



Comparison of self-reported and accelerometer-measured physical activity in Canadian youth

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Delivering insight through data for a better Canada



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Disclosure Statement

- I have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.



Purpose

1. Compare accelerometer-measured and self-reported physical activity from a new physical activity questionnaire in Canadian youth using CHMS data.
2. Examine the reliability and impact of mode (in-person versus telephone) of the physical activity questionnaire by comparing estimates between cycles within each survey and between the CHMS and CCHS.

Canadian Health Measures Survey

Reported and directly measured health data

Cycle 1: 2007-2009

Cycle 2: 2009-2011

Cycle 3: 2011-2013

Cycle 4: 2014-2015

Cycle 5: 2016-2017

Cycle 6: 2018-2019

n = 975
12 to 17 years

~ 6,000 respondents per cycle

National-level estimates

3 to 79 years

Two Physical Activity Measurement Methods:

Self-reported physical activity by domain:

- Transportation
- Recreation
- Household & Occupation
- School



Actical accelerometer

7 days of data (1-minute epochs)

Blind to respondents



Questionnaire



+

Mobile clinic



Self-reported physical activity



• Transportation

- In the last 7 days, did you use active ways like walking or cycling to get to places such as [school, the bus stop, the shopping centre, work/school] or to visit friends?
- How much time did you spend using active ways to get to places...



• Recreation

- In the last 7 days, did you do physical activities in your leisure time including exercising, playing an organized or non-organized sport or playing with your friends?
- How much time did you spend doing these leisure-time activities that made you sweat at least a little and breathe harder?



• School

- In the last 7 days, did you do sports, fitness or recreational physical activities while at [school or day camp, including during physical education classes, during your breaks and any other time you played indoors or outdoors/school or day camp]?
- How much time did you spend doing these activities at school/day camp that made you sweat at least a little and breathe harder?



• Household & Occupation

- In the last seven days, did you do any other physical [activities you have not already], for example, while you were doing paid or unpaid work or were helping your family with chores?
- How much time did you spend doing these other physical activities that made you sweat at least a little and breathe harder?

