Using geolocation data in serious mental illness phenotyping

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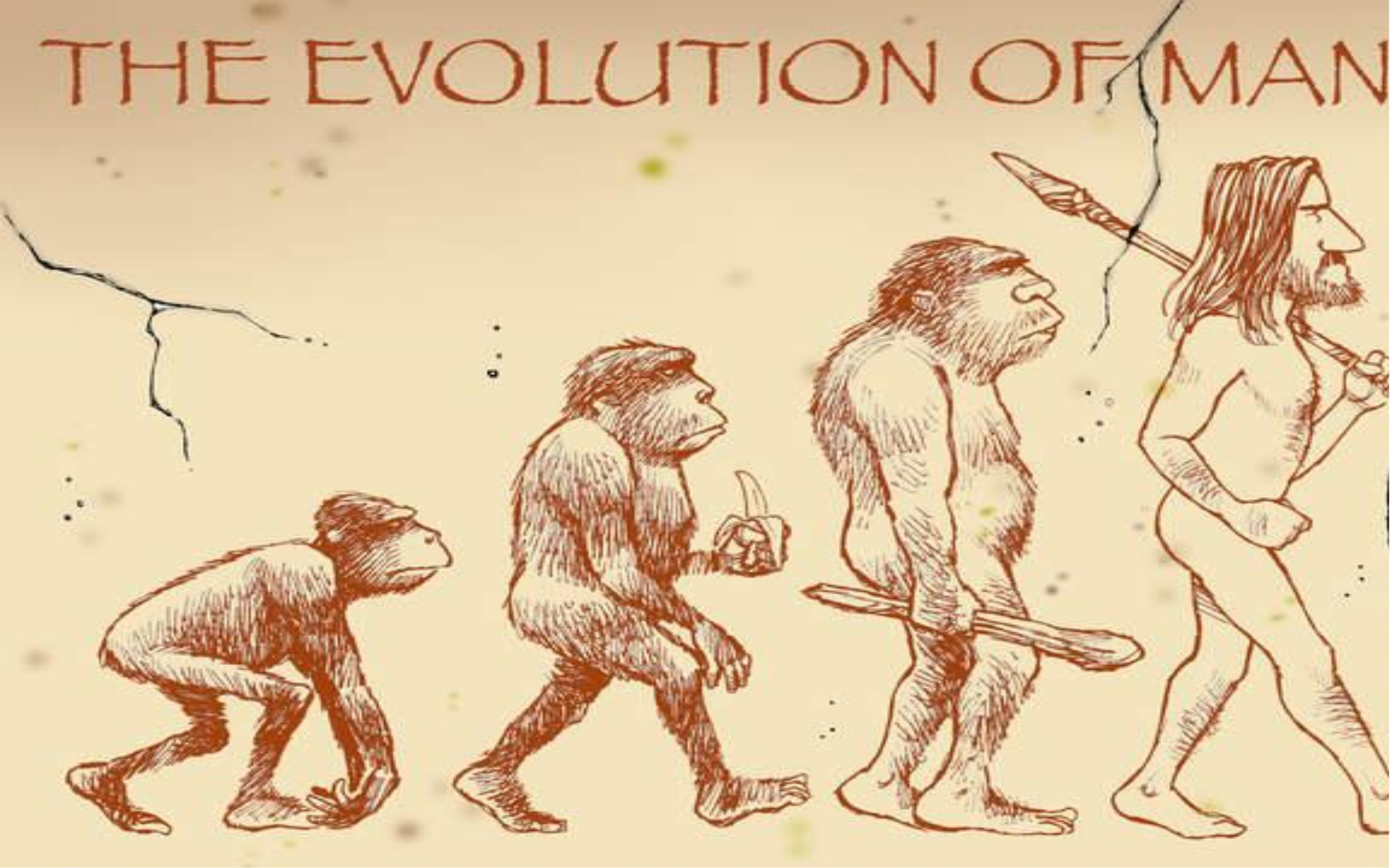
The Wearable Clinic launch event
05/07/2017


THE EVOLUTION OF MAN

Digital phenotyping*

Calendars

Geolocation

Social graph

Physical activity

Interests

Purchases

* Onnela J-P et al. Harnessing Smartphone-Based Digital Phenotyping to Enhance Behavioral and Mental Health.Vol. 41, Neuropsychopharmacology.; 2016. p. 1691–6.

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Why geolocation data to study serious mental illness (SMI)?

