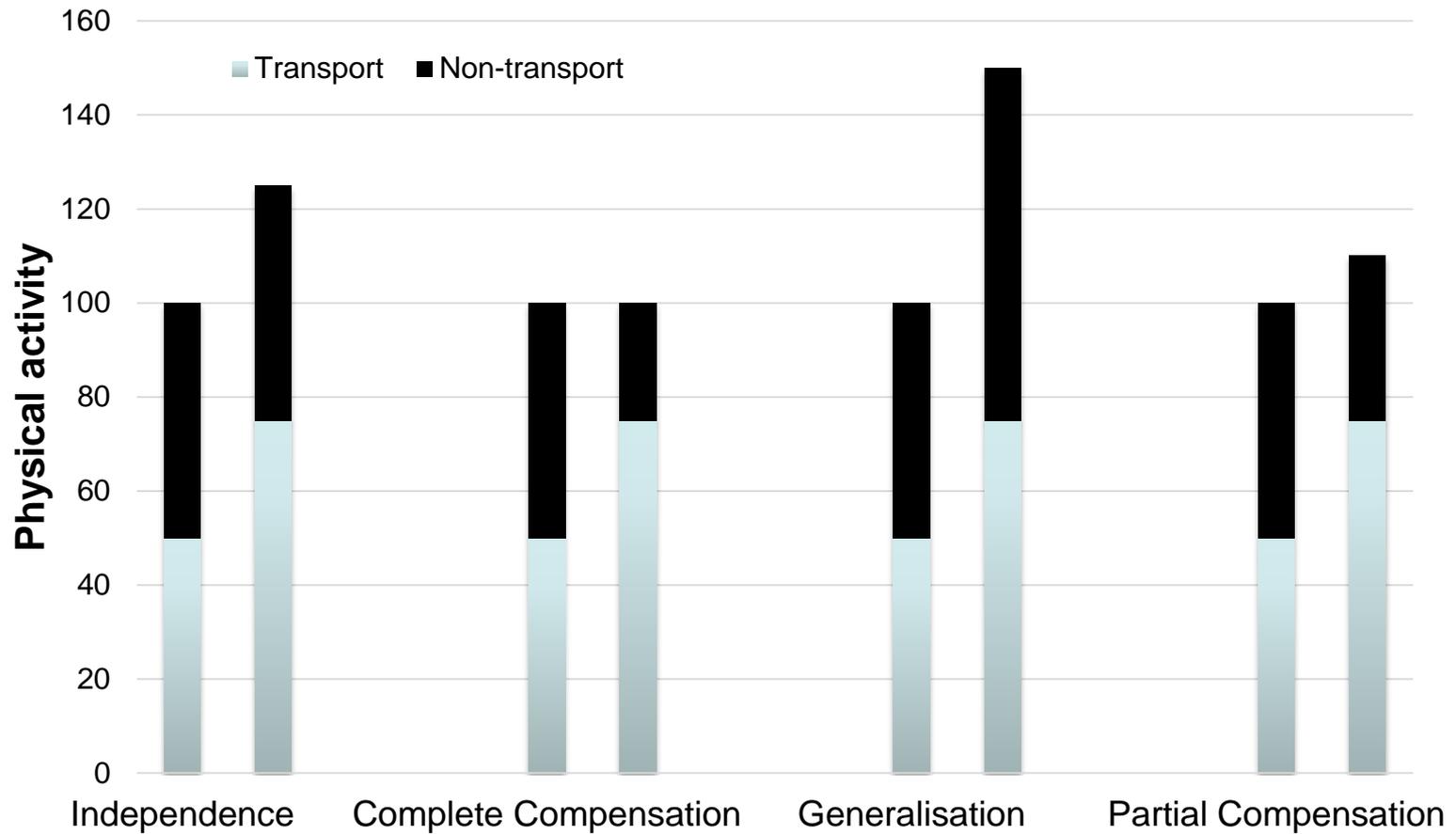
- **Declining physical activity levels worldwide, including for older adults**
- **Physical activity and healthy aging**
 - Lowers the risk of non-communicable diseases such as diabetes, depression, and certain cancers
 - Improves physical functioning, social participation, and wellbeing
- **Transport is an important domain of physical activity**
 - Walking, biking, public transport
- **Urban Interventions and Urban Reform Plans**
 - Health, Environment, Economy
 - Promotion of physical activity has had a place in recent plans
 - E.g. Bike sharing, Improved walking and cycling paths, Traffic calming measures

