



Combining Survey and Wearable Data on Exercise and Sleep

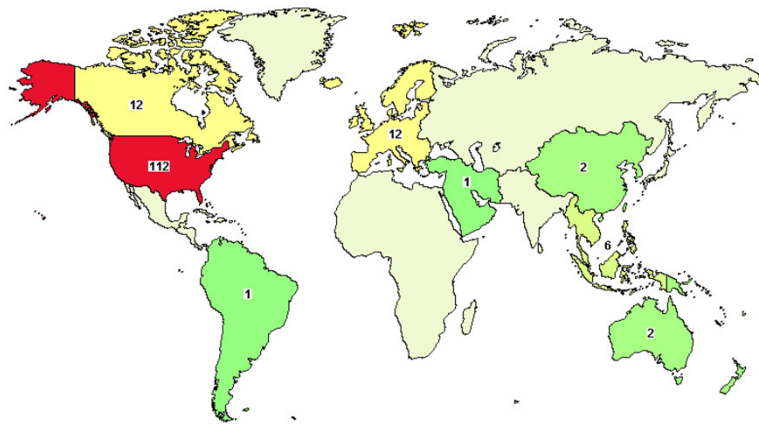
Stephanie Eckman, Robert Furberg, Ashley Amaya





AP Photo, from psys.org

427 devices available
from 266 vendors



217 registered clinical trials
using Fitbit devices



Fitbit Research Library

More than 450 papers
published since 2012

Comparison of Survey & Fitbit Data

with Robert Furberg & Ashley Amaya

Healthy Behavior Data Challenge

- CDC-sponsored contest to improve BRFSS
 - Behavioral Risk Factor Surveillance Study
- RTI solution: collect BRFSS items + Fitbit data
 - Screened Mechanical Turkers for Fitbit ownership
 - Administered BRFSS items
 - Retrieved Fitbit data
 - Linked to survey data
- Won 2nd place in national competition

3-Step Data Collection Protocol

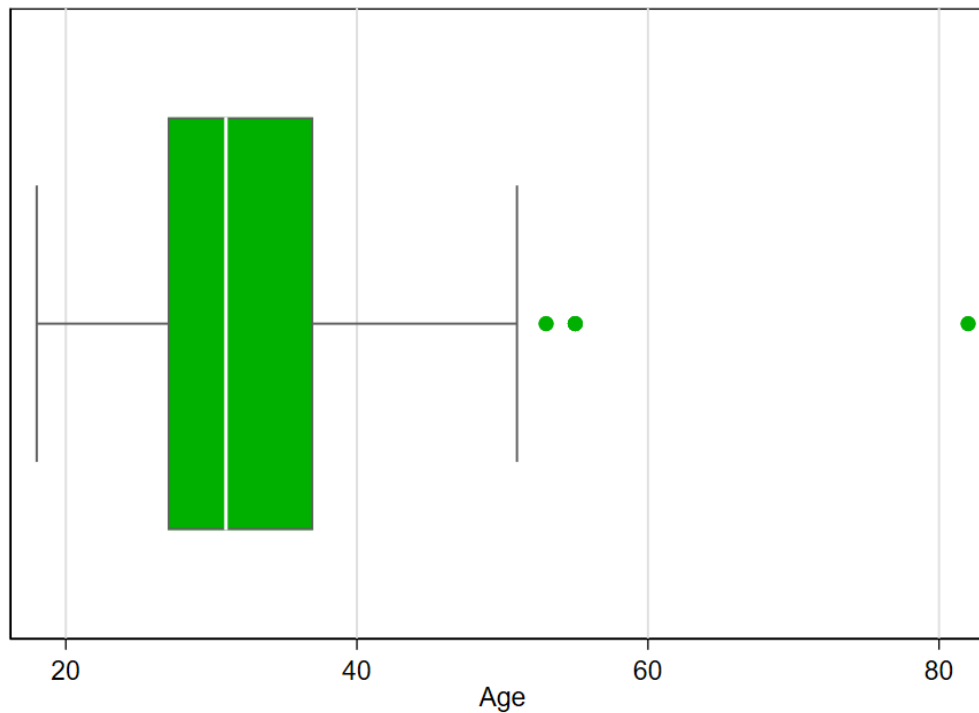
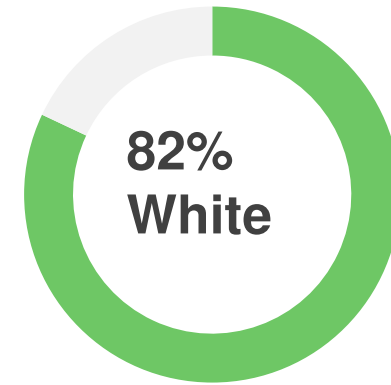
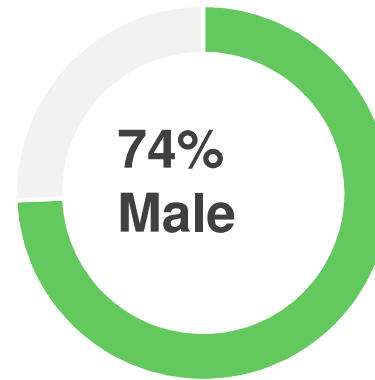
- Screener
 - Only Fitbit owners
 - Willing to donate data
- Survey
 - Height
 - Weight
 - Physical activity (outside of work)
 - Sedentary behaviors
 - Sleep
 - Demographics
- Data retrieval options:
 - Participants manually export
 - Researchers with access manually export
 - Custom Application Programming Interface (API) integration
 - Commercial third-party vendors with scalable APIs
- <http://www.fitabase.com>
 - 1-time donation of 1 month data

