

Bidirectional Associations Of Physical Activity, Sedentary Behavior, and Sleep and Cognitive Function Among Older Adults

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Background

- Physical activity (PA), sedentary behavior (SB), and sleep are independently associated with future cognitive decline.
- Some evidence suggests the potential for bidirectional associations.
- However, few studies have examined whether cognitive decline leads to lower levels of PA, higher levels of SB, and worse sleep.
- Here, we examined whether cognitive trajectories are predictive of PA, SB, and sleep in a community-based cohort of older adults.

Methods

Parent study:

- Data from the US-based Adult Changes in Thought (ACT) cohort.
- ACT eligibility include being ages 65 and over and dementia-free.
- Participants followed biennially for a wide variety of measures.
- 611 ACT participants had the minimum amount of exposure and outcomes data (**Figure 1**).

Cognitive Function Exposure:

- Measured with Cognitive Assessment Screening Instrument (CASI) scored with item response theory (CASI-IRT)
- Required ≥3 CASI-IRT scores over 10 years prior to a 7-day accelerometer wear (**Figure 1**).

Activity & Sleep Outcomes:

- Thigh-worn activPAL measured mean time spent sitting, standing, and stepping, mean daily step count, and mean sitting bout duration.
- Hip-worn ActiGraph measured daily minutes of light-intensity PA and moderate-to-vigorous PA (MVPA).
- Self-reported time in bed and sleep quality (PROMIS sleep disturbance short form) assessed sleep.

Analysis:

- Growth mixture models (GMMs) used to classify CASI-IRT scores prior to activity measurement into latent trajectory groups
- GMMs were used to examine whether trajectory groups were associated with outcomes adjusting for health and demographic covariates.
- GMM analyses were performed using Latent GOLD version 6.0

