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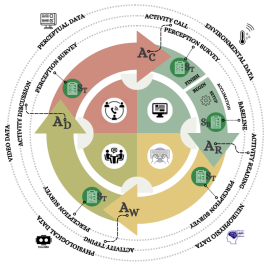
Human Experience in Regulated Offices (HERO) potocol



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Puneet Tomar[1], Dianel Ago[2], Ilaria Pigliautile[1], Veronica Martins Gnecco[1,3], Gloria Cosoli[2], Sara Casaccia[4], Gianluca Sartini[4], Silvia Angela Mansi[2], Anna Laura Pisello[1,3], Marco Arnesano[2]

[1]EAPLAB at CIRIAF "Interuniversity research center on pollution and environment Mauro Felli", University of Perugia, Italy;
[2]Department of Theoretical and Applied Sciences, Università degli Studi eCampus, Italy.;
[3]Department of Engineering, University of Perugia, Perugia (PG), Italy;
[4]Department of Industrial Engineering and Mathematical Sciences,, Marche Polytechnic University

MuSIC

Puneet Tomar
La Rochelle Université

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We use this protocol and it's working

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Abstract

This protocol describes a controlled, office-like indoor exposure experiment designed to quantify multimodal human **autonomic/thermophysiological responses** and **subjective comfort** under two stable thermal conditions: a neutral reference condition **(LT; ~22–24 °C)** and a warm-load condition **(HT; ~30 –32°C),** conducted during the summer season in Köppen–Geiger Csa climate classification. Each participant completes **two sessions** (LT and HT) in counterbalanced order. During a 90-minute timeline, participants perform structured cognitive/social tasks (reading, writing, discussion, conference call) interleaved with standardized perception surveys. Physiological signals (**electrodermal activity, EDA**; **wrist skin temperature, T_skin;** and **electroencephalography EEG**) are recorded continuously using a wearable sensor devices while environmental conditions (air temperature, relative humidity, air velocity, globe temperature, and vertical temperature gradients) are monitored continuously via a dedicated lab monitoring station. Surveys are administered digitally at protocol-defined checkpoints to capture multi-domain indoor environmental quality (thermal, visual, acoustic, air-quality) and perceived productivity.

Guidelines

Eligibility (inclusion/exclusion)

- Age: **18–65 years**
- Exclude individuals with medical conditions likely to influence physiological or perceptual responses.

Notes / reporting checklist (for reproducibility)

When publishing or sharing the dataset, report:

- LT and HT target set-points and achieved stability
- Counterbalancing method for session order
- Exact phase timeline (table above)
- Wearable placement (non-dominant wrist)
- Environmental sensor configuration (including vertical temperature heights)
- Survey instrument versions (S_I, S_{BP}, S_{RP}, S_{WP}, S_{DP}, S_{CP})
- Stopping rules and adverse event logging

Materials

Digital materials (task stimuli)

- Reading text (Session A)
- Reading text (Session B; different content to reduce repetition bias)
- Writing prompt/instructions (summary task)
- Discussion prompt (theme-based)
- Conference-call script / scenario

(All delivered digitally on participant laptops.)

Surveys (digital)

Administer via a digital survey platform (WEPOP) on a local server:

- Initial survey (S_I): demographics + "topology traits" (environmental sensitivity + emotional state items)
- Baseline perception survey (S_{BP})
- Post-task perception surveys: after reading (S_{RP}), writing (S_{WP}), discussion (S_{DP}), call (S_{CP})
- Domains include thermal comfort, air-quality, acoustics, visual comfort, perceived productivity.

Equipment and Modalities

- Wearable physiological sensor (EmotiBit) worn on non-dominant wrist.
- EDA nominal sampling ~15 Hz (stock); reported resolution ±0.01 µS.
- Wrist skin temperature nominal sampling ~7.5 Hz; reported resolution ±0.1 °C.
- Headband four channel EEG sensor (Muse-2).
- EEG sampling ~256 Hz.

Environmental monitoring

- Lab monitoring station (NextRoom) with calibrated modules:
- Air temperature with vertical profiling (e.g., 4 heights: 10, 60, 110, 130 cm)
- Relative humidity probes
- Air velocity via hot-wire anemometers
- Globe temperature sensor

Computing

- Participant laptops for task delivery + surveys
- Local server or stable network access for the survey platform
- Time synchronization method (consistent Unix timestamps across systems is ideal)

Safety warnings

- HT exposure (30–32 °C) can elevate physiological strain. Monitor participants continuously.
- Stop immediately if participant reports dizziness, nausea, headache, overheating, panic, or requests termination.
- Ensure hydration access if permitted by your ethics protocol.
- Keep a trained supervisor present throughout.

(These warnings operationalize the paper's statement that safety was ensured via screening, monitoring, and stopping rules.)

