# Measurement of Physical Activity in Older Adults through Data Donation of Smartphone Health Data and Google Location History


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# Measuring Physical Activity in Older Adults

- Physical activity (PA) foundation of healthy lifestyle, elevated immune and psychological function, and decreased mortality (Pate et al. 1995; Warburton et al. 2006), especially for aging populations (DiPietro 2001)
- Accurate  measurement of PA key to identifying determinants of health and developing appropriate interventions
  - *Self-reports* usually limited to global measures and misclassification (Bauman et al. 2009; Farrell et al. 2014)
  - More fine-grained *day-reconstruction methods* limited to short reference periods, burdensome, and prone to recall error (Kahnemann et al. 2004)
  - *Providing participants with wearables* to track PA reduces reactivity and measurement error but non-compliance and high device costs (Montoye et al. 2016; Schneller et al. 2017)

# Potential Alternative: Data Donation

- Takes advantage of GDPR Articles 15 (Right of access by the data subject) and 20 (Right to data portability)
  - Receive personal data in structured, commonly used, and machine-readable format (“Data Download Package”; DDP)
  - Transmit data to another data controller

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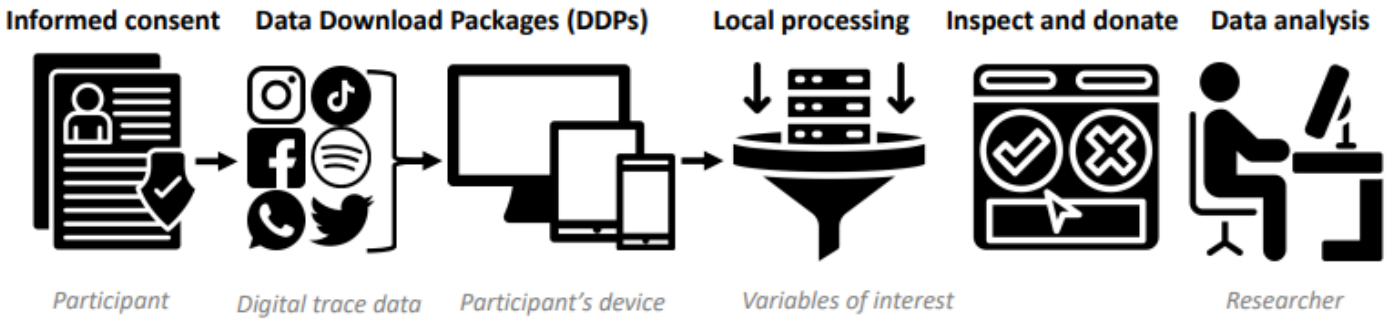
  - Transmit data to another data controller
- Privacy-preserving data donation platforms




Boeschoten et al. (2023)

# Data Donation for PA Studies

- Study participants asked to download PA data from devices they already own (e.g., smartphones, smart watches, fitness bracelets) and share them with researchers
- Leverages advantages of passive data collection - high-frequency information - with study of PA in true longitudinal setting
- Cost-efficient because participants use own devices
- However, very little known about quality of donated PA data

➢ What are determinants of consent and selection bias in PA data donation among older adults?

# Design

- Baseline online survey with 2,000 adults aged 50+ in LISS panel - probability-based online panel of Dutch general population
  - Sociodemographics, self-rated health and health behaviors, chronic illness, (self-reported) PA, BMI, smartphone ownership and use, privacy concerns

- Smartphone owners asked to download passively collected PA data from 2018-2023 from their devices (Apple Health, Google Location History, or Samsung Health) and donate them via PORT

# First Results (January data collection)

| Survey | | | Data donation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Apple Health | | Google Location History | | Samsung Health | |
| | n | % | | n | % | n | % | n | % |
| Invited | 399 | 100 | Asked for consent | 126 | 100 | 178 | 100 | 29 | 100 |
| Completed | 346 | 87 | Consent given | 56 | 44 | 44 | 25 | 11 | 38 |
| Incomplete | 26 | 7 | Attempted donation | 39 | 31 | 22 | 12 | 3 | 10 |
| | | | Donated DDPs | 23 | 18 | 3 | 2 | 2 | 7 |

# First Results (March data collection)

| Survey | | | Data donation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Apple Health | | Google Location History | | Samsung Health | |
| | n | % | | n | % | n | % | n | % |
| Invited | 1946 | 100 | Asked for consent | 197 | 100 | 301 | 100 | 46 | 100 |
| Completed | 548 | 28 | Consent given | 87 | 44 | 73 | 24 | 16 | 35 |
| Incomplete | 80 | 4 | Attempted donation | 56 | 28 | 25 | 8 | 3 | 7 |
| | | | Donated DDPs | 41 | 21 | 21 | 7 | 2 | 4 |

# Lessons Learned

- Complex study (methodological, technical, ethical, & legal sides)
  - Institutional support and pre-existing relationship with vendors paramount
- Multiple interconnected components introduce risks but for our pilot it helped…
  - …to be involved in development of PORT redesign
  - …to be integrated into the D3I consortium
  - …to have done prior studies with PORT-Centerdata integration
- Soft launch learning: Google Location History (GLH) seems problematic - searching for a solution

# Next Steps

- Finish main data collection started on March 4

- Data analysis
  - Determinants of consent and selection bias
  - Quality of donated PA data
  - Multi-source PA data to predict health outcomes

- Potential implementation in larger-scale existing studies

# Thank you!



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