

EMS-Based Transmission of Social Awareness Signals: Simple Study Protocol and Questionnaire Packet (Template)

August 24, 2025

1 Important

- **Check Contraindication Checklist**
- **If time constrained:** Only use top stimulation (120 Hz, 250 μ s)

2 Per-participant procedure

A. Preparation

1. Consent + contraindication checklist

B. Fitting & Calibration

2. Fit sleeve.
3. Determine perception threshold (PT) per channel (clear but comfortable) [1] (using Python application).

C. Tests: Electrotactile Stimulation

- For each EMS condition: Run *Study Tests* Python application.
 - Ask the participant what they feel and where they feel the stimulation
 - Take note of (un-)successful recognition of the stimulation

E. Rating / Questions

CRS (comfort), **EMS-CORE Questionnaire**, open comments, preference ranking (if multiple sensations).

Contraindication Checklist for EMS Participation

Instruction: Please read each statement and tick ☐ **YES** if it applies to you or ☐ **NO** if it does not. If you answer **YES** to any of the major exclusions (marked with ★), you cannot participate in this study for safety reasons.

General Medical Conditions

	YES	NO
★ I have a cardiac pacemaker, implantable cardioverter-defibrillator (ICD), or other implanted electronic device.	<input type="checkbox"/>	<input type="checkbox"/>
★ I have metallic implants near the stimulation site.	<input type="checkbox"/>	<input type="checkbox"/>
★ I have epilepsy or a history of seizures.	<input type="checkbox"/>	<input type="checkbox"/>
★ I have a diagnosed neurological disorder affecting sensation (e.g., neuropathy, multiple sclerosis).	<input type="checkbox"/>	<input type="checkbox"/>
★ I have a serious heart condition or history of heart attack.	<input type="checkbox"/>	<input type="checkbox"/>
★ I am currently pregnant.	<input type="checkbox"/>	<input type="checkbox"/>
★ I have blood clotting disorders or deep vein thrombosis.	<input type="checkbox"/>	<input type="checkbox"/>
★ I have cancer or an active tumor near the stimulation area.	<input type="checkbox"/>	<input type="checkbox"/>

Skin & Local Issues

	YES	NO
I have skin conditions (eczema, psoriasis, dermatitis, wounds, rash) near the electrode site.	<input type="checkbox"/>	<input type="checkbox"/>
I have allergies to electrode gel, adhesives, or conductive materials.	<input type="checkbox"/>	<input type="checkbox"/>
I have had recent injuries or surgery to the forearm/wrist.	<input type="checkbox"/>	<input type="checkbox"/>

Sensitivity & Pain

	YES	NO
I have reduced skin sensation or numbness in my arms/hands.	<input type="checkbox"/>	<input type="checkbox"/>
I experience chronic pain syndromes (e.g., CRPS, fibromyalgia).	<input type="checkbox"/>	<input type="checkbox"/>

Other

	YES	NO
I am under the influence of alcohol or recreational drugs today.	<input type="checkbox"/>	<input type="checkbox"/>
I am taking medication that affects nerve or muscle function.	<input type="checkbox"/>	<input type="checkbox"/>
I am unwilling to receive mild electrical stimulation for research purposes.	<input type="checkbox"/>	<input type="checkbox"/>

Participant Declaration: I confirm that the above information is accurate to the best of my knowledge, and I understand the risks of EMS stimulation.

Name: _____

Date: _____

Signature: _____

Study Tests in Python

Instructions: While the participant does the tests, take note of each successful or unsuccessful recognition of zone or flow.

REMINDER: The order is randomized. Please check the application output for the current tests before filling out the form.

Test 1: Zone Recognition

Stimuli: Zone 1

Durchgang	Stimulus	Erkannte Zone
1	Zone 1	_____
2	Zone 1	_____

Stimuli: Zone 2

Durchgang	Stimulus	Erkannte Zone
1	Zone 2	_____
2	Zone 2	_____

Stimuli: Zone 3

Durchgang	Stimulus	Erkannte Zone
1	Zone 3	_____
2	Zone 3	_____

Test 2: Flow Recognition

Stimulus: Flow 1→3

Durchgang	Stimulus	Erkannter Flow
1	1→3	_____
2	1→3	_____

Stimulus: Flow 3→1

Durchgang	Stimulus	Erkannter Flow
1	3→1	_____
2	3→1	_____

Comfort Rating Scales (CRS)

Instructions: While wearing the device, please rate each aspect below by marking *one* circle on the 0–20 scale. **0** means “not at all / none”; **20** means “extreme”.

Dimension	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Emotion																					
(annoyance/irritation due to wearing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attachment																					
(fit/secure attachment on body)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harm																					
(pain, chafing, skin irritation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perceived Change																					
(awareness of body change, posture, gait)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Movement																					
(restriction, interference with motion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxiety																					
(worry, self-consciousness while wearing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

EMS-CORE Questionnaire (Project-Fit Only)

Instructions: Please rate each statement based on the stimulation you just experienced. Mark *exactly one* circle per row.

Scale: **1** = “strongly disagree” ... **7** = “strongly agree”.

Item	1	2	3	4	5	6	7
<i>Naturalness / Coherence (HXI-inspired)</i>							
The stimulation felt natural, similar to human touch.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The stimulation blended well with my other senses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sensation felt realistic compared to real physical touch.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Subtlety / Interference (custom)</i>							
The signals were intrusive. (<i>R</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The signals distracted me from the task. (<i>R</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cue was noticeable without being distracting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cue felt gentle.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Interpretability / Detectability</i>							
I could reliably tell when a signal was sent to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could distinguish the intended meaning of the cue.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt confident that I did not miss cues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Social Presence (Networked Minds subset)</i>							
I felt the other person’s presence / a sense of togetherness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of the other during the task.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I hardly noticed the other. (<i>R</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Wearability (concise, outside CRS)</i>							
The device made me feel self-conscious in public. (<i>R</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The device restricted my arm movement. (<i>R</i>)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Acceptance</i>							
I would use this system in daily life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be comfortable receiving such cues in public.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend this device to others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Additional comments:

References

- [1] “Evaluation of sensation evoked by electrocutaneous stimulation on forearm in nondisabled subjects (free pdf).” (2012), [Online]. Available: <https://www.rehab.research.va.gov/jour/2012/492/pdf/geng492.pdf> (visited on 08/15/2025).