Supplement: Individual analyses

To assess whether task effects were reliable among participants when considered individually, the FFT spectra obtained for each participant (computed from the 6 segments for each model, see Frequency-domain analysis) were split into 10 segments centered respectively on the expression-specific frequency and its harmonics (i.e., from 1.5 to 16.5 Hz, excluding the base frequency of 12 Hz). Each segment contained 25 frequency bins (12 on each side of the harmonic). The 10 segments were summed to obtain summed amplitude (in µV) for the 1.5 Hz frequency (and its harmonics), as well as for the 24 neighboring frequencies. For each participant, the data for the different expressions were pooled together, separately for the cross and the emotion task. Then, we subtracted summed amplitudes obtained for the cross task from those obtained for the emotion task at each electrode and each frequency bin to obtain the difference in amplitude that the emotion task caused relatively to the cross task (i.e., the *Task* effect).

Next, two procedures were used. First, for each participant, we identified electrodes with significant Task effect by computing *Z*-score for the task effect at expression-specific frequency compared to the task effect at the surrounding frequencies (i.e., difference of summed amplitude between emotion and cross tasks for the 20 surrounding frequency bins excluding the 2 immediately neighboring and the 2 most extreme values). Holm-Bonferroni correction for multiple comparisons was used to identify significant task-effect electrodes for each participant (see Supplementary table S2). This analysis allowed us to identify "significant" electrodes (i.e., electrodes whose activity was significantly different in the emotion and the cross task). Second, we estimated the sample distribution for the Task effect by computing the mean and standard deviation of summed amplitude differences at expression-specific frequency over the 64 scalp electrodes. To reduce the influence of electrodes with a strong task effect, electrodes whose difference was more than two standard deviations from the mean were excluded from estimating the distribution. Finally, the average amplitude difference over the 5 electrodes of each ROI was compared to the sample distribution over the scalp, using Z scores ($p < .05$, two-tailed) (see Supplementary table S3). The hypothesis was that if, for a given participant, the emotion task has the same effect as in analyses at the group level, the same regions should respond more than others, i.e., the mean amplitude difference (or *Task* effect) over the ROI should be significantly higher than the mean amplitude difference over the whole scalp.

An illustration of individual Task effect for each participant is provided in Figure 1 below. For each participants, we identified electrode showed a significant *Task* effect (see Supplementary table S2). Overall, participants showed a significant Task effect over 32 out of 64 electrodes, on average (*SD* = 14.3, range: 6-56), generally indicating a broader response in the emotion task (97.3% of significant electrodes). A second analysis was conducted to further determine if this effect was stronger over the ROIs identified in the manuscrit at group level (see Supplementary table S3). When a ROI did not show a significant effect for a participant, we investigated whether it was possible to observe a *Task* effect by reducing the size of the ROI or/and selecting nearby electrodes (see Figure 2 above; for detailed results, see Supplementary table S3).

As can be seen in Figure 1, the majority of participants experienced the same *Task* effect as the one observed at group level; namely, inconsistent results in mO, but an increase in response over rOT, lOT and CF. In that way, the Task effect, on average for the 22 participants, was significantly larger over rOT, lOT, and CF, but not over mO (see last head map in Figure 1 and Supplementary table S3). For mO, 16 out of 22 participants had at least one of the ROI's electrodes with a significant effect, but 12 in one direction and the other 4 in the opposite direction (see Figure 2 and Supplementary table S2). The effect size over the ROI was also significantly larger than for the whole scalp for only 2 participants, while it was significantly smaller for 5 others (see Supplementary table S3). For rOT, 19 out of 22 participants had a broader response in the emotion task over at least one of the ROI's electrodes. The effect size over the ROI was significantly larger than over the whole scalp for 8 participants. Only one had a smaller effect. It was possible to identify a response over this region (either by reducing the size of the ROI or moving it slightly) among 10 additional participants. For lOT, at least one of the ROI’s electrodes showed a broader response for the emotion task in 21 participants, and the effect size was larger than over the whole scalp for 9 participants. Eight additional participants had a significant response over the same region with smaller or close ROI. Finally, at least one of the ROI’s electrodes showed a broader response for the emotion task over CF in 20 participants, with a larger effect size compared to the whole scalp for 11 participants, and a significant response over smaller or neighbor regions for 5 additional participants.