Introduction

- **Urban interventions are evaluated by changes in transport physical activity**
 - E.g. Min walking for transport, number of active transport trips
- **However, transport physical activity may be compensated in other domains**
 - E.g. leisure-time physical activity

Introduction

Transport PA vs Total PA - Four scenarios



Introduction

- **No study on compensation of transport PA with objective measures of PA**
- **Studies with self-reported data found no compensation** (Foley, 2015; Sahlqvist, 2013)
- **Other evidence - Exercise program evaluations**
 - Physical activity may be compensated during non-exercise time (ActivityStat)
 - Some indication that compensation is more prevalent among older populations
 - But: mixed evidence (Gomersall 2013)
 - Conceptual confusion: Physical Activity vs Energy Expenditure
 - Uncertainty of the time frame

Research Questions

- **Is physical activity during a trip associated to total physical activity in the first hour following that trip?**
- **Is transport PA during a day associated to Total PA during the following day?**
- **Is transport PA during a day associated to non-transport PA during the same day?**

Methods

- **Pooled data set**
 - Canada (Qada – CURHA)
 - Luxembourg (CURHA)
 - France (RECORD)
- **Older adults (65+)**, living independently
- **GPS/accelerometer**, at the hip during 7 days
- **Valid observation day**: > 10 h of wearing accelerometer/GPS
- **Valid participation**: > 4 valid days

Methods

- **Main measures**
 - **Physical activity: sum of activity counts (3 axes)**
 - **Transport time vs non-transport time:**
 - Visited places: Clustering of GPS data detected by kernel-based algorithm
 - Time between visited places = Transport time
- **Other measures**
 - **Age, season, time of day, study, week day**

Analyses

- **Within person analyses**
 - Person-centered measures of PA,
 - E.g. a person's PA per day minus the PA per day typical for that person
 - Within-person analyses filters out all between-person variation
- **Robust linear regressions**
 - Physical activity has typically skew distributions

RESULTS

- 619 participants with at least 4 valid days
- 76 years old (IQR: 70 - 82)
- 50% women
- 13h 31 min wear time per day
- 1h 6 min transport time per day
 - 14% moderate-to-vigorous physical activity
 - 54% physically inactive
- 18% of all physical activity is related to transport

Results

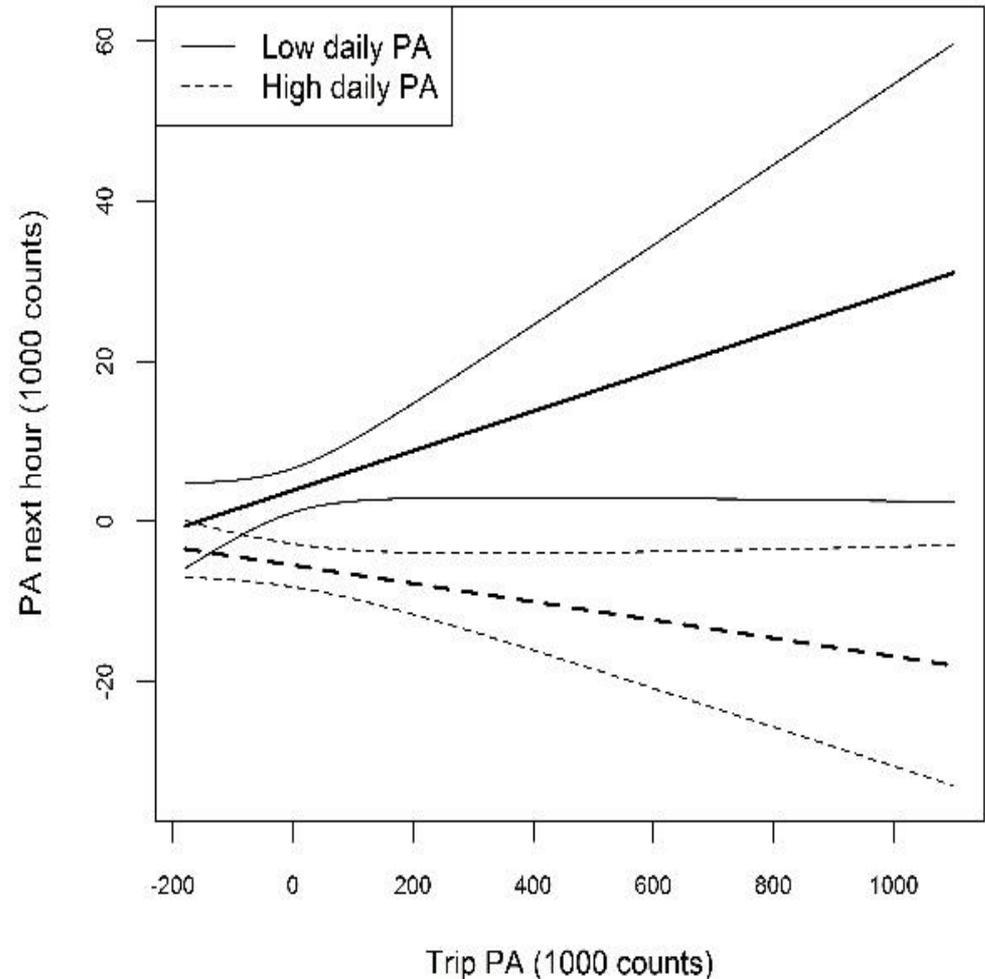
H1: Is a person's PA during a trip related to PA during the following hour?

