Supplementary Figure 1

Face classification accuracy in electrodes used in the study and their neighbors (see

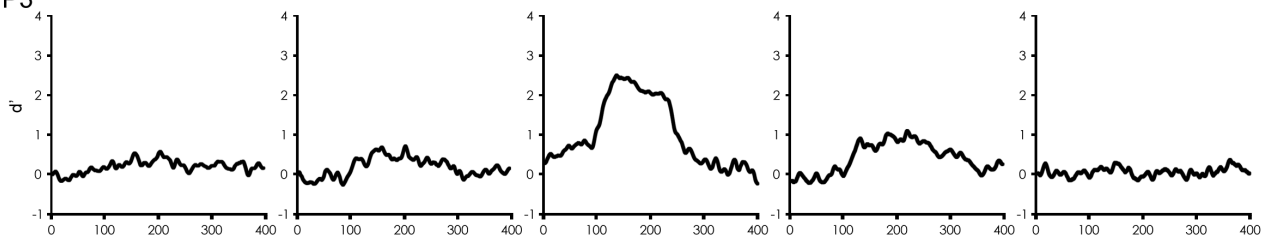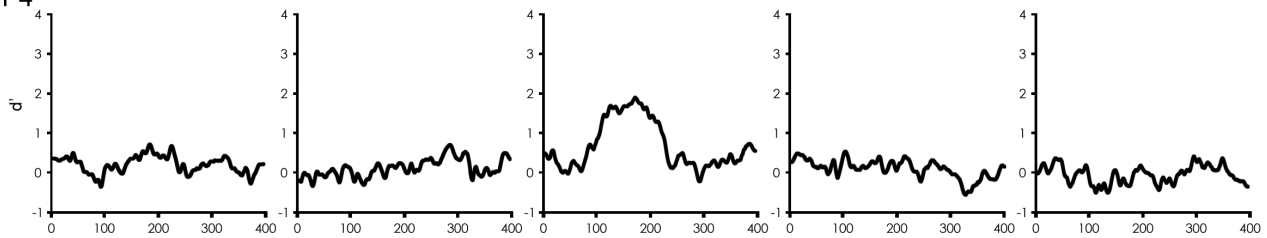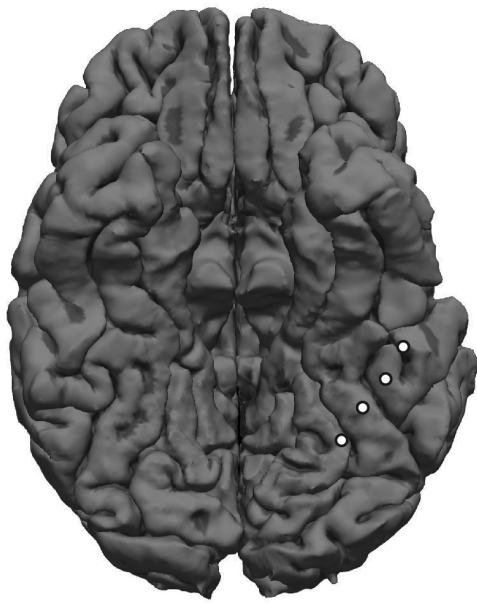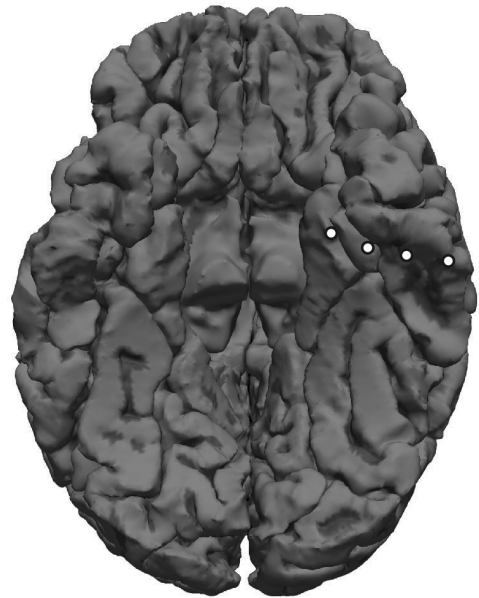Figure 1 for locations of electrodes and these neighbors)