Accelerometer-measured physical activity

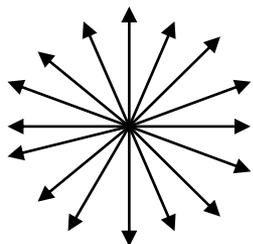


Raw Data
Counts
Steps



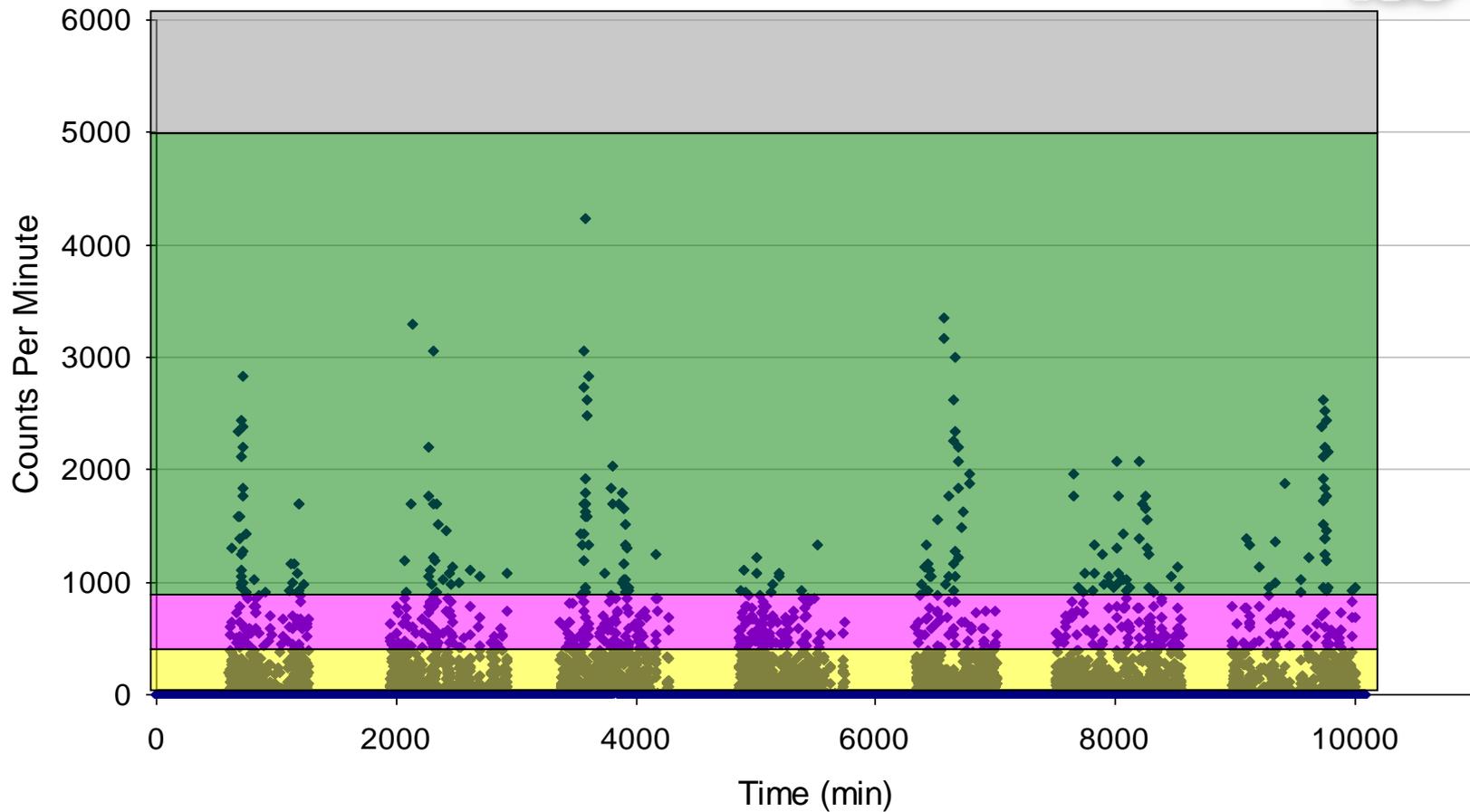
Sedentary
Light
Moderate
Vigorous

Omnidirectional



What is a "count"?

An integration of time and intensity to reflect the magnitude of activity.