Fitbit Measures

- Physical Activity
 - # Steps
 - Distance on foot
 - Days of physical activity
 - Minutes moderate-to-vigorous physical activity
 - Calories burned
 - Active minutes
 - Duration of exercise
 - Flights of stairs climbed
- Sleep
 - Sleep minutes
 - Duration awake
 - # of times awake
 - Time to fall asleep
 - Time in REM sleep
- Sedentary
 - Hours sedentary, excluding sleep

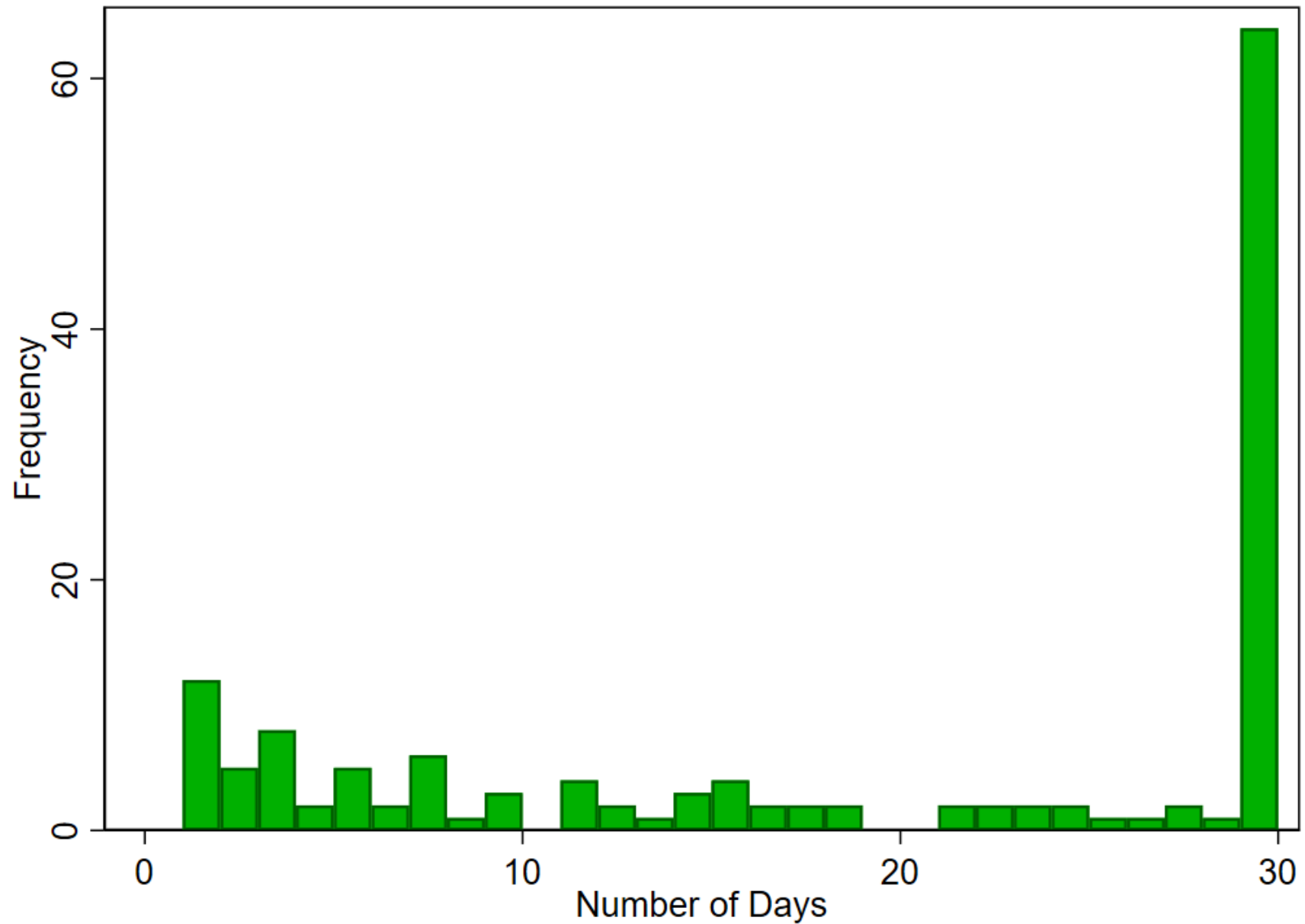
Participation

Survey only	133
Fitbit only	11
Survey + Fitbit	141