Face classification accuracy over time as measured by d' (plotted against the beginning of the 100 ms sliding window) for all electrodes used in the study and their neighboring electrodes. There was 1 cm between the centers of neighboring electrodes. The first column of electrodes represents the most medial and/or posterior electrode on its strip. For P1 there were 4 electrodes on two neighboring strips on the ventral temporal lobes, for P2-P4 there were 6 electrodes on a single ventral temporal strip (Figure 1). Electrodes were chosen based on the criteria that peak d' be above 1.5 (p < .001, shown in the center column, other than for P1). In P1, three electrodes exceeded this threshold (the middle and fourth electrodes in the first row and the middle electrode in the second row) and for all analyses the signal from these three electrodes was averaged. Independently loading these three electrodes into the analyses does not substantially alter the results and indeed each electrode showed similar d' timecourse in experiment 1 and each showed above chance classification and similar classification timecourses for individual faces in experiment 2. In P2, two neighboring electrodes exceeded this threshold. However, the signal recorded from the second electrode on the strip (shown in the second column of the third row) was excluded because, unlike the responses from other face sensitive electrodes selected for this study, faces evoked substantially less activity than the other stimulus categories used in experiment 1 in this electrode (see Figure S4A for ERP from this channel and exclusion criteria in methods section). The signal recorded from the third electrode on the strip (shown in the center column) displayed the more typical pattern of greater activity for faces relative to the other conditions and thus for P2 this electrode was chosen in the study. Electrodes neighboring the face electrodes chosen for the study had significantly smaller d' in each participant (with the exception of the second electrode in
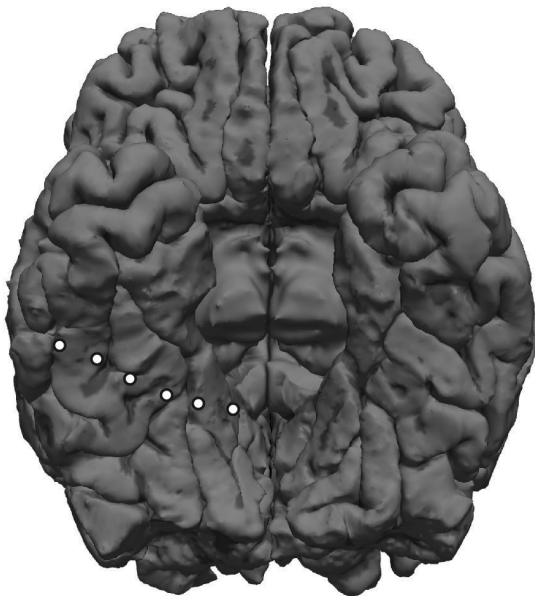
P2, as mentioned above). In addition, in most participants the electrodes neighboring the electrode of interest did not show significant face sensitivity (p > .05 corrected for multiple comparisons, this corresponds to a peak d' of .97) and in all participants the electrodes 2 cm away did not show significant face sensitivity.
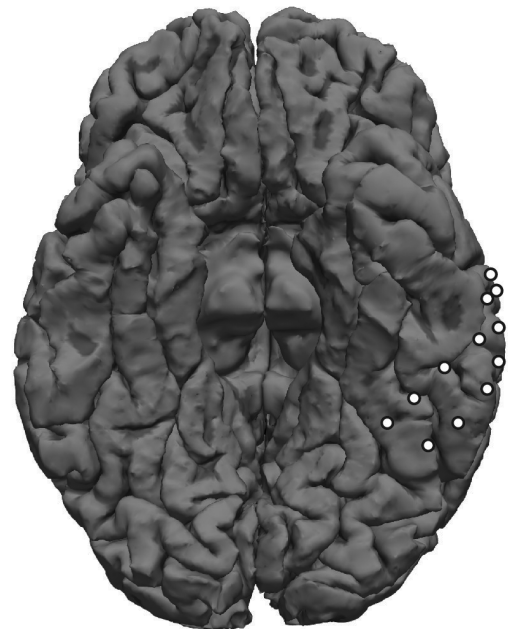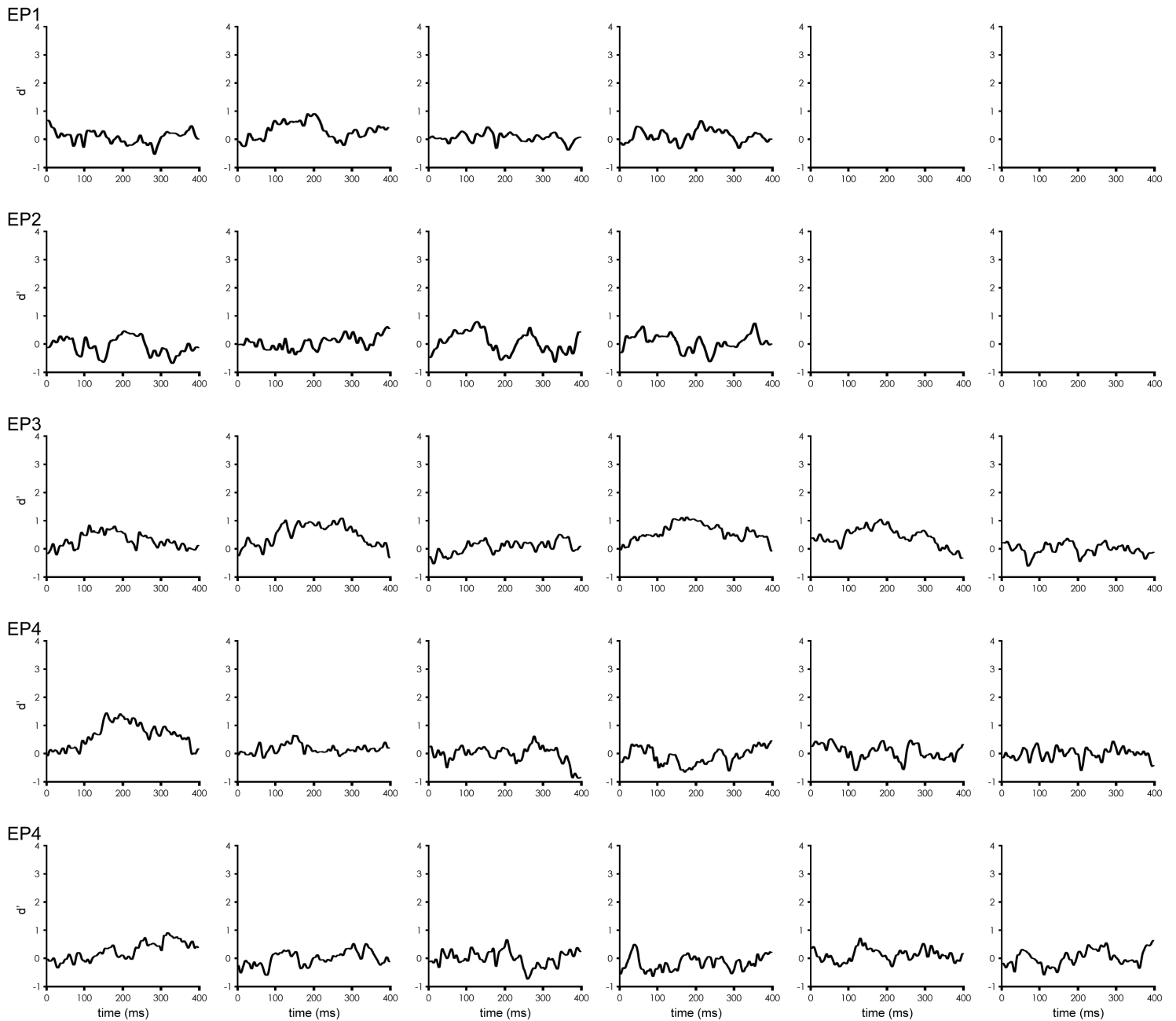
EP1

