

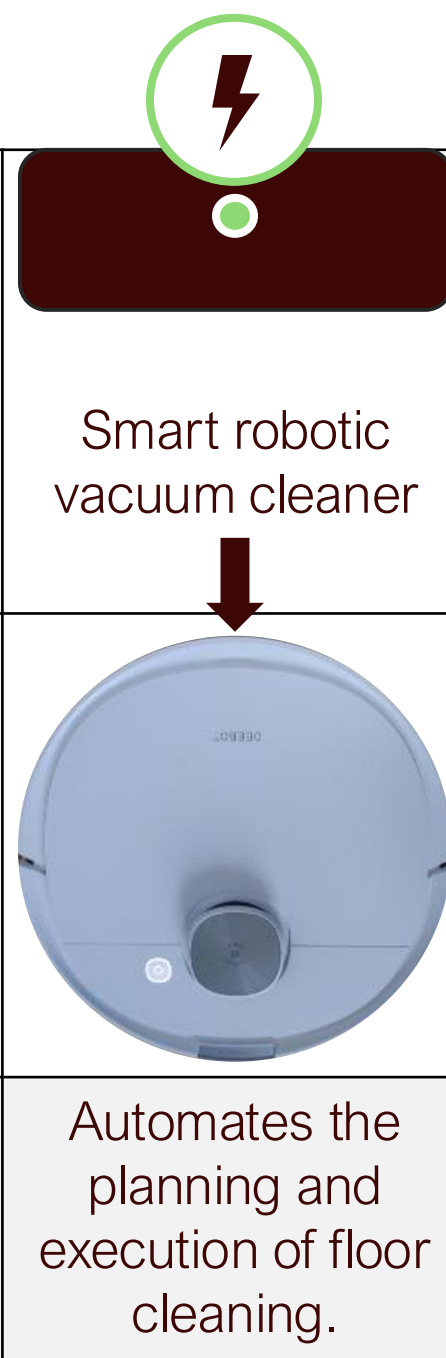
# Can you uncover the secrets of household automation? Energy Demand Detectives

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**iDODDLE**  
The Impacts of Digitalised Daily Life on Climate Change

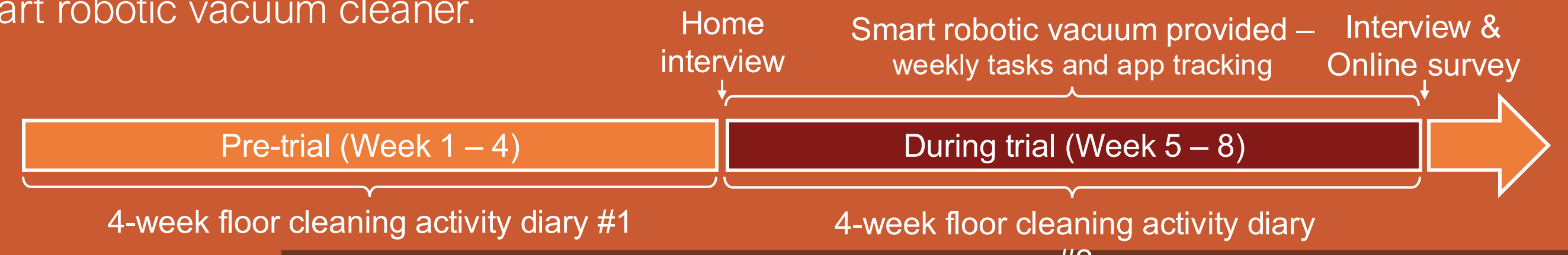
## Aim of your visit

Discover the overlooked impacts of automation and their implications for energy demand.  
Your mission is to complete the Detective Note Pad and solve the mystery.  
To start, go to the Study Design room to learn about the research context and design, then help yourself to a Detective Note Pad and pen.  
Visit the rooms to uncover clues about the methods used and key results.



