



Consultation on plans for physical activity, geolocation, and sleep data collection in Understanding Society: Background information

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Background to Understanding Society / Innovation Panel

Understanding Society: the UK Household Longitudinal Study is a major research study designed to enhance understanding of life in the UK and how it is changing. The Study, funded primarily by the UK Economic and Social Research Council, takes a sample of 40,000 households containing around 100,000 individuals and attempts to interview all household members annually. A large boost sample of ethnic minority participants is also included. The first wave began in January 2009 with each wave of interviewing being spread over 24 months (meaning two overlapping waves of interviews are in the field at any one time).

The **Innovation Panel** is an important and integral part of the design of Understanding Society. It consists of an original sample of around 2,500 participants clustered within households, plus refreshment samples of around 700 people added in 2011, 2014, 2017, 2018, 2019, and 2021. Interviews have been attempted with all adult sample members at annual intervals starting with Wave 1 in 2008. Wave 16 is currently in the field (summer 2023). Subsequent waves of interviewing will continue to be carried out at annual intervals, around June to November. Aside from the shorter time in the field for each wave, the design of the Innovation Panel largely replicates the household panel survey design employed by Understanding Society, with attempts made to re-interview all sample members at each wave regardless of changes in household composition or geographical location, as well as any other (non-sample) members of the current households of sample members.

The Innovation Panel tests two types of innovations:

- New survey content/data, that will be used to address innovative substantive research questions
- New survey methods. Methodological studies to evaluate the impact of different survey options are typically experimental and can relate to the design of survey instruments (e.g. question wording, item order, etc.) or to survey design features (e.g. procedures intended to reduce non-response or to improve fieldwork efficiency).



This project will contribute to both, developing new content/data and new methods of collecting data.

To date, a range of experiments and tests have been incorporated into the Innovation Panel. These are documented in the [Innovation Panel User Guide](#) and in a series of [Understanding Society Working Papers](#) summarizing early findings from experiments.

Brief overview of the proposed project

We are planning to enhance the data from the annual Understanding Society interviews, by passively collecting data on geolocation, physical activity and sleep using *activity trackers*. Subject to ESRC approval, activity tracker data collection will initially be implemented on the Innovation Panel sample. If successful, it could be implemented in the main Understanding Society sample in the future.

Study design. Respondents who agree to participate in the study will be sent activity trackers (that is devices equipped with: accelerometer, GPS and sleep tracker) and asked to wear them continuously for an agreed period of time (for at least 22 hours a day). Depending on the device choice, we are considering a data collection period of between 8 days and 3 months. Every evening during the 8-day data collection period (or weekly if the data collection period is longer), respondents will additionally be asked a small number of questions about their activities and wellbeing during the day. At the end of the data collection period, respondents will be additionally asked a small set of questions about their day, including how typical their past week was.

We estimate that the sample size of people who will complete the data collection will be between 800-1000. Depending on the number of devices available, it is likely that the devices will have to be recycled and so the data collection period for the trackers will be longer than the annual interview fieldwork period.

Overall, this study will consist of three main components:

- Subjective data collection using questionnaires (questions asked daily/weekly, questions asked once at the end of the activity tracker study period, and questions from the annual IP questionnaire)
- Data collected from activity trackers (accelerometer, sleep, GPS)
- Data on neighbourhood characteristics: linked from administrative data (e.g., ONS) + self-report

The type of data collected by activity trackers will include (subject to the capabilities of the device):

- Time-stamped detailed GPS data, collected outside geo-fenced locations such as respondent's house and workplace, collected during waking hours (i.e. between 5am and 9pm),
- Time-stamped level of physical activity based on accelerometer data (exact measures will depend on the device chosen) collected during waking hours (i.e. between 5am and 9pm)



- Sleep (duration, sleep onset latency, efficiency, sleep phases, wake after sleep onset, time awake)
- Heart rate, heart rate variability across the sleep and wake cycle
- Blood oxygen level
- Other measures depending on the device choice

Data collected at the end of each study-day via self-report questionnaire will include questions about:

- Mental health (mood/stress)
- Physical activity
- Social interactions and events
- Time scarcity
- Subjective perceptions of sleep

Data collected at the end of the study period via short questionnaire will include:

- General Health Questionnaire (GHQ), which is a commonly used instrument to measure mental wellbeing
- Questions asking respondents to reflect on how typical the past week was in terms of different aspects of life (i.e. sleep, exercise, daily routine, workload)

Linked data:

The study will also link a wide range of neighbourhood characteristics, including:

- Deprivation
- Availability and quality of green spaces
- Air pollution
- Noise

All of the above indicators are available on small area level (i.e. LSOA/MSOA) from administrative data. This will enable researchers to analyse if and how the use of local outdoor spaces (based on GPS data) is linked with their objective characteristics.

Data collected in the annual interview preceding the activity tracker study:

We will also include relevant questions on physical activity, sleep, mental health, perceptions of the quality of local green spaces and local neighbourhood in the annual interview to allow for comprehensive analysis of a wide range of factors that affect how people interact with their local environment. This will also allow us to look at any differential up-take of the activity tracker study.



What is the consultation process for?