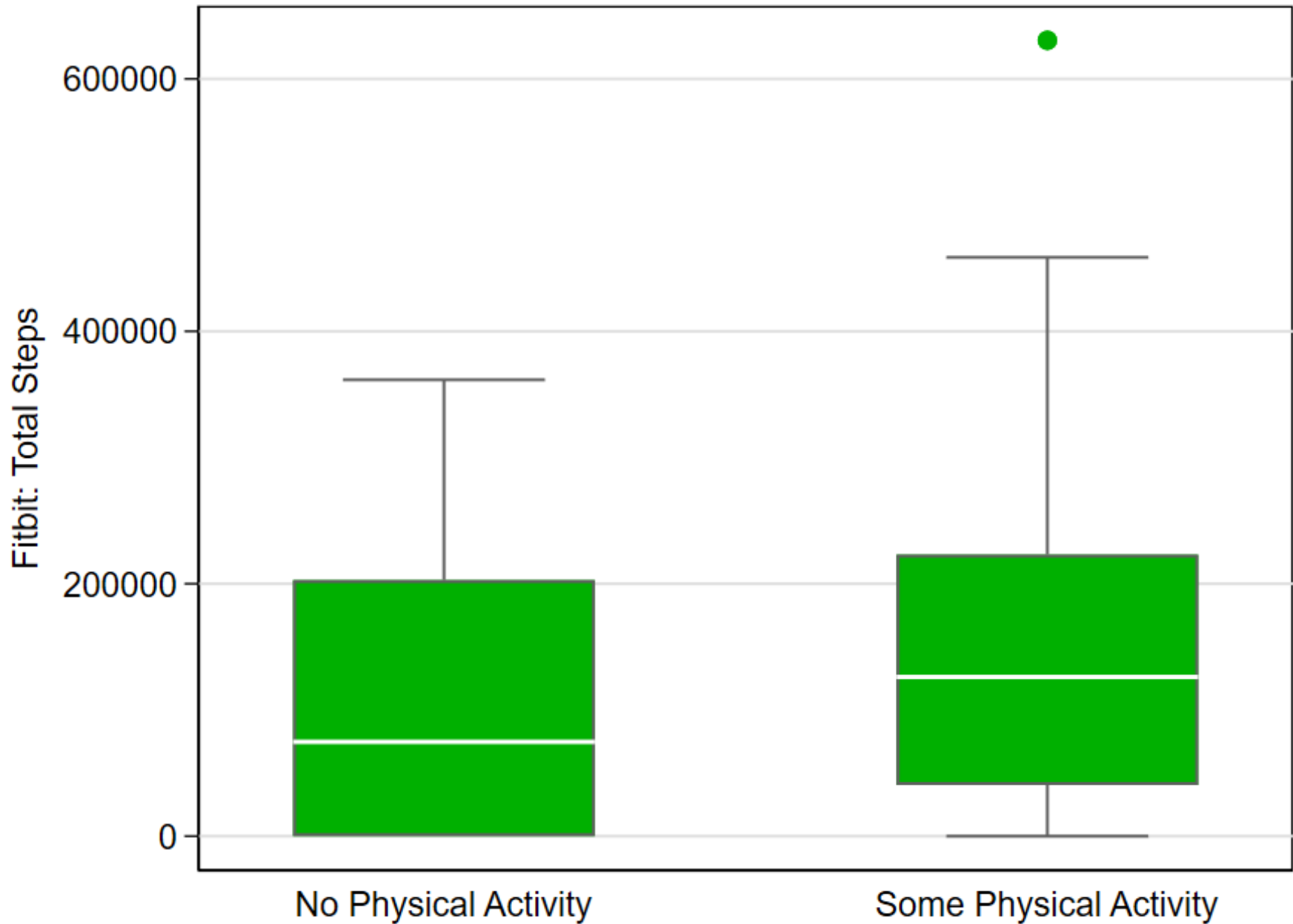


Median: 31
Mean: 33

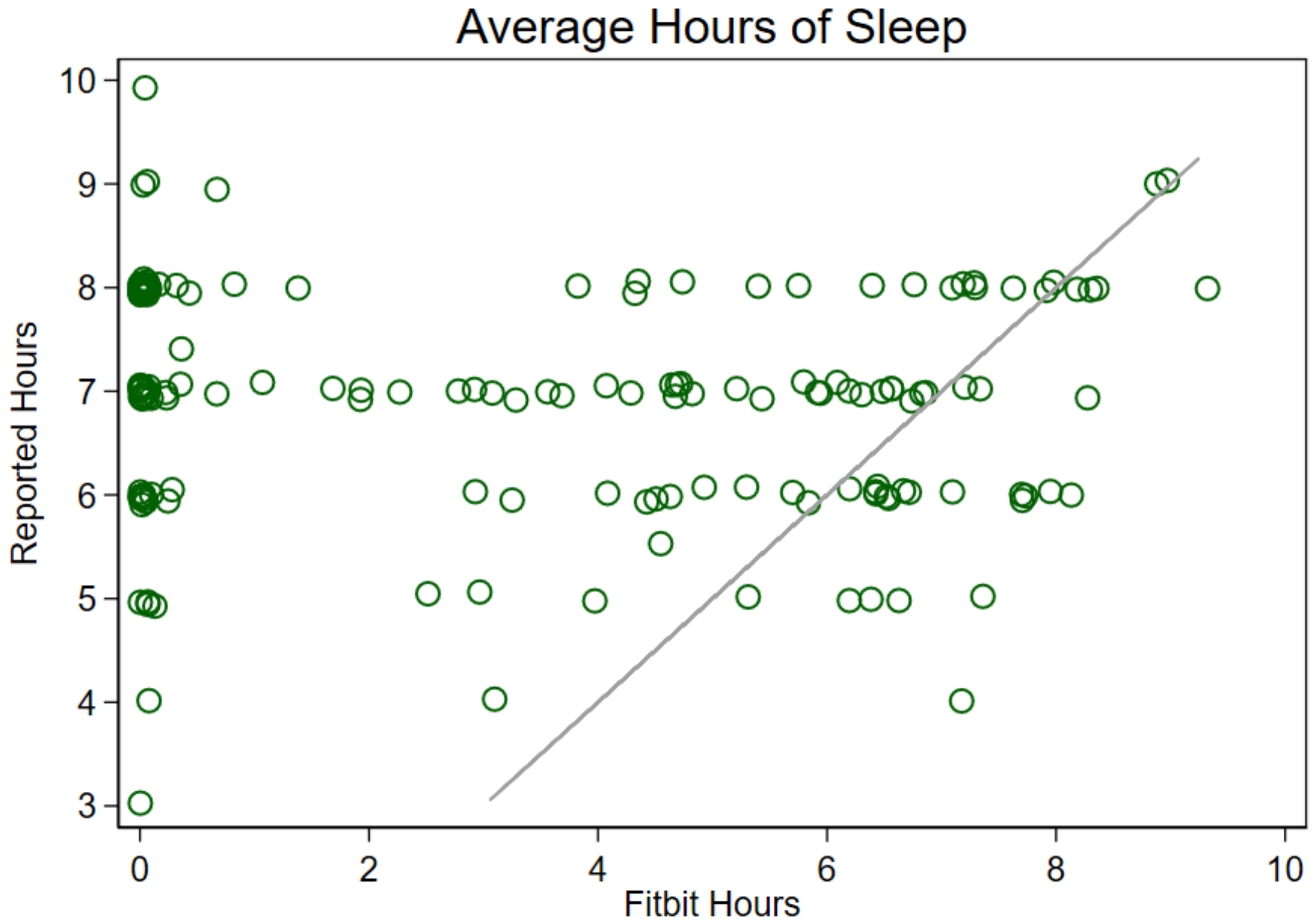
Days of Fitbit Data per Person



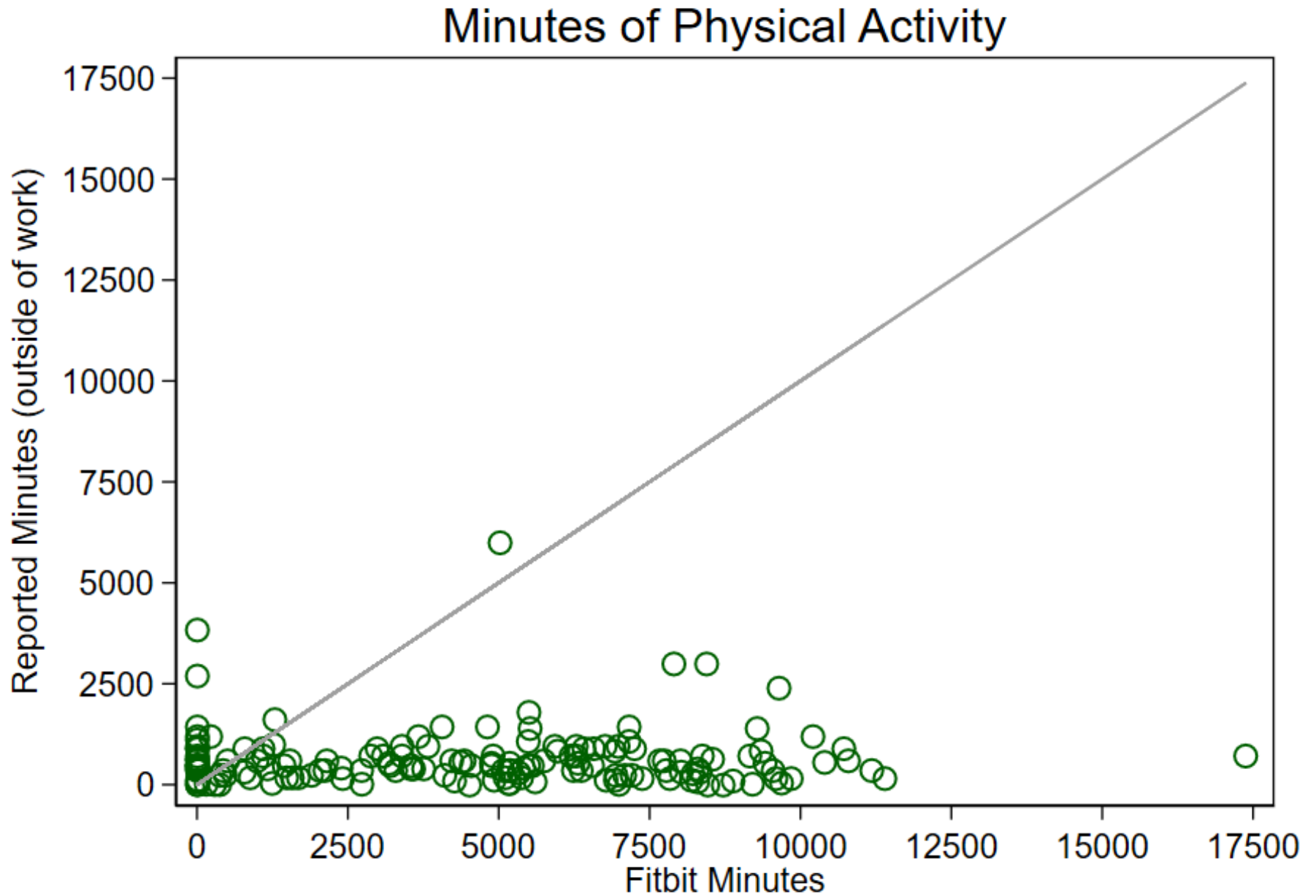
Comparison of Survey & Fitbit Data



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Using Latent Models to Estimate Health Behaviors from Linked Survey & Device Data

with Robert Furberg

Data Sources

- AddHealth study Wave 5
 - ~ 12,000 Wave 5 completes
 - ~ 8% report owning device
 - ~ 51% approve data transfer