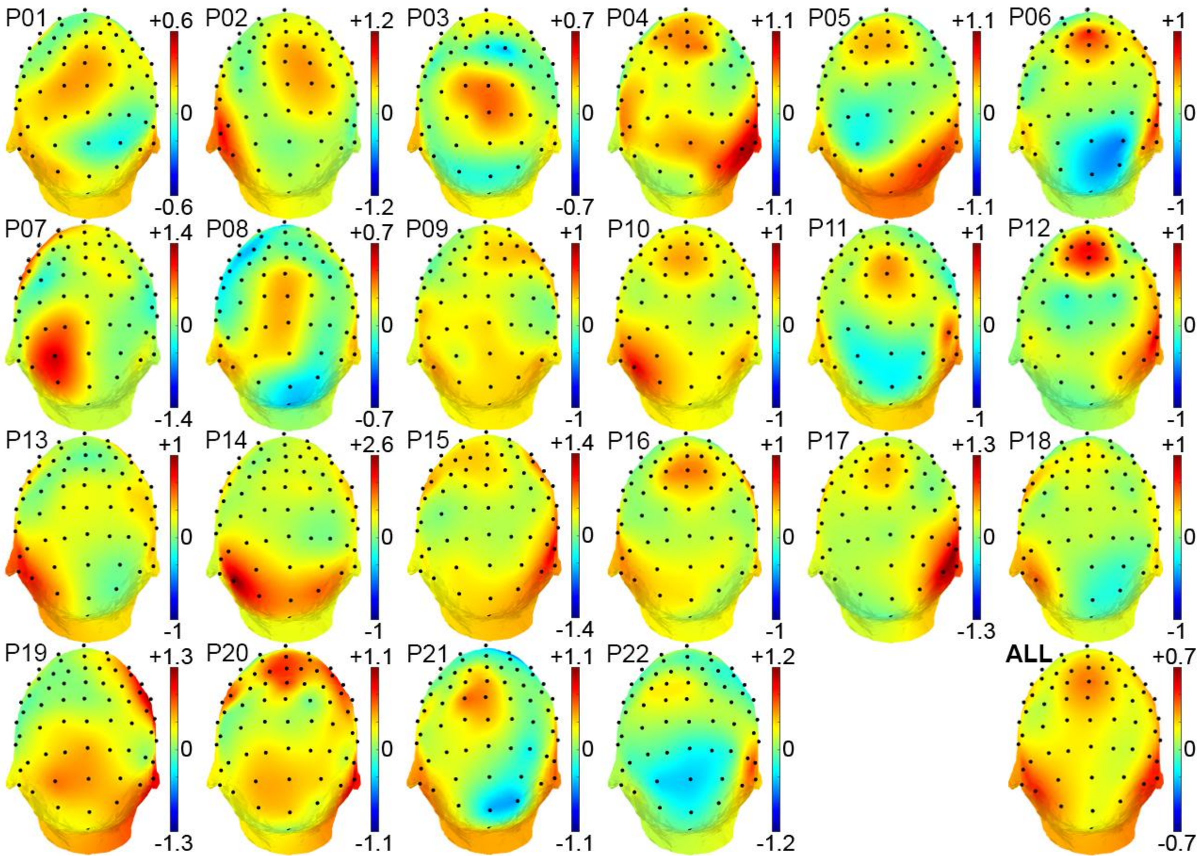

Figure 1. Individual Task effect. 3D-topographical maps of summed bca difference between the expression-specific response (at 1.5 Hz) in the emotion task and in the cross task, for the 22 participants, individually**.** These maps illustrate the individual *Task* effect, with hot colors indicating the regions that responded more when participants were explicitly told to recognize the expression displayed at 1.5 Hz. The *Task* effect averaged across participants is illustrated in the last head map.

