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Touch perception reveals the dominance of spatial over digital representation of numbers

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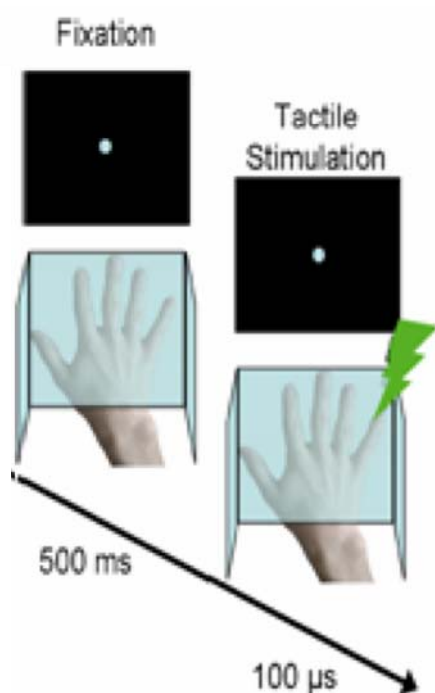
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SUPPORTING INFORMATION EXPERIMENT 1

Supporting Procedures

To obtain approximately 80% correct detections for both fingers, the stimulus intensity was set individually for each subject and each stimulated finger in a preliminary session before the main experiment. The set up was the same used as for the main session, but the procedure differed as depicted in the Supporting Figure 1. The fixation point was presented for 500 ms and after which, if the subject succeeded in keeping fixation, a tactile stimulus was delivered either to the thumb or the little finger. No number stimuli were presented.



SI Figure 1 Timing of stimuli presentation for the preliminary titration session.

The figure illustrates the example of a tactile stimulus delivered to the little finger (green symbol) in the palm-down posture. As in the experimental sessions, the subjects were instructed to respond to the tactile stimulus as quickly as possible regardless of the finger stimulated, by pressing a pedal with their right foot.

The titration block used to set the intensity consisted of 15 trials, where 5 stimulations to the thumb and 5 to the little finger were randomly intermingled with 5 trials in which no tactile stimulus was delivered (catch trials). The intensity was first set at 0.10 mA for both constant current stimulators, each delivering electrocutaneous square wave pulses to one finger. At the end of the first preliminary block, the experimenter varied the stimulator current, independently for each finger, in order to reach a detection performance of 80% for each of them. Thus, the intensity was increased or reduced depending on whether the performance was below or above the criterion. The first step was 2 mA, then the step amplitude was halved at every direction reversal. The same block of trials and procedure was then repeated until the criterion of 80% of accuracy was met for each finger. The same procedure was applied for each hand posture (palm-up, palm-down). SI Table 1 below reports the stimulus intensity used for each subject for both fingers and postures.

SI Table 1 Stimulus intensity (mA) for each subject's thumb and little finger for the two hand postures.

Stimulus Intensity (mA)				
Subjects	Thumb		Little Finger	
	Palm-Down	Palm-Up	Palm-Down	Palm-Up
1	3,5	3,6	2	2,1
2	3,4	3,3	1,9	1,5
3	2,7	2,6	1,8	1,8
4	7,5	7,7	4,2	4,3
5	4,8	4,8	3,6	3,6
6	3,7	3,7	3	3
7	7	6,8	1,9	1,6
8	2,4	2,4	4,1	4,1
9	5,6	5,6	3	3
10	2	2,1	2	2
11	3,2	3	2,4	2,5
12	2,5	2,3	2,2	2,2
13	3	3	2,8	2,9
14	2	2	1,8	1,8

<i>Mean</i>	3,81	3,78	2,62	2,60
<i>SD</i>	1,77	1,79	0,85	0,91

Supporting Results

Electrocutaneous current intensity

A statistical analysis (ANOVA) with finger (thumb vs. little finger) and posture (palm-up vs. palm-down) as variables showed that, in order to have the same performance in terms of accuracy a different intensity had to be set for thumb (3,79 mA) and little finger (2,61 mA) [$F(1,13) = 7.13$; $p < 0.05$]. No difference was present between the two postures.

Number Magnitude

To ensure that number magnitude was processed, subjects were told they could be asked, without warning, which number had been presented in the immediately preceding trial. Two of such probing situations were randomly interspersed within each block of trials. All subjects answered without error to this request in each block (100% accuracy), except one (subject 9) who made two errors reporting an incorrect number (83% accuracy).

Catch Trials

Each experimental block consisted of 160 trials: 4 repetitions for each combination of number, delay and finger (128) plus 32 trials (20%), where after the visual presentation of the number no electric pulse was delivered (catch trials). False alarms rate was in average 1,16% without difference across conditions.

SUPPORTING INFORMATION EXPERIMENT 2

Supporting procedures

Subjects started the experimental session alternatively with the hand in the palm-down or palm-up posture. The experiment consisted of a unique session of 4 experimental blocks (2 for each posture), postures being counterbalanced across blocks. The same procedures and criterion (80% accuracy independently for both fingers) as for the first experiment were used in the second experiment to set the tactile stimulations intensity before the experimental session. As in the first experiment, stimulus intensity was not varied during the experimental session, but in the second experiment it was set in the palm-down posture for six subjects and with the hand in the palm-up posture for the remaining seven subjects. SI Table 2 below reports the stimulus intensity used for each subject for each finger.

SI Table 2. Stimulus intensity (mA) for each subject's thumb and little finger. From subject 1 to 6, intensity was set with the hand in the palm-down posture; from 7 to 13 intensity was set with the hand was in the palm-up posture.

Stimulus Intensity (mA)		
Subjects	Thumb	Little Finger
1	3,9	2,7
2	4,1	2,5
3	4,3	3,0
4	4,7	3,3
5	5,3	3,3
6	4,1	2,6
7	4,7	2,7
8	1,9	1,9
9	4,5	3,5
10	6,1	4,4
11	5,9	4,1
12	4,2	2,2
13	3,2	2,1
Mean	4,38	2,94
SD	1,09	0,75

Supporting Results

Electrocutaneous current intensity

Similar to the first experiment, a statistical analysis (ANOVA) with posture (palm-up vs. palm-down) as between-subject variable and finger (thumb vs. little finger) as within-subject variable showed that a difference in tactile stimulus intensity was set to obtain the same detection performance for thumb (4,38 mA) and little finger (2,94 mA) [$F(1,11) = 81.98$; $p < 0.001$]. No difference was found between postures.

Number Magnitude

Subjects performed errorless when requested to report which number had been presented in the immediately preceding trial in each block (100% accuracy), except one subject (subject 11) who made one error reporting an incorrect number (4 instead of 5) (75% accuracy).

Catch Trials

Each experimental block consisted of 160 trials: 8 repetitions for each combination of number, delay and finger (128) plus 32 trials (20%), where after the visual presentation of the number no electric pulse was delivered (catch trials). False alarms rate was in average 2,49% without difference across conditions.