

Micropatterned surface electrode for selective stimulation of intraepidermal nociceptive fibres

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Aims and methods:

A new, interdigitated electrode consisting of conductive rails arranged in a comb-like micropattern situated 150 μm apart from each other, provide selective stimulation of nociceptive system, activating electric field limited to intraepidermal free nerve endings (figure 1);

We aimed to verify the nociceptive selectivity of this new micropatterned interdigitated surface electrode.

Experiment 1: The surface electrode was applied to the hairy skin of the hand dorsum in 10 healthy subjects (6M, 4F, 23-36 years) to assess the subjective perception as a function of the stimulus intensity. Each stimulus consisted of a burst of ten electrical pulses at 1kHz.

Experiment 2: Superficial radial nerve SAP recording at increasing stimulation intensity (comparison with standard electrode);

Experiment 3: Pain related evoked potentials recording after face and hand dorsum stimulation using 32 Ag-AgCl scalp electrodes. We compared microelectrode low-intensity to high-intensity evoked potential, and microelectrode low-intensity to laser evoked potential.

Results

Experiment 1: Micropatterned surface electrode elicits a clear pinprick sensation in all subjects with a stimulus intensity less than 10 mA (figure 2);

Experiment 2: No A β -mediated sensory action potentials are recorded at low intensity (< 10 mA) (figure 3);

Experiment 3: latencies of microelectrode low stimulation and laser evoked potentials were similar, conversely the short latency of the evoked potentials after high intensity stimulation suggests the coactivation of A β fibres (figure 4).

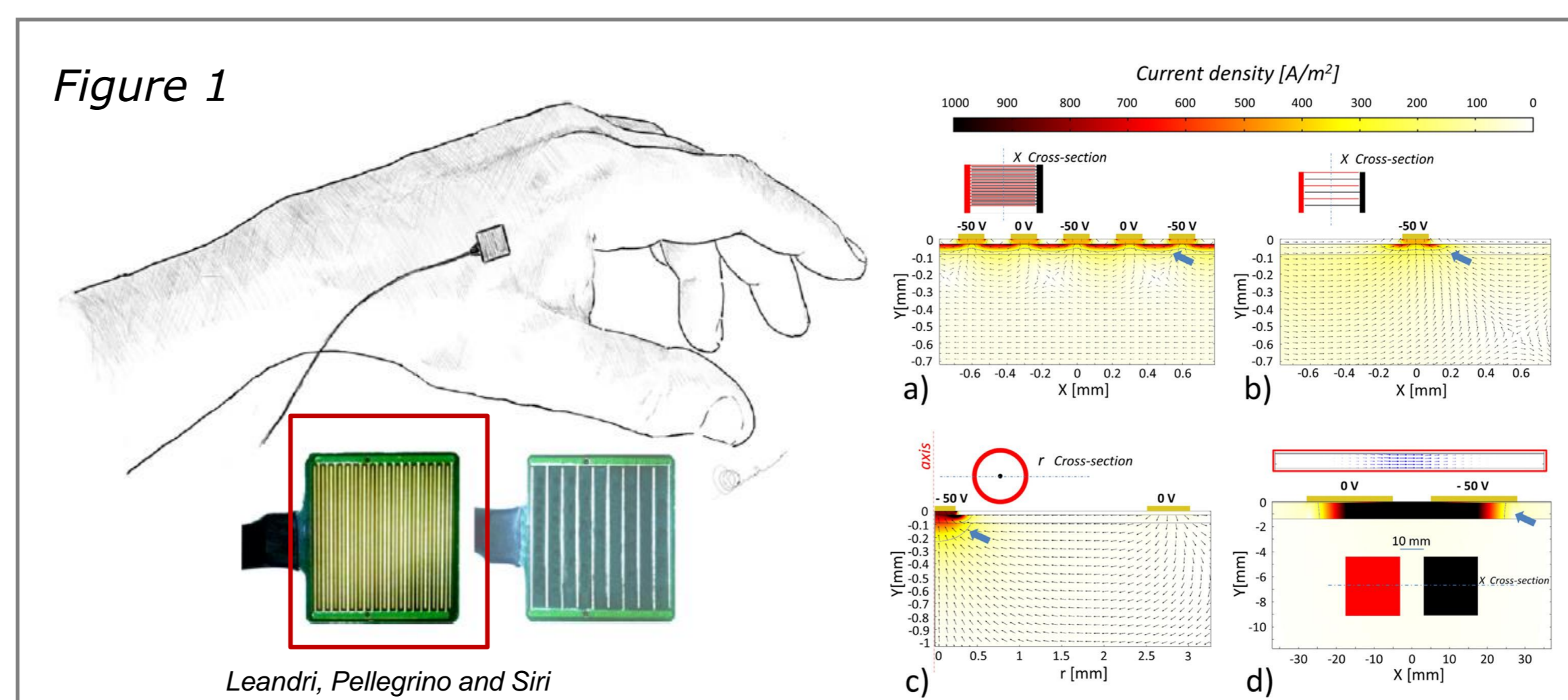
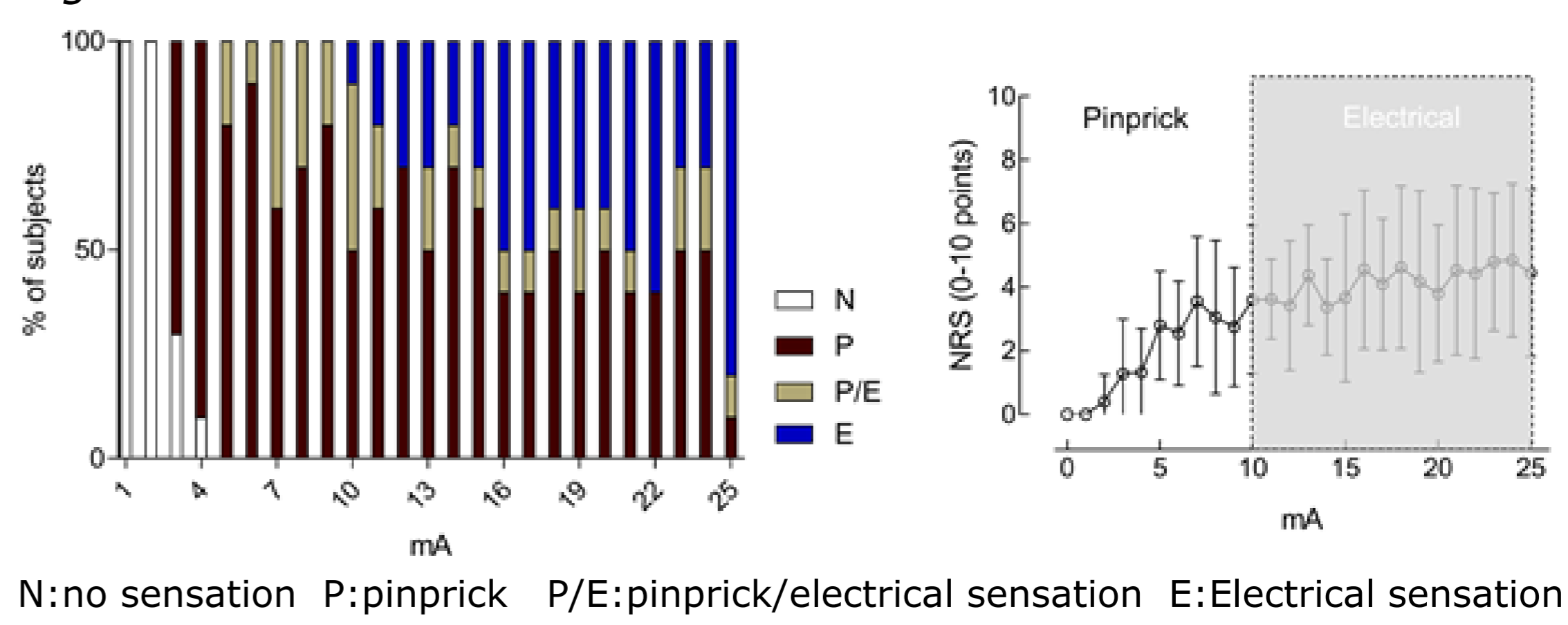