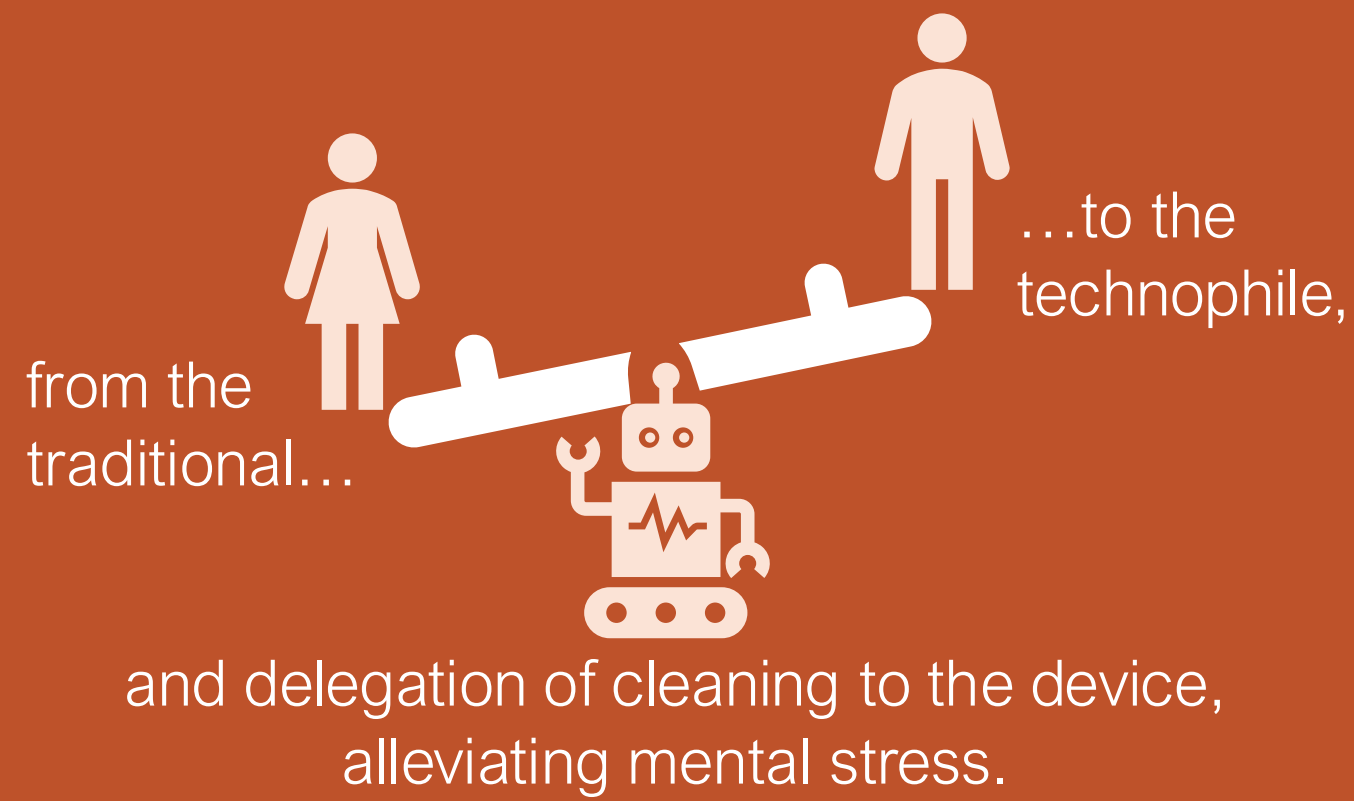
## Study Design room

Automation of daily life activities promise energy efficiency gains, demand reduction and a more integrated, flexible energy system. Much research investigates direct energy impacts of automation technologies<sup>1</sup>, with indirect energy (and other) impacts of usage often overlooked.  
We used a mixed methods experimental research design with 10 households as part of a UK living lab to uncover direct and indirect impacts of automation using a case study technology - Smart robotic vacuum cleaner.