- Increasing Smartphone ownership in people living with SMI
- Passive monitoring of important disease indicators (i.e. mobility, rhythmicity and routines)
- Real-time monitoring, as opposed to infrequent visits and questionnaires

To what extent have these opportunities been explored?

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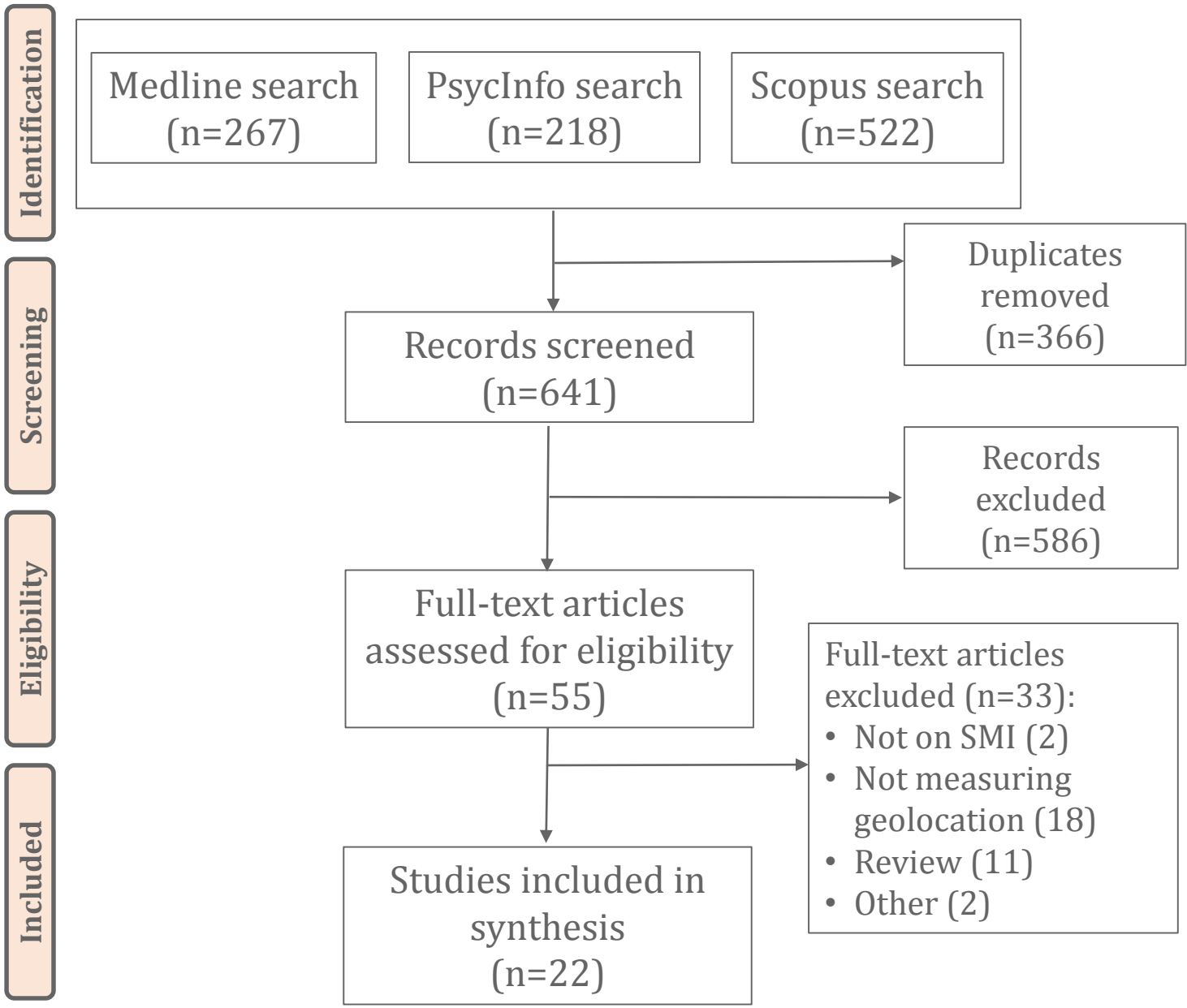
Systematic review of the literature

Search on 16/5/2017:

(<smartphone> OR <geolocation>)

AND

(<schizophrenia> OR <bipolar disorder>)