Slight partial compensation:
+1000 counts during a trip

→ -70 counts during next hour.

Dependent on the person's typical level of physical activity:
people with low levels of daily PA

→ slight generalization

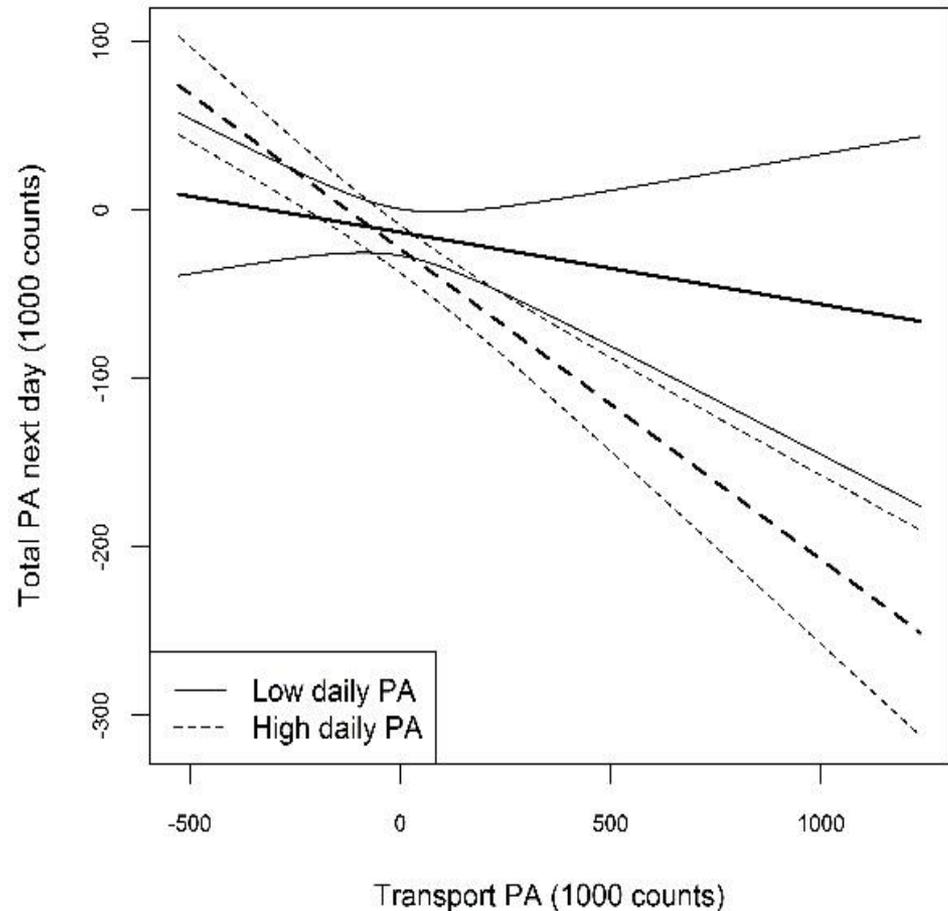


Results

H2: Is a person's transport PA during a day associated with its total PA the following day

