smart socks | DISCOVERY

In collaboration with Alzheimer's Society

Physiological and movement data capture for research



SmartSocks®DISCOVERY uses sensor-instrumented (smart) socks to capture pulse rate, pulse rate variability, skin temperature, electrodermal activity, and movement/gait data in human research.

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Limitations of conventional wearables

Frequently removed — people with neurological disorders often become irritated by and remove wrist-worn devices, leading to sparse, inconsistent data[1].

May alter behaviour — research participants are normally aware of devices on the wrist which can affect their behaviour.

Difficult to use — Complex user interfaces are burdensome for researchers and participants.

What SmartSocks®DISCOVERY offers

- **Excellent compliance**
  Worn like an everyday sock. Well tolerated even by people living with advanced dementia.[2]
- **Comfortable and safe**
  Natural materials, stretchy welt, padded soles, and flat toe seams reduce the risk of injury for those with swollen ankles and fragile skin.
- **Easy to deploy**
  Starts recording automatically after the Sensor is inserted into the Sock.
- **Remote data collection**
  Data are transmitted securely over Wi-Fi and are buffered internally in case of connection issues.
- **Rich data**
  Pulse rate (PR), pulse rate variability (PRV), skin temperature, electrodermal activity (EDA), 6-axis inertial measurement (IMU), and gait metrics.

SmartSocks®DISCOVERY — superior data quality and better compliance

The sock form factor is familiar and comfortable for all research populations, minimising distress and maximising protocol adherence. The medial arch of the foot is a superior location for measuring electrodermal activity compared to the wrist[3].



Sensor

- Removable for charging
- Fully watertight and safe to go in the wash
- 12 to 16-hour battery life
- Communicates over Wi-Fi



Sock

- Stretchy “honey-comb” welt
- Knitted from natural fibres
- Machine washable at 30°C
- Padded soles
- Flat toe seams

Research applications

SmartSocks®DISCOVERY supports research across multiple domains

Neurocognitive & neurodegenerative disease

Psychology

Movement, sports & rehabilitation science

Mental health

Sleep physiology

Gerontology

Occupational health research

Frequently asked questions

- **How accurate are the socks compared to the gold standard?**
  SmartSocks®DISCOVERY has been validated against gold-standard ECG, thermocouple probe, commercial GSR sensor, and gait pressure mat. Pulse rate is accurate to within 5 bpm in stationary testing.
- **Can I collect data from both feet simultaneously?**
  Each pair includes one active Sock containing the Sensor and one inactive sock, with data collected only from the active Sock. Data can be collected from both feet simultaneously using a full kit (contains 2 Sensors and a left-active sock pack) and an additional right-active sock pack.
- **Are the data GDPR compliant?**
  SmartSocks®DISCOVERY is fully GDPR compliant and data are stored on UK servers.

References

1 Farina, N., Smith, L., Rajalingam, M., & Banerjee, S. (2025). Implementation outcomes for agitation detection technologies in people with dementia: A systematic review. Geriatrics, 10(3), 70. https://doi.org/10.3390/geriatrics10030070

2 Macfarlane, D., Dahir, I., Ali, R., Ghosalkar, N., Webb, L. M., Ismail, Z., Medina-Lara, A., McDermid, J., Steer, Z., Venkatesh, P., & Creese, B. (2025). Acceptability and feasibility of a sensor-instrumented ‘SmartSocks’ wearable prototype to detect agitation in people with dementia. International Psychogeriatrics, 100154. https://doi.org/10.1016/j.inpsyc.2025.100154

3 van Dooren, M., de Vries, J. J. G. G., & Janssen, J. H. (2012). Emotional sweating across the body: Comparing 16 different skin conductance measurement locations. Physiology & Behavior, 106(2), 211–217. https://doi.org/10.1016/j.physbeh.2012.01.010

Milbotix Ltd. (2024). SmartSocks: Pulse rate and pulse rate variability system [White paper]. Milbotix. https://milbotix.com

Product specifications

Output	Sensor	Rate	Key detail
Pulse rate (PR) / Pulse rate variability (PRV)	Photoplethysmography (PPG)	**64 Hz**	AI signal quality classification
Skin temperature	Infrared thermopile	**4 Hz**	Range: −20 to 85°C. Resolution: 0.02°C.
Skin conductance	Electrodermal activity (EDA)	**4 Hz**	Medial longitudinal arch placement. Range: 0.01–100 µS.
Movement, activity, gait†:	6-axis inertial measurement unit (IMU) (accelerometer + gyroscope.)	**32 Hz**	Accelerometer: ±16g / Gyroscope: ±2000 dps

†Temporal parameters: stride time, swing time, stance time, cadence, duty cycle.
Spatial parameters: Arc length, gait velocity, initial contact angle, max. lateral excursion, max. orientation change, max. sensor lift, stride length, terminal contact angle, turning angle, stride speed, stride distance

Battery: Up to 16 hours operating time. Charges in ~8 hours using supplied USB-C charger.