Preliminary findings

- 15 individual studies, with 6 being feasibility studies
- Mostly density-based methods to process the geolocation data
- Main metrics reported:
  - number of locations visited and distance travelled
  - time spent outdoor or specific location
  - cell tower movements
- Only two studies looking at more complex metrics (i.e. out-of-home behaviours and entropy of life)
- Seven studies reported clinical significance of the geolocation-derived metrics

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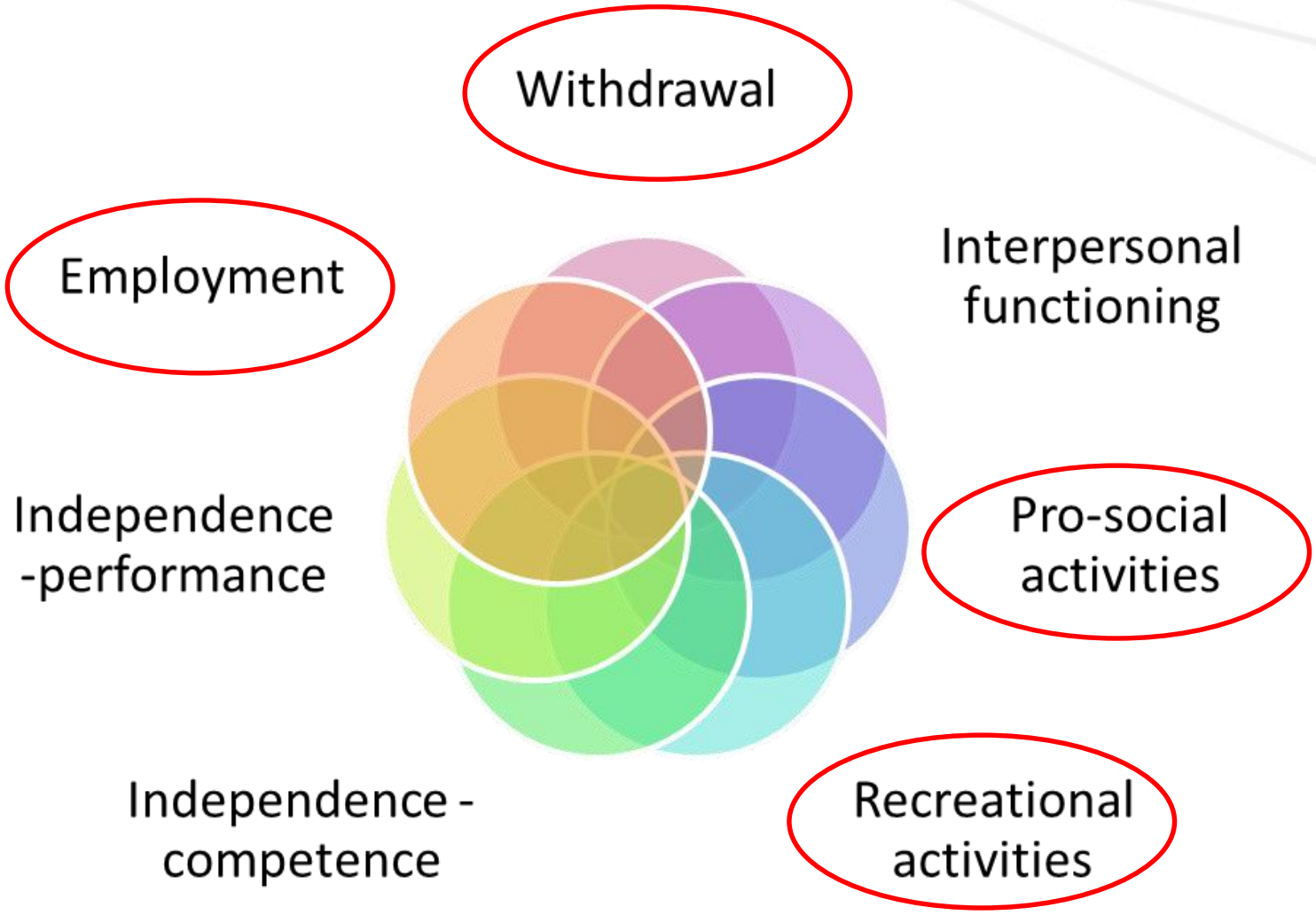
Monitoring SMI: Social functioning



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Feasibility study

Research question: To what extent is it feasible to collect the data necessary to validate algorithms inferring daily out-of-home activities?