## Responsibility

Transferral between household members

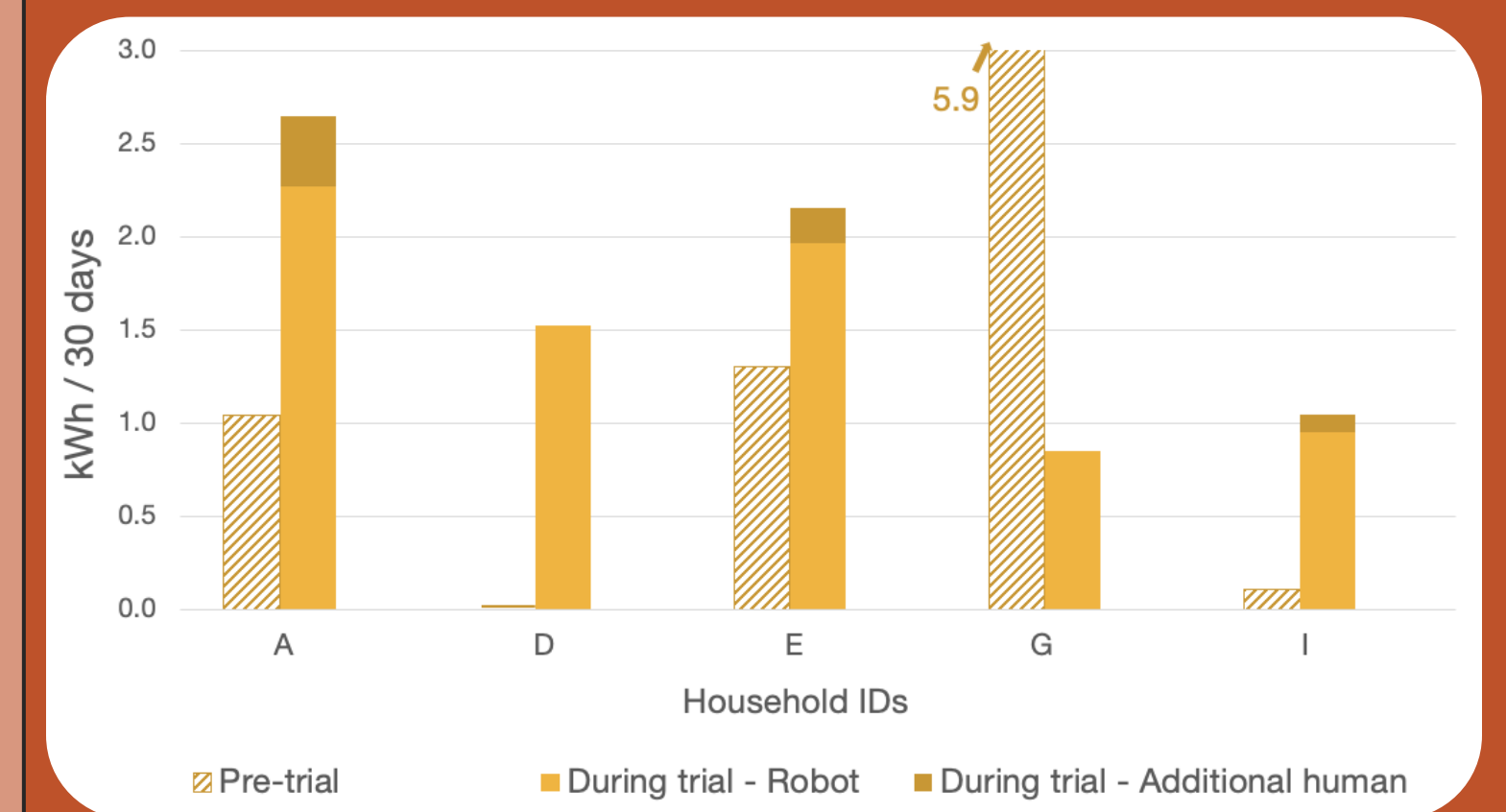


## How does automation impact ...?



## Energy-use

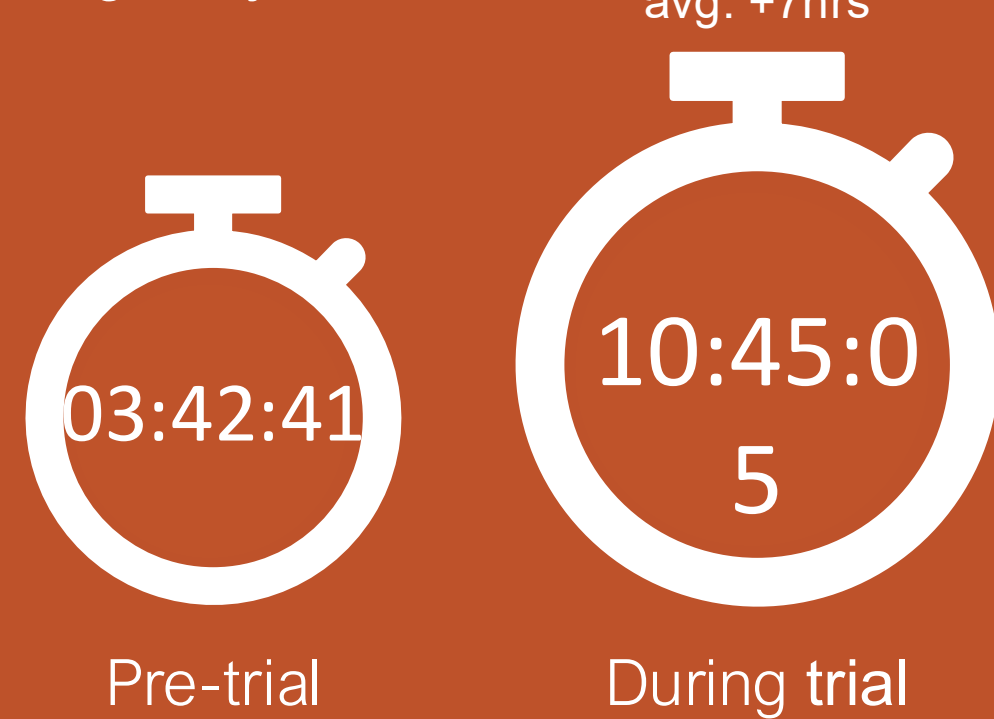