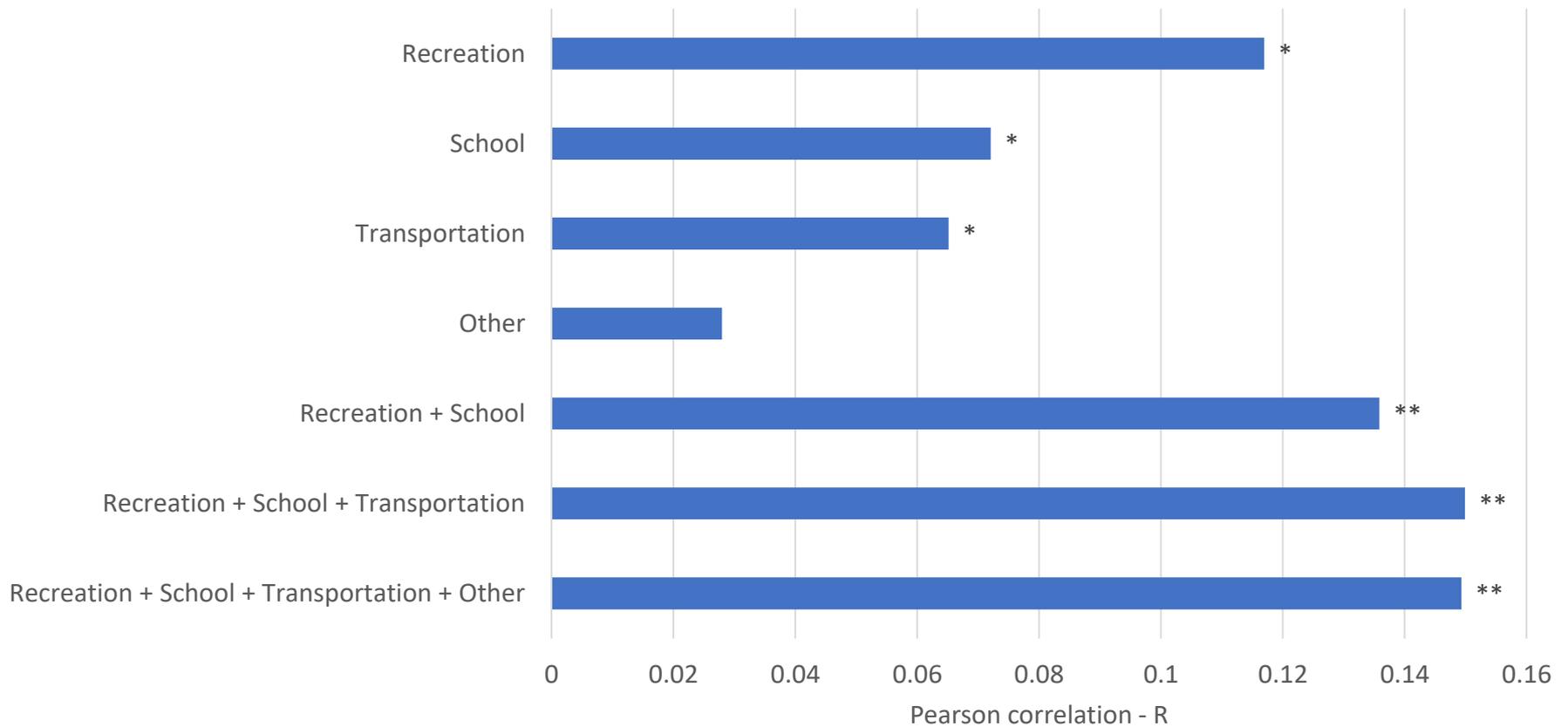


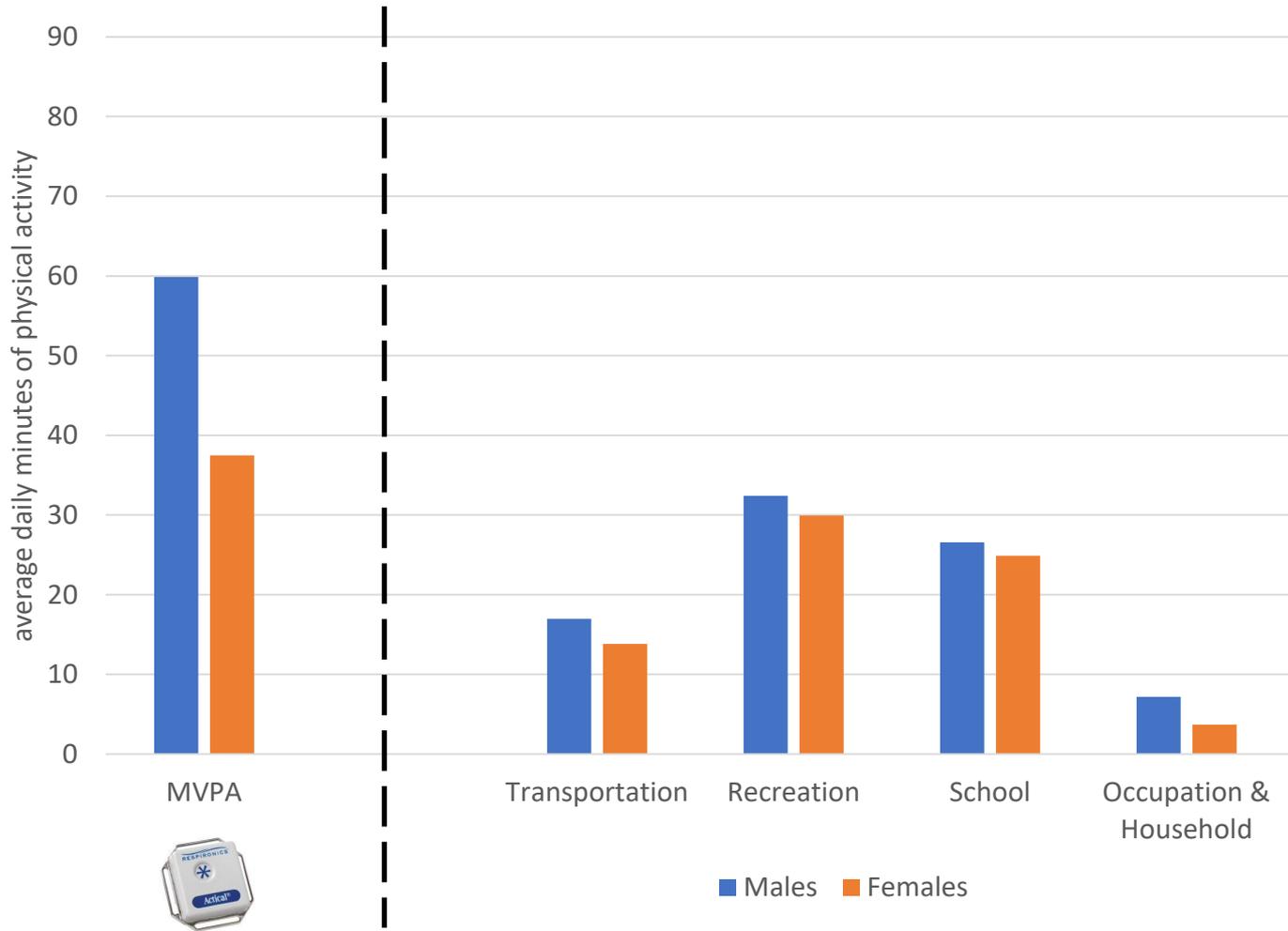


Results

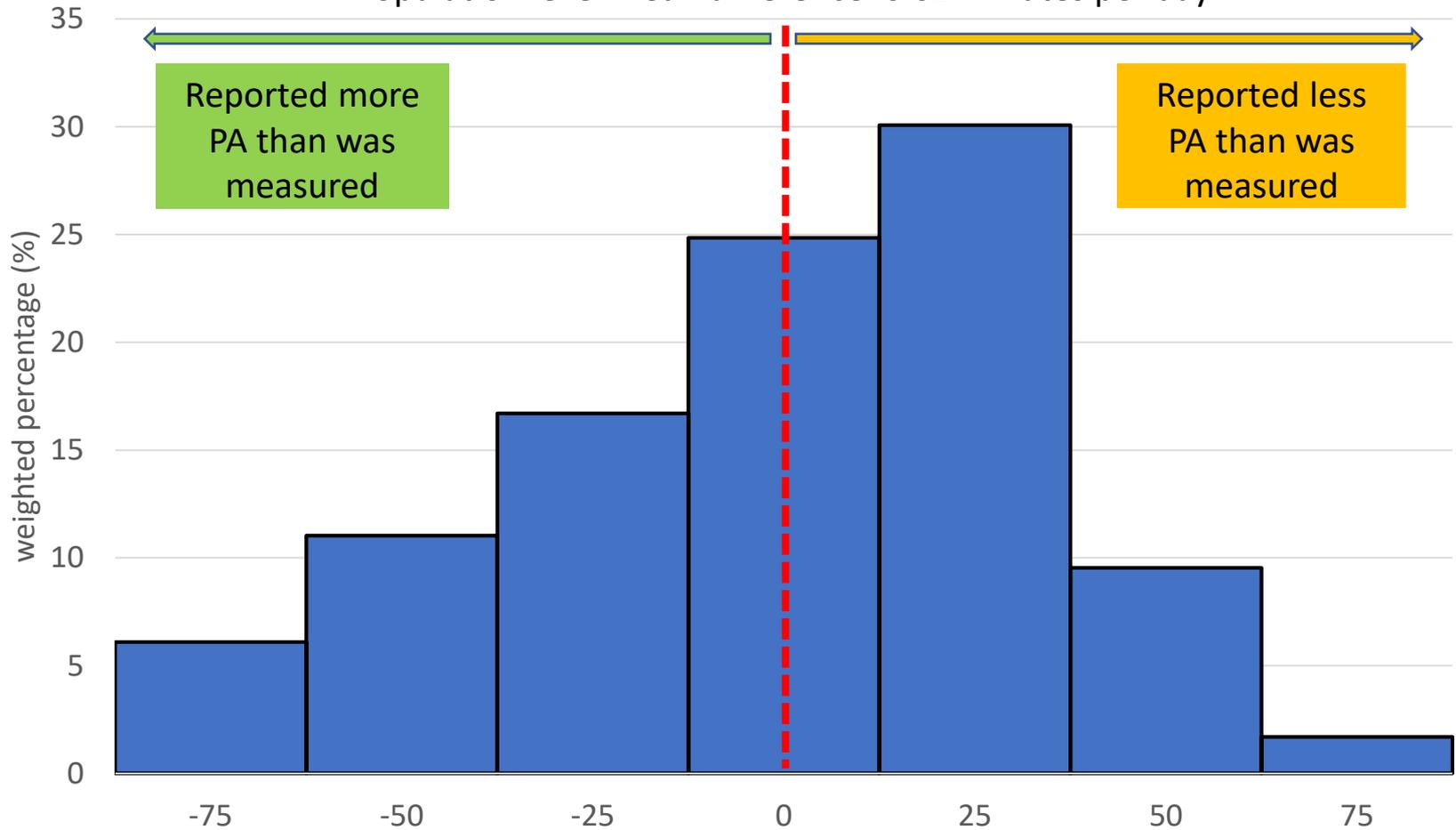


Correlation between methods: self-reported versus accelerometer-measured MVPA



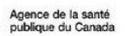
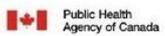


Population level mean difference: 0.02 minutes per day



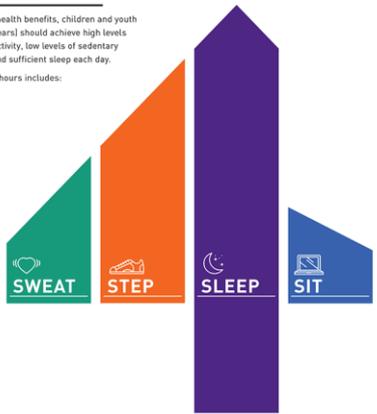
Mean Difference = Accelerometer (MVPA) – Questionnaire

Just to make things even more complicated...