Methods

- 21 healthy volunteers (7 male:14 female)
- Mix of personal and rental devices

- Measured 10 days over 4 weeks
- Completed feedback questionnaire

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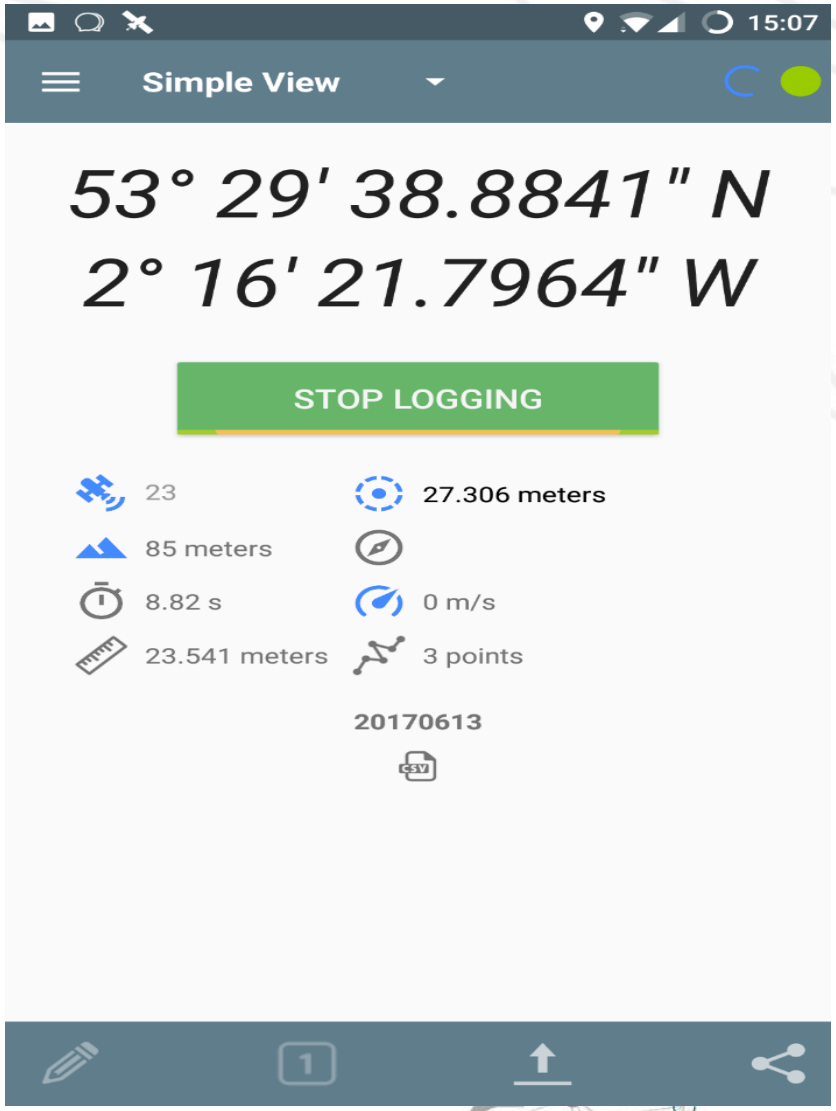
GPS Data

- Logging application
- Start on waking, end on sleeping
- Upload to secure server
- Valid if 10+ hours long