AP Photo, from psys.org

Research Question

- Comparison of 2 sources on sleep and exercise
 - Survey responses
 - Device data
 - Via **Validic**
- Both subject to error
 - For different reasons



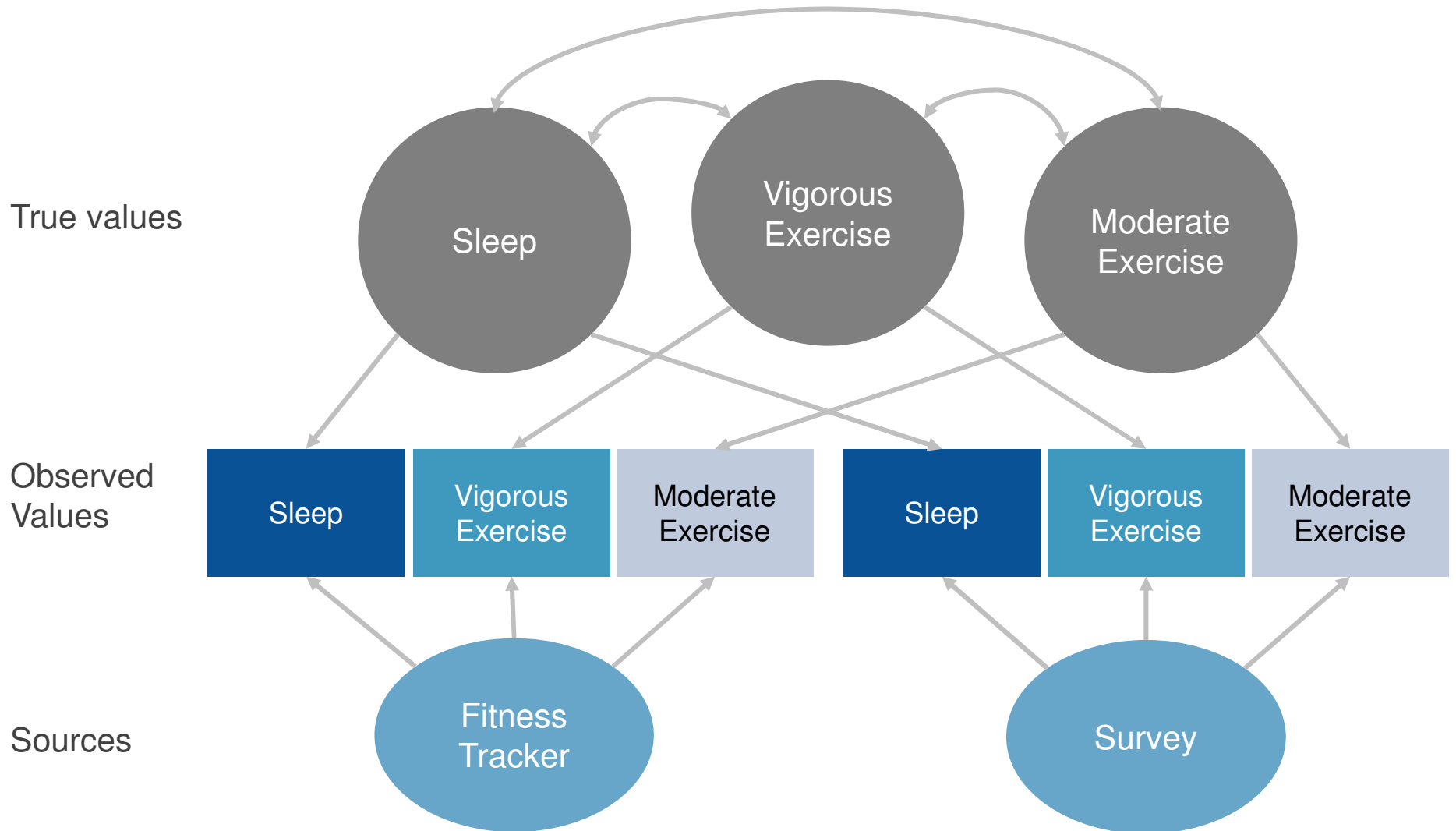
Latent Class/Variable Models to Uncover Truth

- 2 sources, both measured with error
- Similar to Oberski et al JASA, 2017
 - Comparison of survey & administrative data

Evaluating the Quality of Survey and Administrative Data with Generalized Multitrait-Multimethod Models

D. L. Oberski, A. Kirchner, S. Eckman & F. Kreuter

Latent Class Model to Estimate Truth





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