GUIDELINES

For optimal health benefits, children and youth (aged 5-17 years) should achieve high levels of physical activity, low levels of sedentary behaviour, and sufficient sleep each day. A healthy 24 hours includes:



Preserving sufficient sleep, trading indoor time for outdoor time, and replacing sedentary behaviours and light physical activity with additional moderate to vigorous physical activity can provide greater health benefits.

SWEAT

MODERATE TO VIGOROUS PHYSICAL ACTIVITY
An accumulation of at least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities, vigorous physical activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week.

STEP

LIGHT PHYSICAL ACTIVITY
Several hours of a variety of structured and unstructured light physical activities.

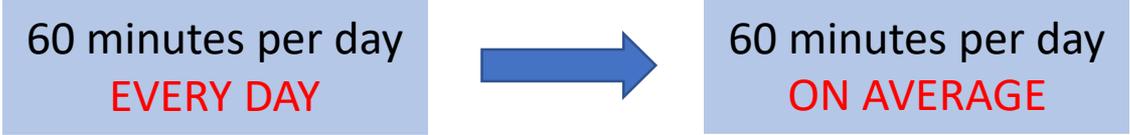
SLEEP

SLEEP
Uninterrupted 9 to 11 hours of sleep per night for those aged 5-13 years and 8 to 10 hours per night for those aged 14-17 years, with consistent bed and wake-up times.