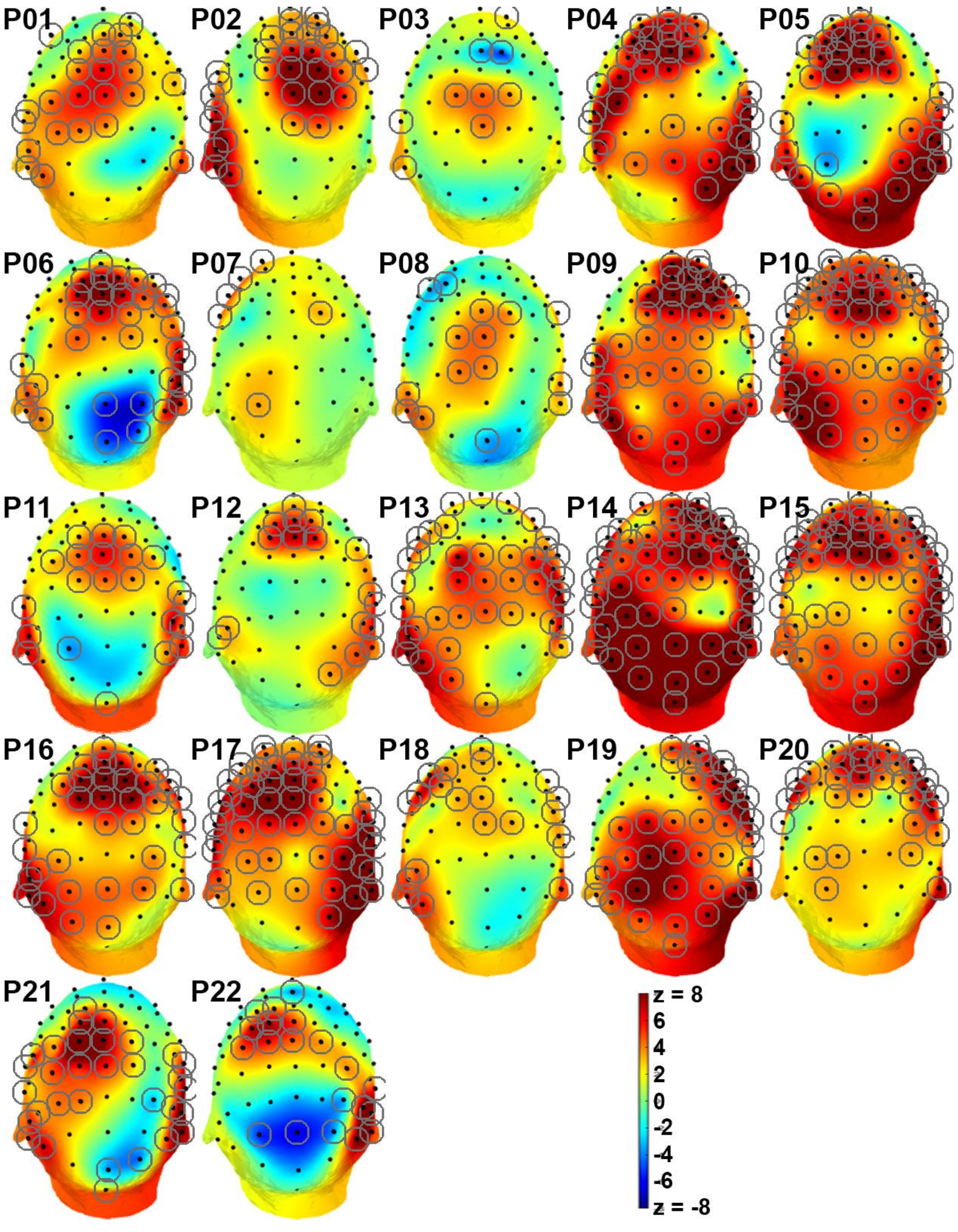

Figure 2: Individual Z scores for the *Task* effect. 3D-topographical maps of Z scores for the expression-specific response for each participant. Z-scores were calculated after subtracting the summed amplitude of the response in the cross task from that in the emotion task for the expression-specific frequency (1.5 Hz and its harmonics) and neighbor frequencies. Z-scores at the expression-specific frequency were computed from neighbor frequencies. The circles indicate the significant electrodes after Holm-Bonferroni correction (see Supplementary table S2).

Thus, the individual analysis showed that the effects reported at the group level are also observed at the level of each participant in the majority of individuals. This is particularly the case for the increase in responses over the right and left occipito-temporal regions, as well as over the central-frontal region. It also makes it possible to highlight individual differences, with responses that are stronger, more focalized or have a slightly different topography from the one observed at the group level.