Figure 1. Flow Diagram

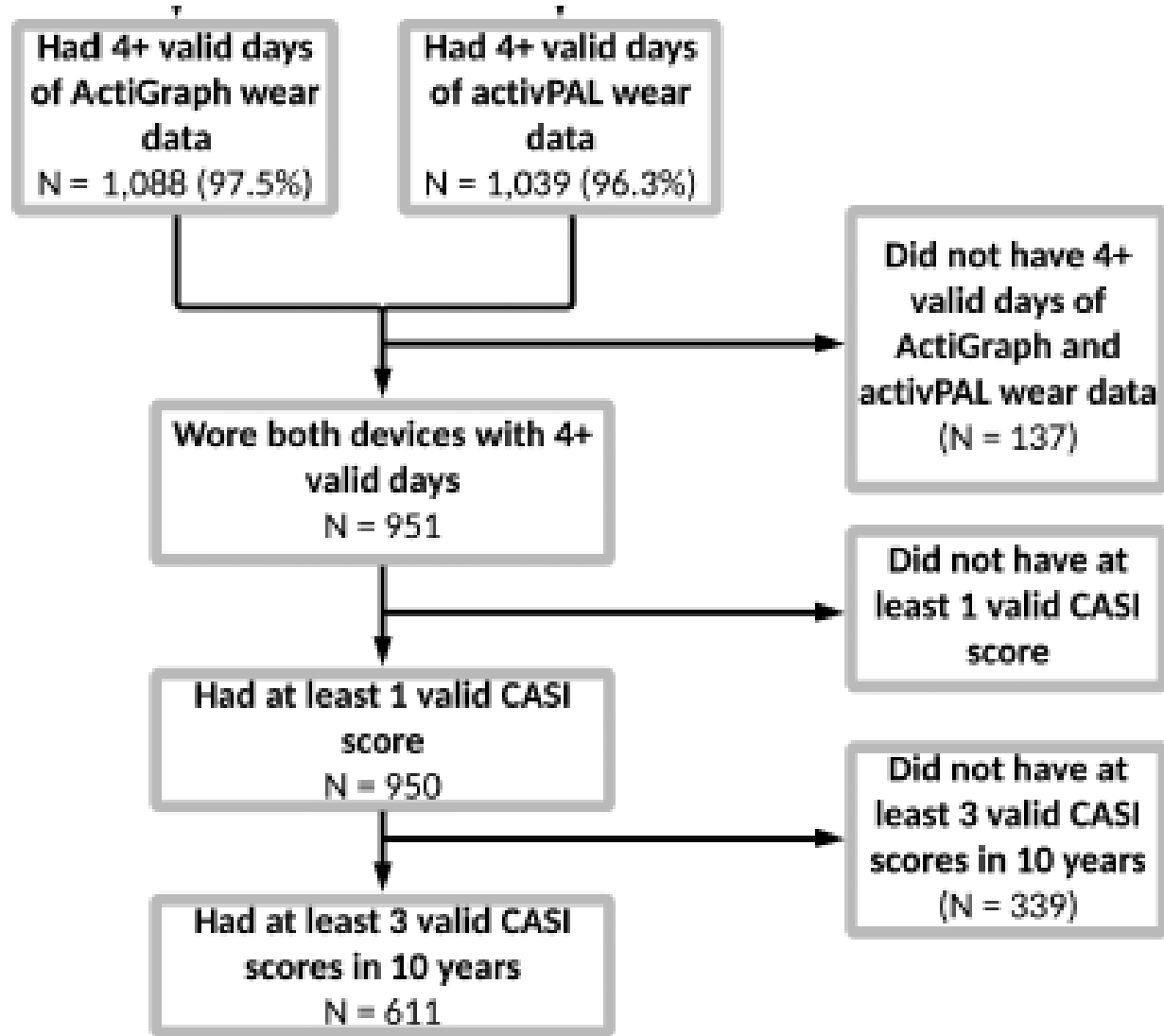


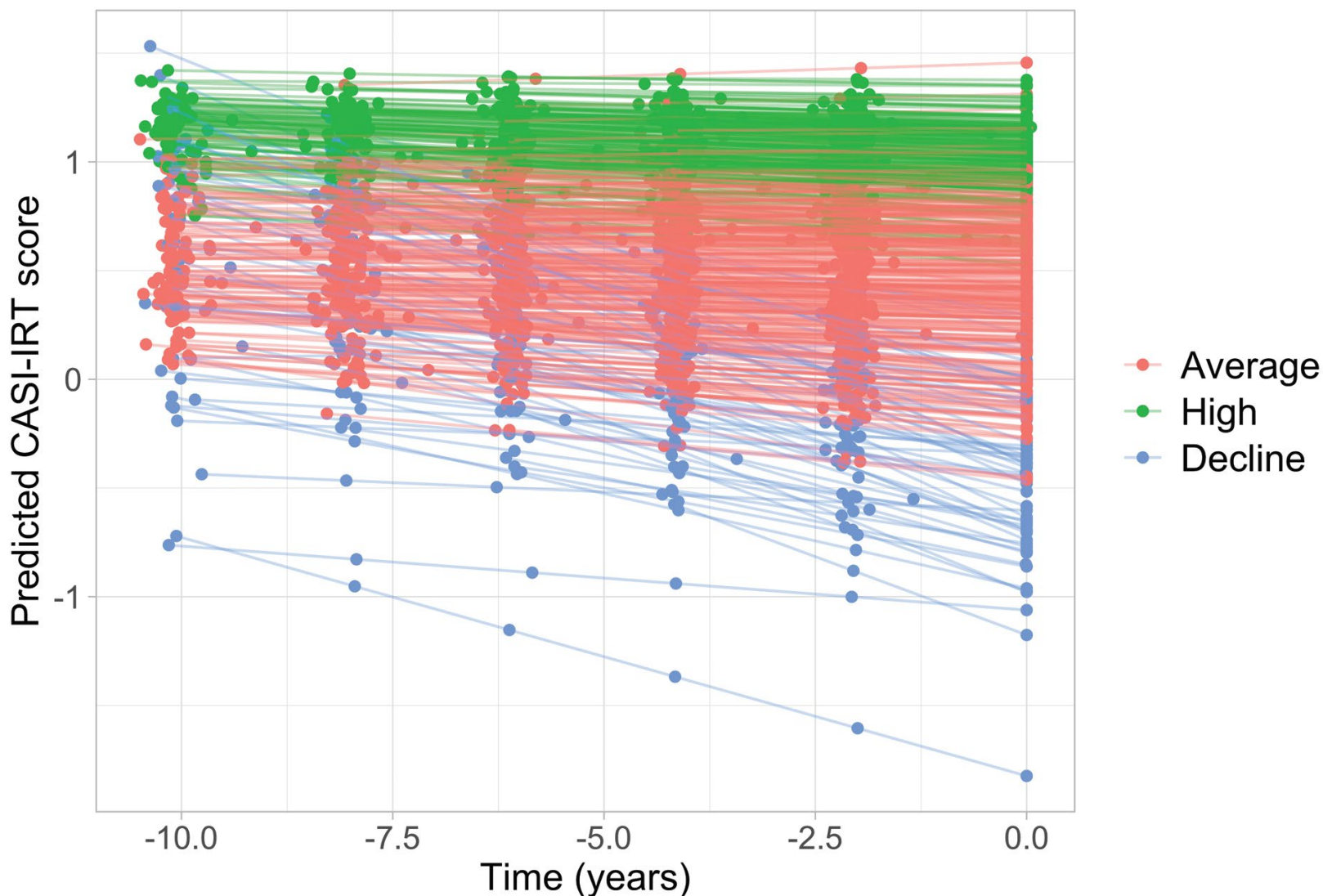
Table 1. Participant characteristics (n=611)