SIT

SEDENTARY BEHAVIOUR
No more than 2 hours per day of recreational screen time; Limited sitting for extended periods.

- In 2016, the Canadian physical activity guideline was incorporated into the **24-Hour Movement Guidelines**
- The recommended dose remained the same: **60 minutes per day of MVPA**
- However, the suggested interpretation changed...

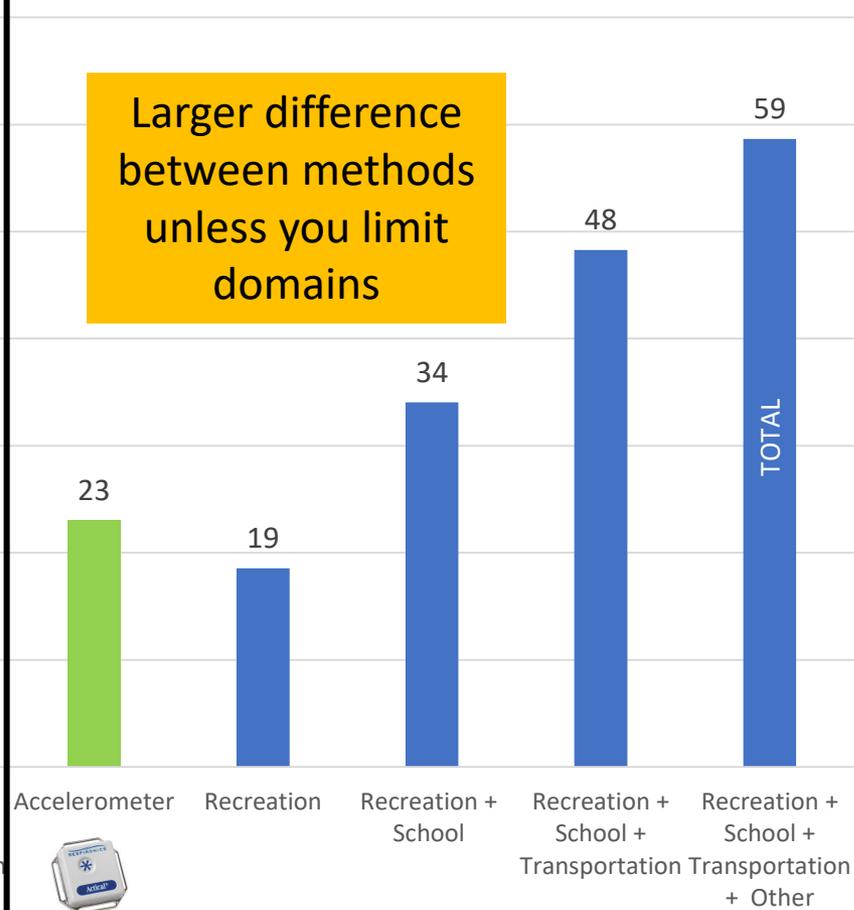
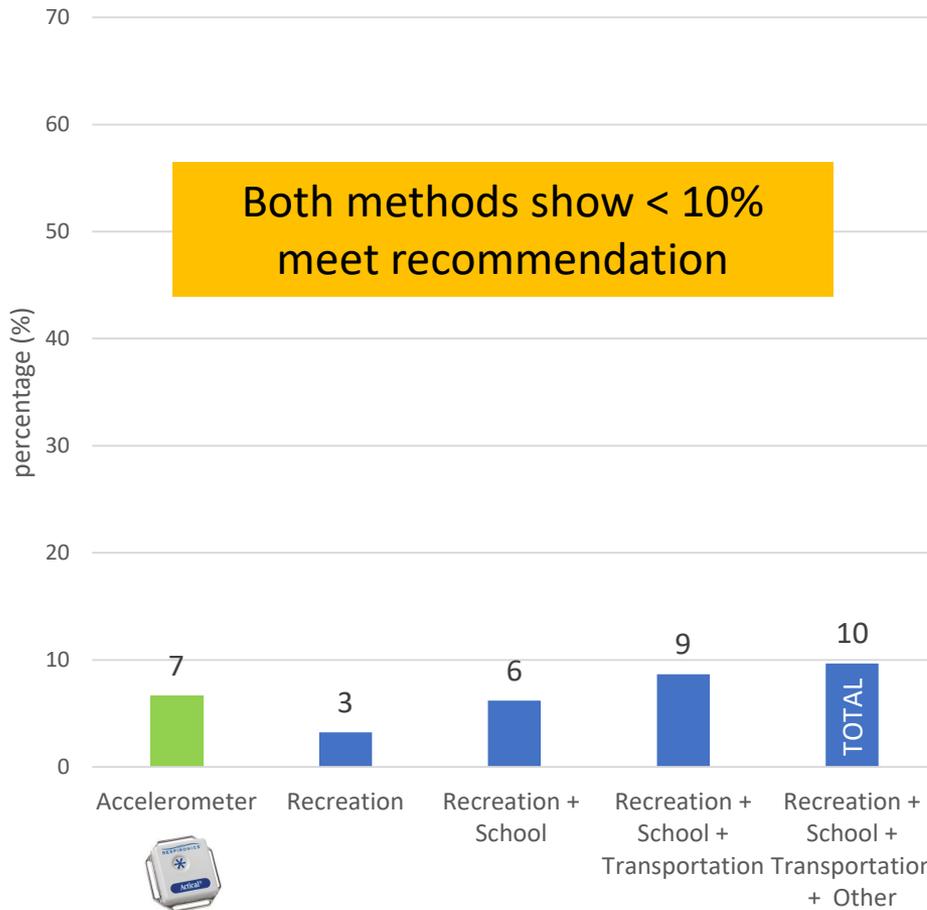


