

Supplementary Material

Sensorimotor network crucial for inferring amusement from smiles

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Supplementary Materials and Methods

Empathic Accuracy (EA) task

For each social target, only smiles associated with the highest ratings of felt amusement (mean values across social targets: $M = 6.3$, $SD = 1.4$) and full amusement judgment confidence (i.e., “I am 100% sure of my judgment”) were considered authentic expressions of amusement. False expressions of amusement were smiles with subjective amusement ratings equal to zero and full amusement judgment confidence. We selected 30 authentic and 30 fake expressions meeting the above criteria for each social target, for a total of 600 clips, and submitted these clips to the pilot experiments for further validation (see below). In the EA task, participants were presented with short movies showing social targets making authentically and falsely amused smiles.

Non-social control (NS) task

Using custom software (programmed in C#), we extracted the X and Y coordinates of each social target’s outer canthus and labial commissure (over both the left and right sides of the face) from the very last frame of each video-clip. The estimated positions were then shifted vertically on the Y axis in order to locate the white bars above and below the mouth or the eye. To ensure subjects explored the whole face for the duration of the video, the white bar appeared after the end of the video clip, and observers were instructed to pay attention to the social target’s facial movements and track the position of the outer canthus and labial commissure throughout the entire movie. The white bar remained onscreen for 350 ms and was followed by the instruction: “Mouth: above or below” or “Eye: above or below”. The position of the white bar was equally distributed above and below our landmarks (eyes and mouth).

Stimuli and task validation

Five sequential pilot experiments (PE1, PE2, PE3, PE4 and PE5) were conducted to select the video clips for the main inferential experiments. Only stimuli associated with ~75% accuracy in both the EA and the NS tasks were included in the final pool. In each pilot experiment, 20 participants (10 females) were tested.

-PE1: In the first pilot experiment, participants watched the whole set of 600 clips (30 authentic/30 fake expressions x 10 social targets) and performed the EA task. Each clip was presented only once. Based on

participants' EA performance, 30 clips were selected for each social target so that each clip was associated with a percentage of correct responses ranging between 65% and 85% across participants. One social target (a female) was excluded from the final sample because of an insufficient number of videos meeting the accuracy criterion.

-PE2: Participants performed the EA task on a set of 270 clips (15 authentic/15 fake expressions x 9 social targets) that were selected in PE1. Each clip was presented twice. Based on PE2, 8 clips for each social target were selected (accuracy range 65-85%) and another social target was excluded.

-PE3: Participants performed both the EA and the NS tasks on a set of 64 clips (4 authentic/4 fake expressions x 8 social targets). In the EA task, each of the 64 clips was presented only once. In the NS task, each movie was repeated 4 times for a total of 256 trials. For each movie, a facial landmark (left/right outer canthus, left/right labial commissure) and a position of the bar (above or below the landmark) were selected. Then, for each of the 4 movie repetitions, we manipulated the Y coordinates of the white bar by gradually spacing it from the selected landmark by 4-5 pixels. In this way, we manipulated the difficulty of the spatial judgment across the 4 movie repetitions and could select the position of the white bar that was closest to the 75% accuracy criterion in the NS task (8 smiles x 8 social targets x 4 positions).

-PE4: Participants performed both the EA and the NS tasks on the same set of movies used in PE3. For the NS task, we rearranged the position of the white bar and tested 3 positions for each movie (192 trials) on the basis of the PE3 data; the position of the white bar that came the closest to yielding 75% accuracy in PE3 was selected as the median bar in PE4, and two additional bars, one above and one below, were added. Based on participants' performance in PE4, we selected the final set of stimuli that included 4 smiles (2 authentic/2 fake expressions) x 8 social targets (4 female).

-PE5: In the last pilot experiment, the final set of 32 stimuli was tested again for both the EA and NS tasks to ensure the tasks were matched for difficulty. Results confirmed that the percentage of correct responses ranged between 65% and 85% for all the stimuli in both tasks. Moreover, a paired *t*-test comparing the percentages of correct responses in the two tasks confirmed the successful matching ($t_{19} = 0.38, P = 0.71$).