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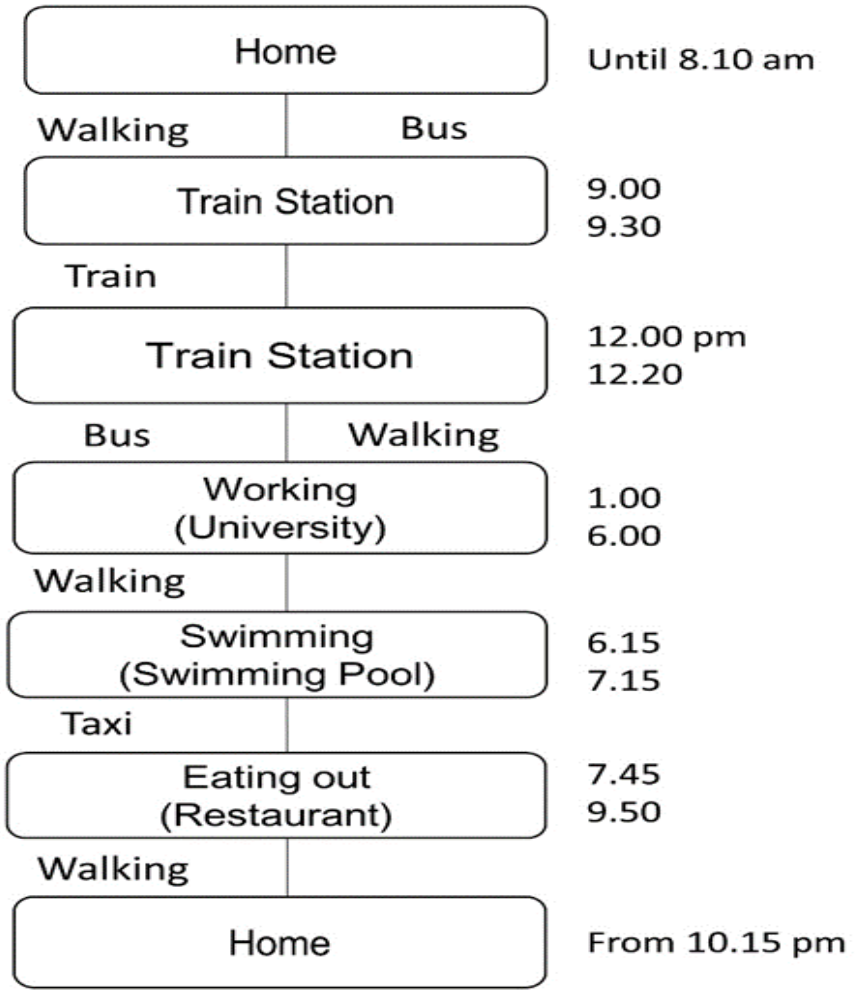
Activity diary

- Total time out of home
- Flowchart of activities
- Valid if time out of home clearly stated