We would like to ask specialists working in the areas of health, wellbeing, neighbourhood effects, physical activity, sleep, and time use who either use data from activity trackers or use survey data and are interested in incorporating data from activity trackers in their research for their expert opinion on:

- Ideas for using the data: example research questions that could be addressed with these data
- Proposed study design options: including the length of the data collection, data types, devices considered, pros and cons of different options
- Considerations when designing activity trackers data collection
- 'Lessons learned' from their own research using activity trackers

Agenda for the consultation meetings

Welcome and introduction (5 minutes)

Part 1: Content (40-50 minutes)

- Questions we would like to discuss:
 - Any initial comments on the study design/timing of data collection in relation to GPS, Physical Activity, Sleep, Daily survey questions? (Please see summary tables at the end of this document)
 - How would you use the data? What research questions might it help you to answer that you weren't able to before?
 - What's the ideal balance between data quality/rigour and ability to scale up and link to other forms of data?
 - How can the Understanding Society team help make the data more user-friendly for researchers?
 - Are there other questions as part of the daily/yearly survey that we would need to collect to make the activity tracking data really useful?

Break (10 mins)

Part 2: Implementation (40-50 mins)

- Here we are interested in learning from people about potential pitfalls/problems with this kind of study (based on their own experiences of what has and hasn't worked well)
- We will ask about the device options we have explored so far and give examples of topics that we have considered but invite people to share their own too
 - Device issues (2 devices, app + device)
 - Technical/data issues
 - Practical issues
 - Participant burden/uptake/attrition
- Is there anything else we need to be mindful of from the outset that we haven't considered?
- What are the compromises that we might need to make?

<i>Devices and app options considered to date</i>						
	Physical Activity Recording	Sleep Recording	GPS Recording	Hide Information from User	How many apps required to install?/ Interaction with app required?	Other considerations
Garmin + Smartphone	Recorded by Garmin device	Recorded by Garmin device (not sufficient data quality)	Recorded by Fitrockr or Ethica app on smartphone.	Possible	1 app; No interaction with app required	Impact of GPS tracking on respondent's smartphone battery life (estimate impact between 12% to 30% depending on the device)
Fitbit + standard GPS (Interrex, BT-Q1000XT or similar)	Recorded by Fitbit device	Recorded by Fitbit device	Recorded by Interrex (or similar)	Potentially possible with Ethica app	1 app if Ethica app used, unclear whether interaction with app required	Development of a strap that could hold the GPS device, size of GPS device

Fitbit + Smartphone	Recorded by Fitbit device	Recorded by Fitbit device	Recorded by Fitrockr or Ethica app on smartphone.	Potentially possible with Ethica app	1 app if Ethica app used, unclear whether interaction with app required	Impact of GPS tracking on respondent's smartphone battery life (estimate impact between 12% to 30% depending on the device)
Apple watch + Smartphone	Recorded by Apple device	Recorded by Apple watch (quality not tested)	Recorded by Fitrockr or Ethica app on smartphone.	Potentially possible with Ethica app	1 app if Ethica app used, unclear whether interaction with app required	Garmin, Apple and Google watches deemed easier to work with Ethica/Fitrockr app than Fitbit, more frequent data uploads
Google watch + Smartphone	Recorded by Google watch device	Recorded by Google watch (quality not tested)	Recorded by Fitrockr or Ethica app on smartphone.	Potentially possible with Ethica app	1 app if Ethica app used, unclear whether interaction with app required	Garmin, Apple and Google watches deemed easier to work with Ethica/Fitrockr app than Fitbit, more frequent data uploads



Fitbit only	Recorded by Fitbit device	Recorded by Fitbit device	Recorded by Fitbit device (significant software development required, not yet tested)	Potentially possible with Ethica app	1 app if Ethica app used, unclear whether interaction with app required	
Garmin only	Recorded by Garmin device	Recorded by Garmin device (not sufficient data quality)	Would require manual GPS switching on/off at least once a day	Possible	1 app, interaction with app required	
Activinsights band + Garmin watch GPS	Recorded by Activinsights device	Recorded by Activinsights device	Would require manual GPS switching on/off at least once a day	Possible	Potentially no app required	Non-replaceable battery that lasts 1 year
Activinsights band + standard GPS (Interrex, BT-Q1000XT or similar)	Recorded by Activinsights device	Recorded by Activinsights device	Recorded by Interrex (or similar)	Possible	Potentially no app required	Non-replaceable battery that lasts 1 year
Activinsights watch (Geneactiv)+ Garmin watch GPS	Recorded by Activinsights device	Recorded by Activinsights device	Would require manual GPS switching on/off at least once a day	Possible	Potentially no app required	
Activinsights watch (Geneactiv) + standard GPS (Interrex, BT-Q1000XT or similar)	Recorded by Activinsights device	Recorded by Activinsights device	Recorded by Interrex (or similar)	Possible	Potentially no app required	



Actigraph watch + Garmin watch GPS	Recorded by Actigraph device	Recorded by Actigraph device	Would require manual GPS switching on/off at least once a day	Possible	Potentially no app required	
Actigraph watch + standard GPS (Interrex, BT-Q1000XT or similar)	Recorded by Actigraph device	Recorded by Actigraph device	Recorded by Interrex (or similar)	Possible	Potentially no app required	
Links to some of the mentioned suppliers: https://ethicadata.com/ ; https://www.fitrockr.com/ ; https://interrex-tracking.com/						



	Data collection period	
	Shorter (8 to 14 days)	Longer (3 months +)
Considerations	Fewer devices required (i.e. 300-400 devices) that could be recycled (retrieved from respondents and re-sent to another group of respondents); data collection could be repeated twice in the same year to account for seasonal variation in physical activity. More difficult logistically.	Devices could be kept by respondents as incentives to take part in the study. Easier logistics. Only cheaper, consumer devices can be used for this option. If no external app used, respondents would see their data in the consumer device app, which is likely to affect their behaviour, at least in the short term.