+1000 counts during transport
→ -105 counts total PA
following day

But, more compensation for
people with higher daily PA



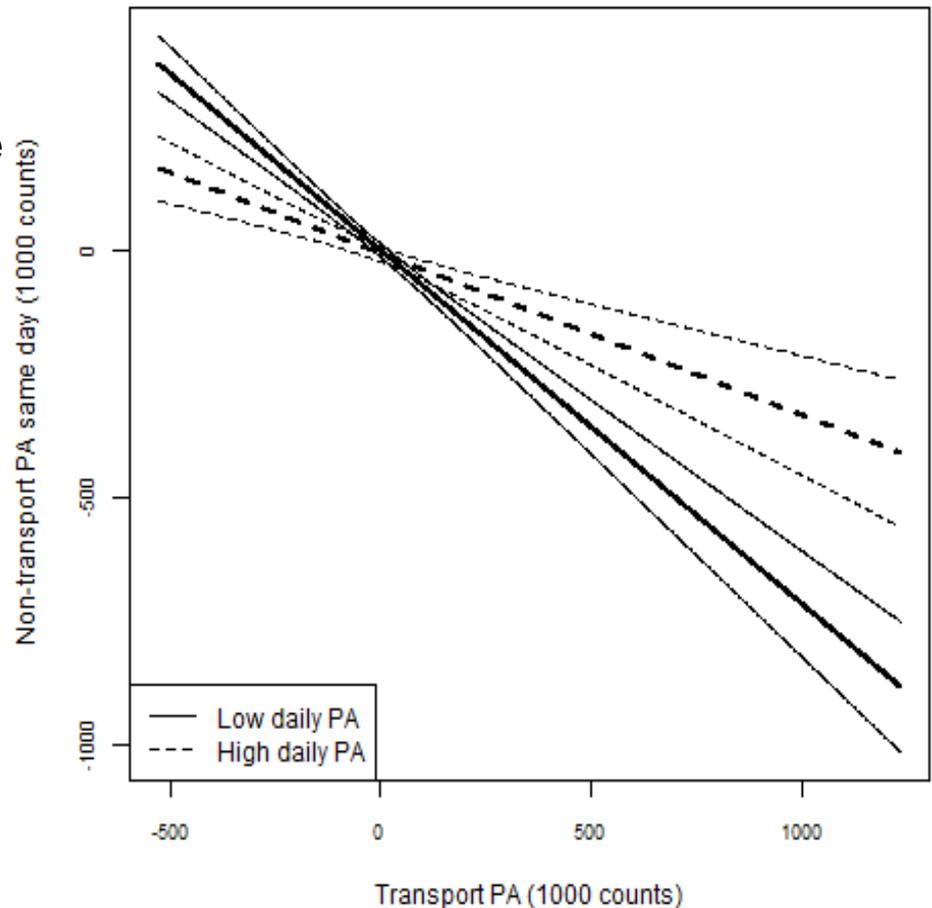
Results

H3: Is a person's transport PA during a day associated with its non-transport PA the same day

+1000 counts in transport PA

➡ -571 decrease non-transport PA the same day.

Dependent on average daily physical activity, but partial compensation for everyone



Discussion & Conclusion

- **Among older adults, we found no or limited evidence that transport PA is compensated in subsequent time periods**
- **Hypothesis stems from biological theories of compensation**
 - Period with higher levels of PA is followed by period with lower levels of PA
 - Mechanism might be fatigue

Discussion

- **However, partial compensation during the same day, indicating behavioral factors**
 - Anticipation, planning of PA ?
 - Time limits ?
- **Future (qualitative) research on motivation of people to partially compensate transport PA**
- **No differences between countries in compensation, despite differences in PA levels**

Conclusion

- Understanding compensation mechanisms is crucial for adequate evaluations of urban interventions
- More studies with objective PA and transport data is needed
 - To determine when compensation takes place
 - Population, context of PA
 - To understand the underlying mechanism
 - To confirm compensation in longitudinal, intervention settings