Household energy consumption (kWh) measured with smart plugs pre and during trial.



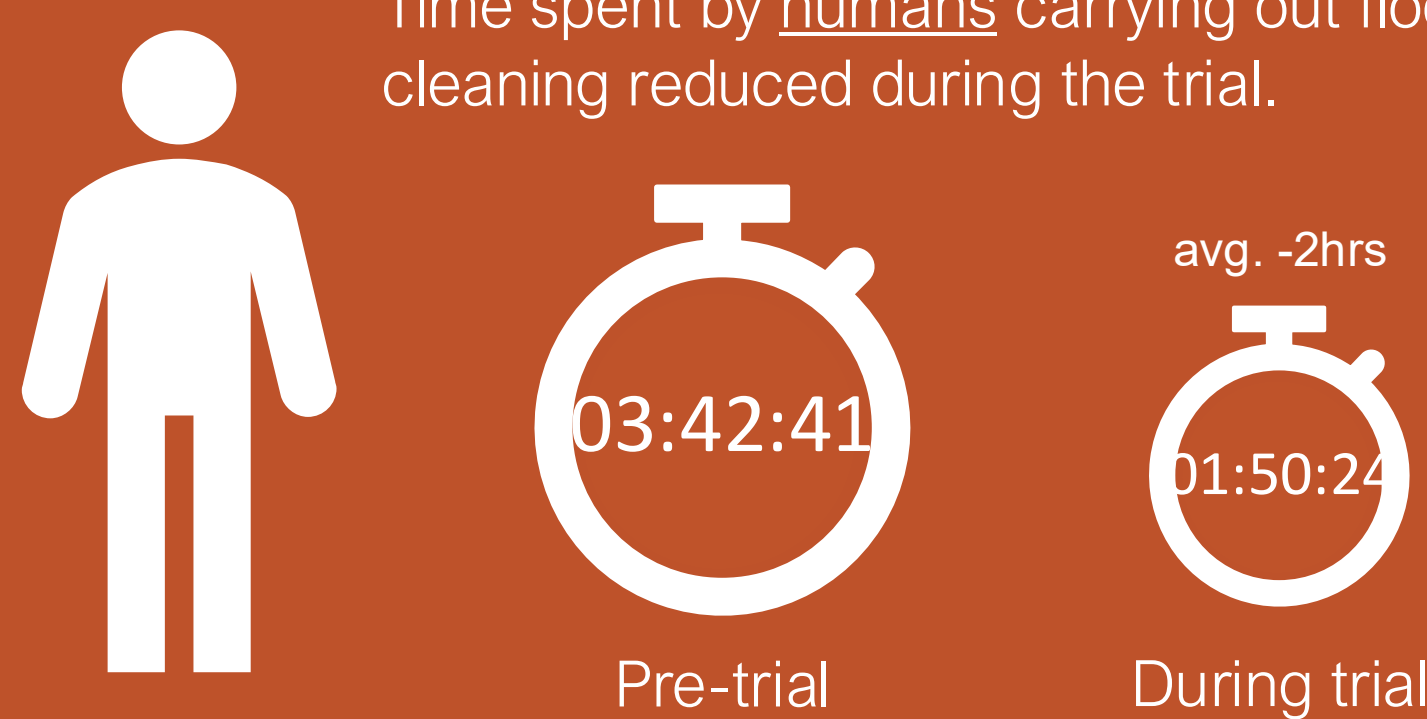
Despite the devices being small energy users, results reveal an increase in energy consumption for 4 out of 5 households.