Figure 2



N: no sensation P: pinprick P/E: pinprick/electrical sensation E: Electrical sensation

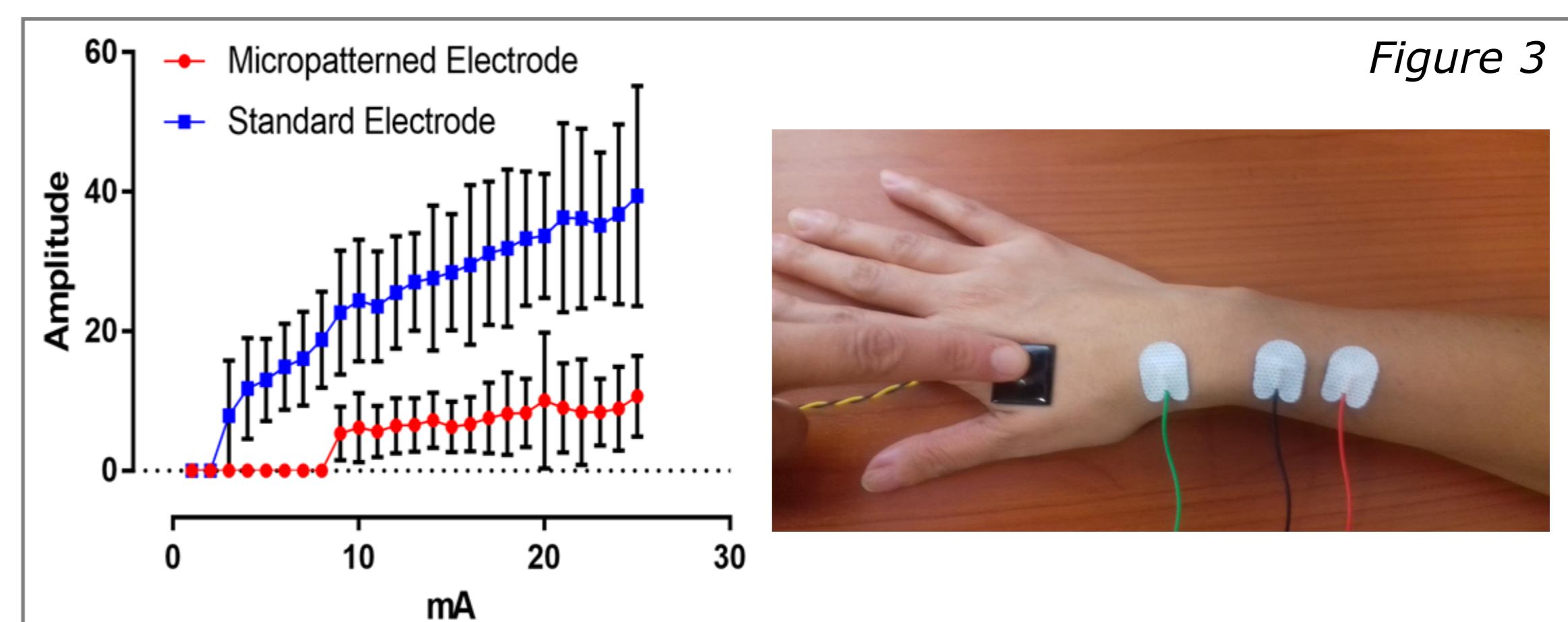
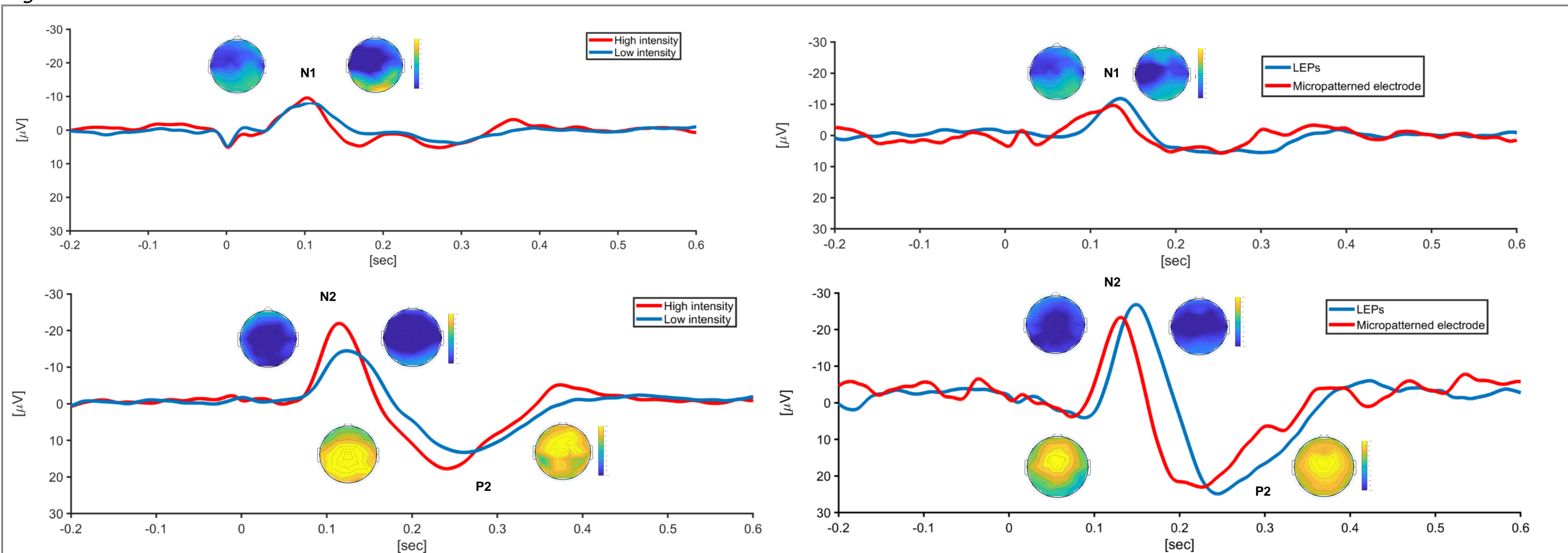


Figure 3

Figure 4



Conclusion

These data therefore suggest that the new micropatterned surface electrode after low intensity stimulation might be useful for a selective investigation of nociceptive system.

Bibliografia

M. Leandri et Al, Micropatterned surface electrode for massive selective stimulation of intraepidermal nociceptive fibres; J neuroscience methods 2018 Jan 1;