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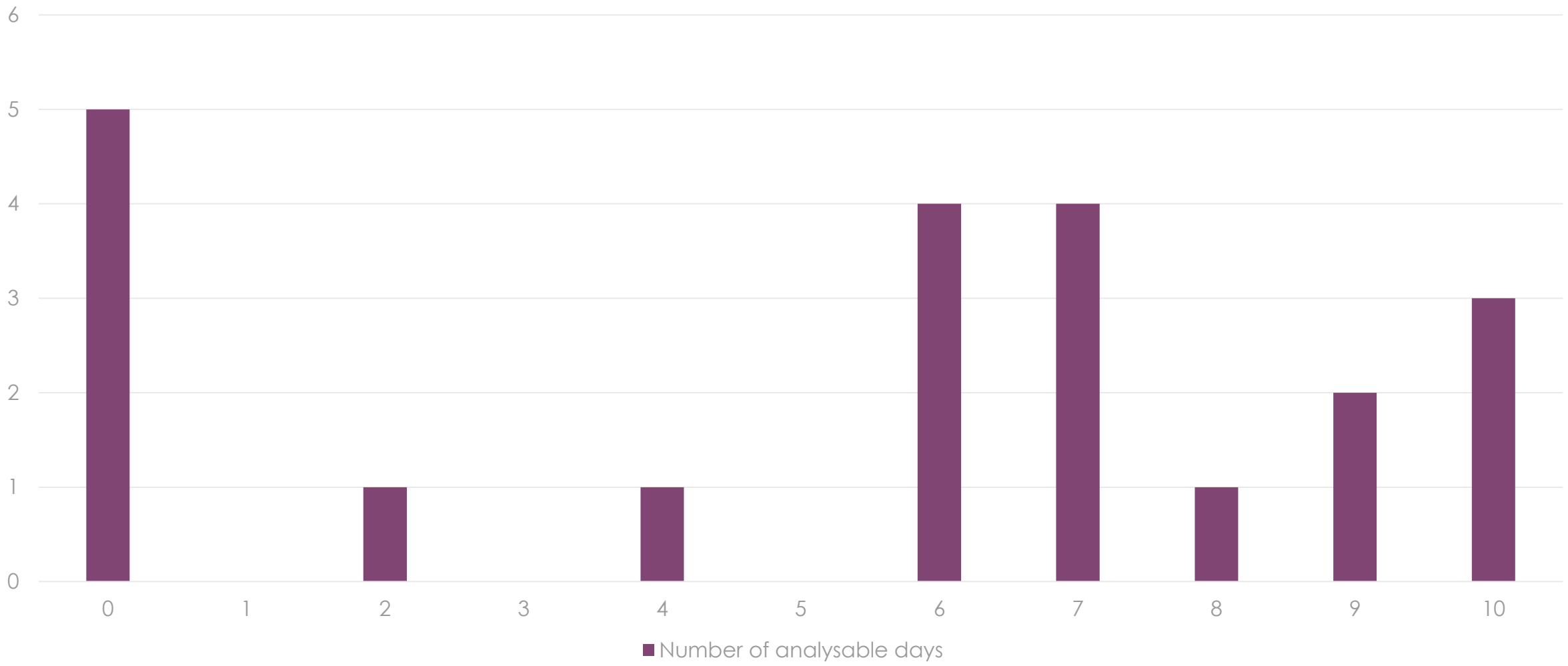
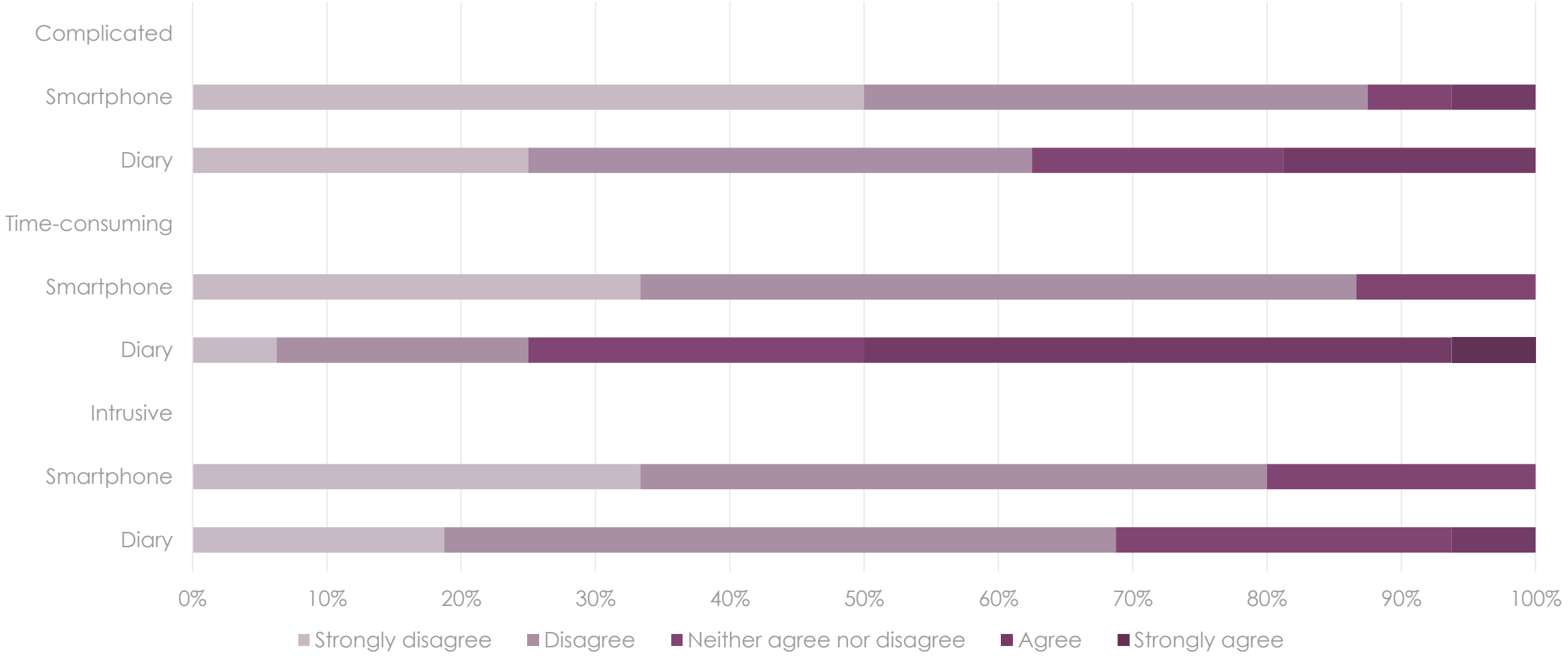
Total number of analysible days

		Activity Diaries		
		Valid	Invalid	Total
GPS Data	Valid	114	48	162
	Invalid	24	24	48
	Total	138	72	210

Number of analysible days per participant



Results from feedback questionnaires



Conclusion

- More GPS files returned than activity diaries
- Smartphones found to be less bothersome

- Results suggest potential
- More studies needed, including participants with mental health issues
- Next step processing the data to infer out-of-home activities

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Thanks for listening!