## Time-use

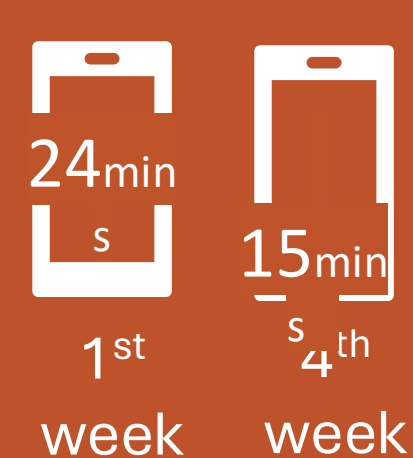
During the one-month trial, the total amount of time the floor was cleaned greatly increased. avg. +7hrs



Time spent by humans carrying out floor cleaning reduced during the trial.

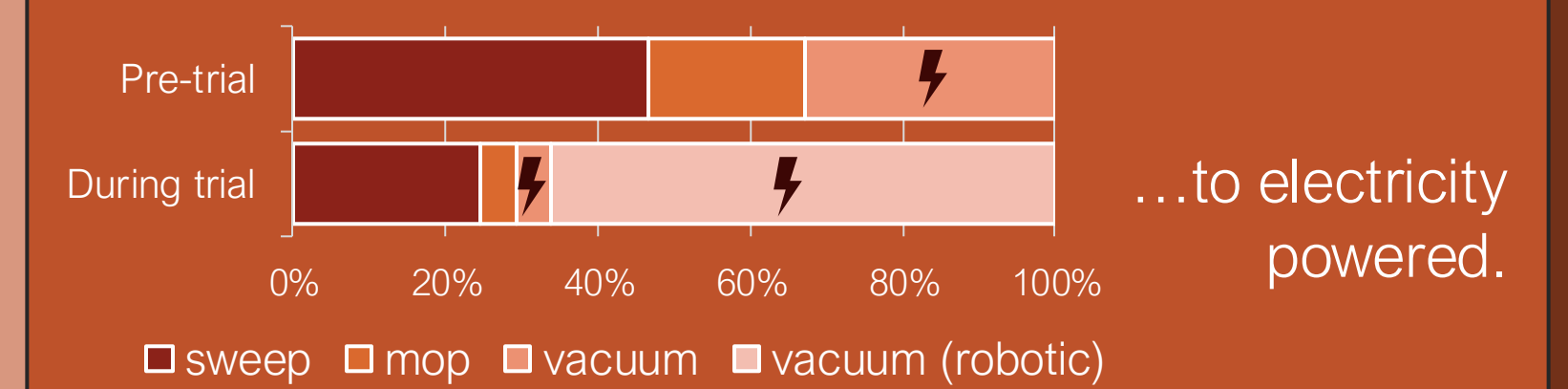


BUT additional time was spent using the vacuum's app (this reduced with the learning process)



## Cleaning methods

Households shifted methods from human...