Troubleshooting

Problem
EDA flatlines or spikes unrealistically

Solution
Re-seat the wrist device on the non-dominant hand; ensure stable skin contact. Confirm participant is seated and not performing excessive motion during baseline.

Problem
EEG noisy signals

Solution
Restart sensor bluetooth and reconnect. Make sure to eeg channels is in contact with scalp.

Problem
Room fails to stabilize at LT/HT

Solution
Delay T0 until set-point stability is achieved; record actual environmental traces continuously.

Problem
Learning/repetition effects across LT/HT

Solution
Ensure different task contents across sessions while keeping task structure identical.

Before start

Pre-session restrictions (control measures):
Participants should follow the same pre-session instructions for all visits, including:

- Avoid caffeine
- Avoid vigorous physical activity

Record any deviations.

Procedure

1 **Overview timing (90 minutes total per session)**

	Time (min)	Phase	Label	What happens
	0–20	Acclimation	START; S_I	Setup, instructions, seated rest, initial survey
	20–25	Baseline survey	S_BP	Baseline perception survey
	25–30	Baseline signals	B	Start/confirm data collection, stabilization
	30–40	Activity: Reading	A_R	Reading task
	40–45	Washout 1 + survey	S_RP	Post-reading perception survey
	45–55	Activity: Writing	A_W	Writing/typing summary task
	55–60	Washout 2 + survey	S_WP	Post-writing perception survey
	60–70	Activity: Discussion	A_D	Peer discussion task
	70–75	Washout 3 + survey	S_DP	Post-discussion perception survey
	75–85	Activity: Call	A_C	Simulated conference call
	85–90	Washout 4 + survey + end	S_CP; END	Post-call perception survey; stop recording

Step-by-step

1h 55m

2 **Session preparation (25-30 min before T0)** 30m

2.1 **Set thermal condition** for the session (LT or HT) and stabilize the room at target set-point.

- LT target: ~22–24 °C; HT target: ~30–32 °C.
- Maintain humidity/air velocity stable (record continuously).

2.2 **Prepare environmental logging**

- Confirm sensors are recording: air temperature (including vertical gradient), RH, air velocity, globe temperature.

2.3 **Prepare physiological logging**

- Ensure wearable device is charged, time-synced if applicable, and ready to log.

2.4 **Prepare survey platform**
- Confirm the WEPOP survey flow: S_I → S_{BP} → S_{RP} → S_{WP} → S_{DP} → S_{CP}.

2.5 **Prepare task materials**
- Load reading/writing/discussion/call instructions on participant laptops. Use different content between LT and HT sessions to reduce learning effects.

3 **T0–T20: Acclimation + Initial survey (S_I)** 20m

3.1 **Participant arrival + checklist** 3m
- Confirm pre-session restrictions (caffeine/exercise) and record deviations.
- Confirm eligibility and that no new contraindications have emerged.

3.2 **Attach wrist-wearable sensor** to **non-dominant wrist**. 5m
Checkpoint**:** Verify stable **EDA** and **skin-temperature** readouts.

Attach headband-wearable sensor on forehead.
Checkpoint: Verify stable **EEG** readouts.

3.3 **Seated acclimation/rest** until minute 15. 15m

3.4 At **T15**, administer **Initial survey (S_I)**. 5m
- Includes environmental sensitivity and emotional state items.

4 **T20–T30: Baseline perception + start recording** 10m

4.1 At **T20**, administer **Baseline perception survey (S_{BP})**. 5m

4.2 At **T25**, begin baseline stabilization window and **start data collection**. 5m
1. **Checkpoint:** Confirm continuous logging for:
- physiological (EDA, T_skin)
- environmental channels
- timestamp continuity (no obvious gaps)

5 **T30–T40: Reading (A_R) + post-reading survey (S_{RP})** 10m

5.1 At **T30**, begin **Reading task (A_R)**. 10m

5.2 At **T40**, administer **Post-reading perception survey (S_{RP})**. 5m

6 **T45–T60: Writing (A_W) + post-writing survey (S_{WP})** 15m

6.1 At **T45**, begin **Writing task (A_W)** (10 min): participant types a summary of the reading. 10m

6.2 At **T55**, administer **Post-writing perception survey (S_{WP})**. 5m

7 **T60–T75: Discussion (A_D) + post-discussion survey (S_{DP})** 15m

7.1 At **T60**, begin **Discussion task (A_D)** (10 min): peer discussion of the theme, same room setup.

7.2 At **T70**, administer **Post-discussion perception survey (S_DP)**. 5m

8 **T75–T90: Conference call (A_C) + post-call survey (S_{CP}) + end** 15m

8.1 At **T75**, begin **Conference call task (A_C)** (10 min): simulated group call extending discussion.

8.2 At **T85**, administer **Post-call perception survey (S_{CP})**. 5m

8.3 At **T90**, stop all recordings; debrief participant; remove sensors.

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