Connectivity: IEEE 802.11 b/g/n Wi-Fi (2.4GHz only) for burst data transfer at the configured transmit interval.

Storage: 16GB flash memory for offline buffering when Wi-Fi connection is lost.

Certifications: UKCA (UK) and CE (Europe).

Material - Active sock: Cotton 62%, nylon 30%, elastane 5%, copper/nylon metallic 3%. Dock: SEBS polymer & NiC silicone rubber.

Material - Inactive sock: Cotton 65%, nylon 30%, elastane 5%.

Safety: Padded sole, flat toe seams, honeycomb welt.

Environmental: Operating: 0 to 30°C.
Safe storage: −20 to 85°C.

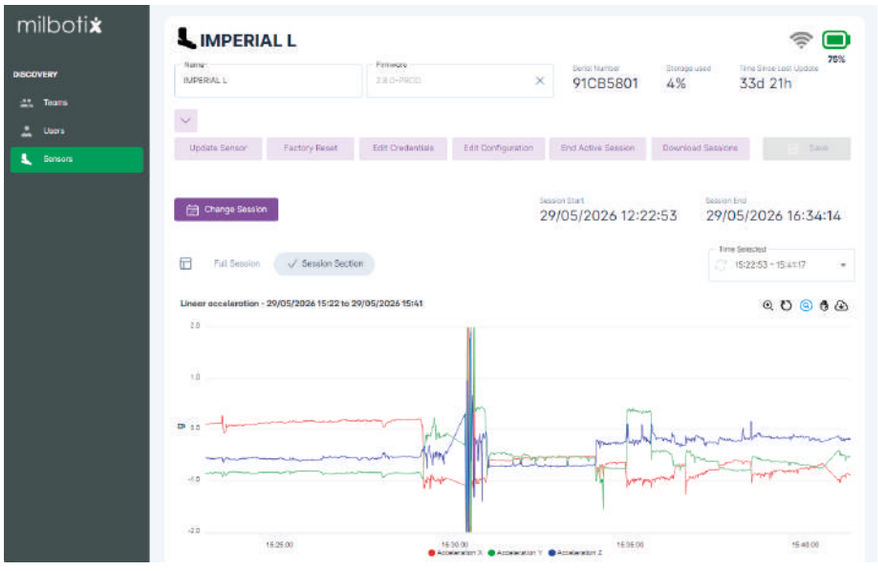
Colours: white and grey.

Sizes: XS (UK3-5, EU35.5-38, US4-6) and MM (UK9-11, EU43-45, US10-12)

Four steps for continuous data collection

1. **Insert the sensor**
   Insert the Sensor into the active Sock.
2. **Start collecting data**
   Sensor powers on and begins collecting data automatically. Data are buffered internally and transmitted securely to the cloud via Wi-Fi.
3. **Download/integrate data**
   Download CSV files using the Dashboard application or connect to the SmartSocks® API for programmatic data access.
4. **Wash and dry**
   Socks are machine washable at 30°C. Line dry only.

DISCOVERY Dashboard web application





Provides real-time sensor status and session management. Data are accessible as continuous waveforms and downloadable to CSV for offline analysis.

What's in the box – Starter kit vs Full kit

Kit component	Starter kit	Full kit
Pairs of Machine-washable SmartSocks®	2	5
Removable Sensor	1	2
USB-C mains charger	1	1
Laundry bag	1	1

Researcher testimonials

What researchers say about SmartSocks®DISCOVERY



"The greatest draw [of SmartSocks] is just that ability to record it for longer periods of time."

Dr. Elmar Kal
Senior Lecturer in Physiotherapy,
Brunel University London



"The advantage [of SmartSocks] is that it's invisible. Participants can wear it without being worried about stigma."

Luigi Moretti
PhD Researcher,
University of the West of England



"There is a need for a wearable device that is acceptable to users, that provides continuous physiological data, and helps identify data signals in the environment as belonging to the individual... SmartSocks have the potential to be an elegant solution to this need."

Matthew Harrison
Senior Designer,
UK Dementia Research Institute Care Research & Technology Centre, Imperial College London

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SmartSocks®DISCOVERY is not a medical device. The Sensor, Charger, Socks and Dashboard are not intended for use as medical devices or to replace medical devices. They do not and are not intended to diagnose, treat, prevent, alleviate or monitor disease, injury or disability or investigate, replace or modify the anatomy or any physiological process.

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