60 minutes per day, *every day*

60 minutes per day, *on average*

Both methods show < 10% meet recommendation

Larger difference between methods unless you limit domains



Canadian Community Health Survey 2015-2016

Canadian Health Measures Survey 2013-2017

Self-reported physical activity by domain:

Transportation

Recreation

Household & Occupation

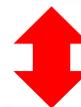
School



n = 7,619 (12 to 17 years)

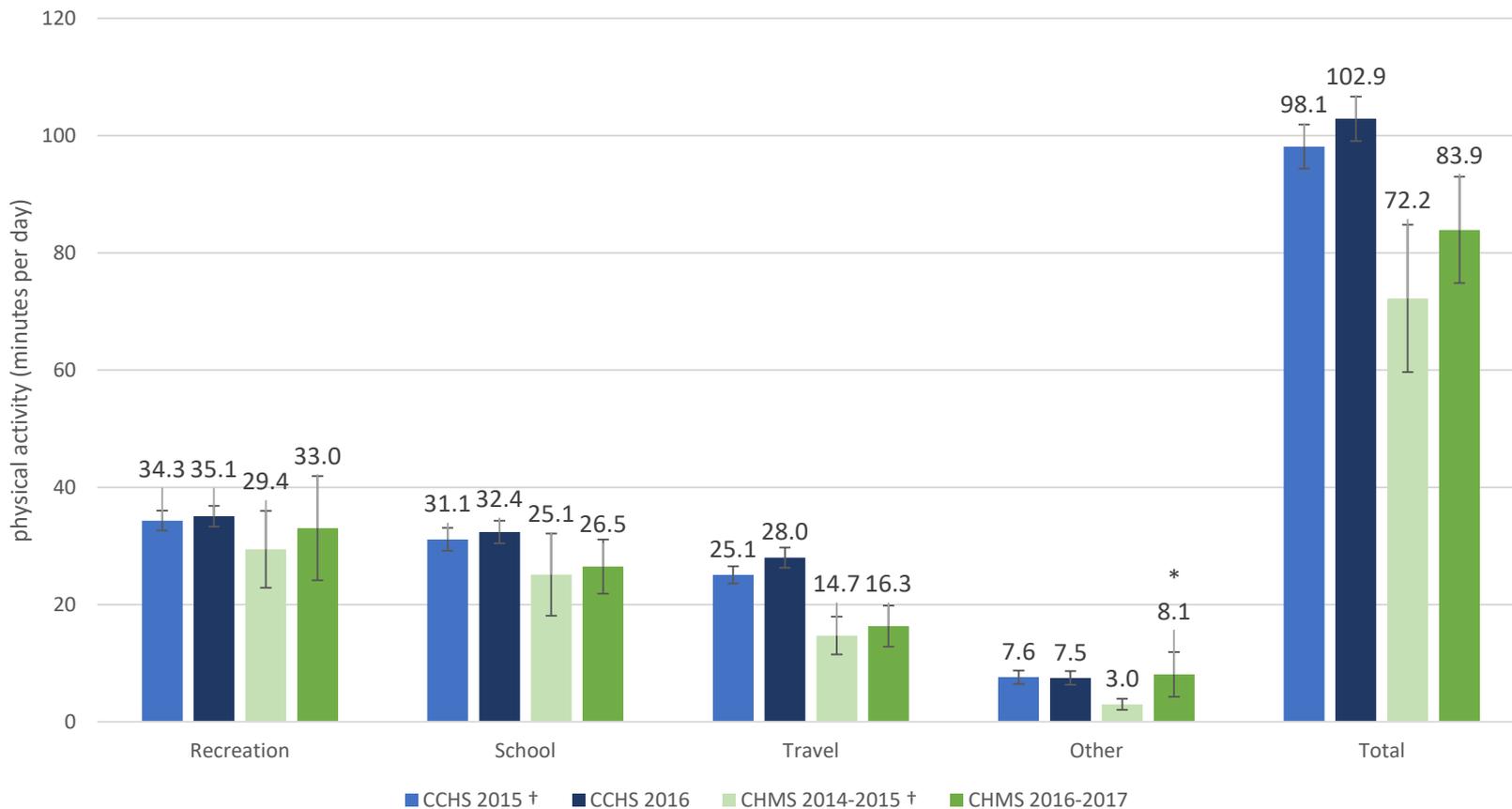


n = 975 (12 to 17 years)



Accelerometer-measured:
Moderate-to-vigorous
physical activity
Light physical activity

Questionnaire module exhibited good reliability (within survey)
 Physical activity estimates were higher in CCHS compared to CHMS (phone versus in-person)



Summary

1. Methods were weakly correlated – consistent with previous research.
2. The mean difference between methods varied widely in both directions.
3. Limiting the number of domains from the questionnaire data may help to align the questionnaire results more closely with the accelerometer-measured data.
4. Analytical approach (daily versus average) must be consistent to make proper comparisons between methods.

Correction factor not possible



Limitations

Methods each have their own strengths and limitations

- Questionnaires: recall and bias
- Accelerometers: no context, difficulty measuring cycling, loads

Questionnaire and accelerometer measurements were not completed in same week

- correlation may be underestimated
- reliant on assumption that both are capturing “typical” physical activity behaviour



Conclusion

- Accelerometers and questionnaires capture different aspects of physical activity.
- Move away from determining which method is more “correct” and rather determine ways to use the information from both in complementary ways.
- Measured data are not always possible so these comparisons are important



Thinking into the future...

“Physical activity researchers need to be aware that physical activity estimates derived from these types of approaches [accelerometer, self-report] are not conceptually equivalent; they may be expressed in the same metrics, **but they are not assessing the same thing.** As more measures based on devices are used in physical activity research studies and reported in the health literature, it will be important to recognize the likely error of making **inappropriate direct data comparisons.**”

Troiano, McClain, Brychta, Chen. Evolution of accelerometer methods for physical activity research. *Br J Sports Med* 2014; 48(13): 1019-1023.

Thank you

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Acknowledgements:

Karen Roberts

Greg Butler

Stephanie Prince

Didier Garriguet

Manuscript in press with Health Reports (July 2019)