Female	57.1%
16+ years of education	70.7%
Able to walk ½ mile	71.5%
White	90.3%
	Mean (SD)
Age (years)	80 (6.5)
activPAL sitting (mins)	603 (120)
activPAL steps/day	6355 (3409)
ActiGraph light-intensity PA (mins)	276 (78)
ActiGraph MVPA (mins)	61 (43)

Results

- Table 1** describes the study sample.
- Three cognitive trajectory groups over 10 years were identified (**Figure 2**):
 - Average stable CASI scores (56.1% of the sample)
 - High stable CASI scores (34% of the sample)
 - Declining CASI scores (9.8% of the sample)
- Compared to the average stable group, those in the declining group had:
 - Less stepping time (-16 mins/day, 95% CI -31.4, -0.6)
 - Fewer steps/day (-1517 steps/day, 95% CI -2896, -138)
 - Less MVPA (16.3 min/day, 95% CI -31.3, -1.3)
- Outcomes for the high stable and average stable groups did not significantly differ from each other.
- CASI-IRT trajectory group was not associated with sedentary behavior or sleep outcomes.

Figure 2. Predicted CASI-IRT scores for each trajectory group



Discussion

- Results suggest bidirectional associations between cognitive function and PA, confirming prior research in other cohorts.
- Declining cognition could impact PA levels because cognitive resources such as effort, planning, and problem solving are required for engagement in PA.
- Our findings showed no association between declining cognition and sedentary behavior.

Limitations

- Device-data are unable to provide information on the types of SB people engage in. For example, people with declining cognition could have the same total sitting time but shift from more cognitively active sedentary behavior (e.g., reading) to cognitively passive SBs (e.g., TV viewing)
- We used time-in-bed as a proxy for sleep; future research should examine device measured sleep.
- We used a global cognitive screener that is less sensitive to changes in cognition; future studies can examine more specific domains with more detailed testing.

Conclusions

- Cognitive trajectories influence levels of PA.
- Future research should examine the potential for reverse causality in associations of PA, SB, and sleep with cognitive health outcomes, including examining more domains of cognition and device-based sleep measures.

Funding: U19 AG066567 (McEvoy/LaCroix/Crane)