## Cleanliness

Expectations of cleanliness increased during trial.

and positive emotions were associated with a perceived increase in cleanliness.

"It's soo nice, the house definitely feels much cleaner."

Knock-on effects on human behaviour



of reduced 'floor-drobe' effect (when items are left on the floor)

## Multi-tasking

"Time better spent"

Task	Household count
Food preparation	7
Household chores	6
Work	5
Leisure	4
Floor cleaning	3
Supervising robotic vacuum	3
Out shopping	1



Pre-trial

During trial

## References and Acknowledgments

<sup>1</sup>Freitag, C., et al., (2021) The Real Climate and Transformative Impact of ICT: A Critique of Estimates, Trends, and Regulations. Patterns 2: 100340.

Based on research in the extended abstract:

Vrain, E. (2025) "Detecting indirect impacts of digital daily life", Mainstreaming Sustainable Consumption, SCORAI Conference. Lund, Sweden 8-10 April.

Thank you to all the households for participating and providing their valuable insights. A special thanks to Astrid for her demonstration of floor-drobe! Thanks also to Marina Topouzi and the iDODDLE team for piloting this poster game.

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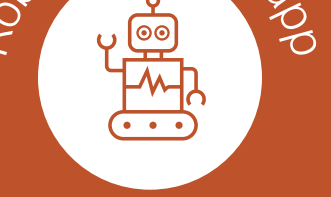
## Responsibility 'weapons used'

Activity diary



Who floor cleaned each occasion.

Robotic vacuum app



Device's floor cleaning occasions.

Online survey



Changes in roles and responsibilities.

'weapons

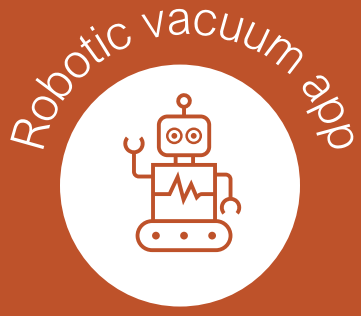
## Responsibility room



## Cleanliness room



## Time-use 'weapons used'



Device's time spent floor cleaning.

App tracking



Participant's time spent interacting with the robotic vacuum's app.

Activity diary



Participant's time spent floor cleaning each occasion.



Participants' perceptions on changes to time spent floor cleaning.

## Time-use room



## Cleanliness 'weapons used'

Household interview



Normal cleanliness expectations

Video diary



Changes in cleanliness and expectations.

Weekly reporting



Reflections on changes and the reasons why.

## Multi-tasking room



## Cleaning Methods room

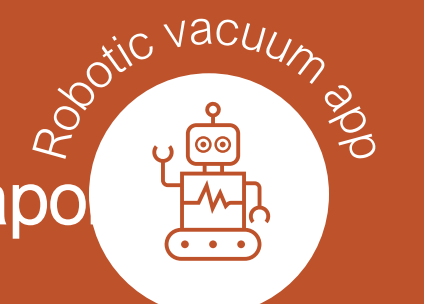


Activity diary



Frequency of methods used (vacuum/broom/mop).

## Cleaning methods 'weapons used'



'weapo

Frequency of robotic vacuum.

## Multi-tasking 'weapon used'



Participants' responses to:  
"What activities have you been doing whilst the robotic vacuum is cleaning your floor?"

## Energy-use room



## Energy-use 'weapons used'

Smart plug



One smart plug (Kasa KP115) attached to regular vacuum pre-trial, then transferred to robotic vacuum during trial.

Activity diary



Additional floor cleaning by participants during trial.

Future research: provide enough smart plugs for all floor cleaning devices during trial.