EP2

EP3

EP4

Supplementary Figure 2

Electrode localization for 4 participants excluded from the main analyses due to lack of

face sensitive activity.

Supplementary Figure 3

Face classification accuracy in electrodes from participants excluded due to lack of face

sensitive electrodes (see Figure S2 for locations of electrodes and these neighbors)

Face classification accuracy over time as measured by d' (plotted against the beginning

of the 100 ms sliding window) for all electrodes used in the study and their neighboring

electrodes. There was 1 cm between the centers of neighboring electrodes. None of these show significant face sensitivity (p > .05 corrected for multiple comparisons, this corresponds to a peak d' of .97) except for the first electrode in EP4 (peak d' = 1.5). However, the signal recorded from this electrode was excluded because faces evoked substantially less activity than the other stimulus categories used in experiment 1 in this electrode (see Figure S4B for ERP from this channel and exclusion criteria in methods section).
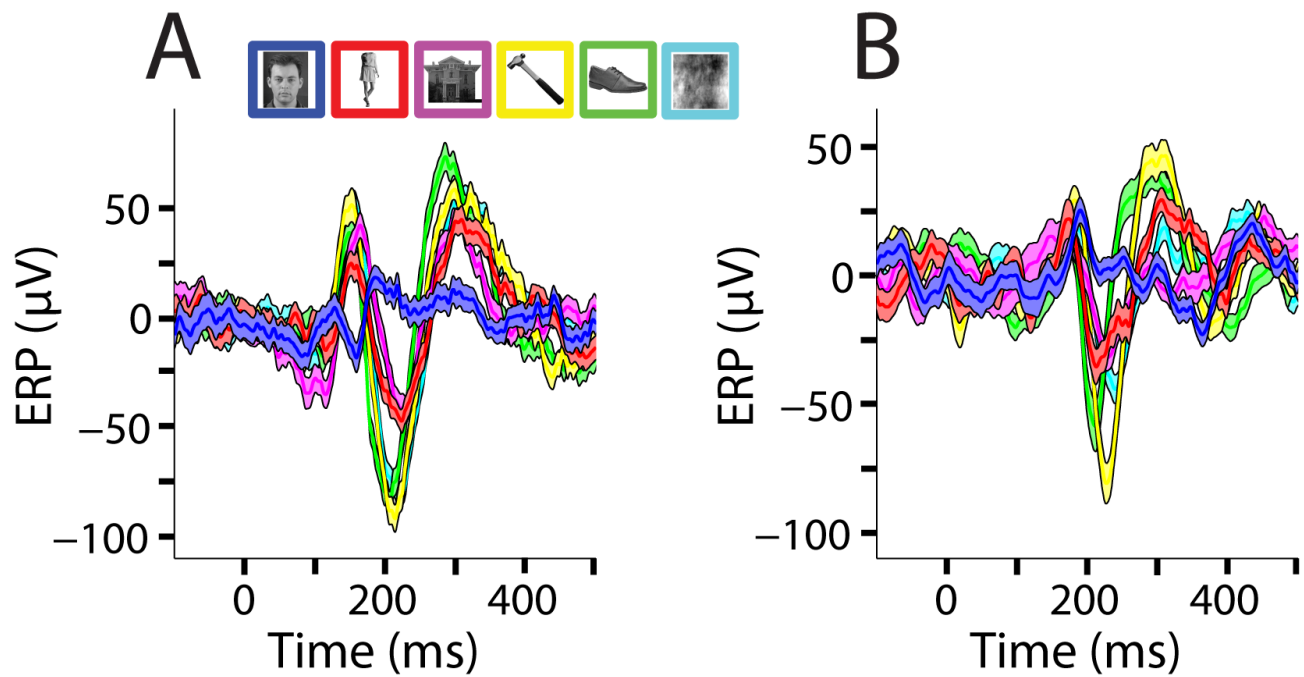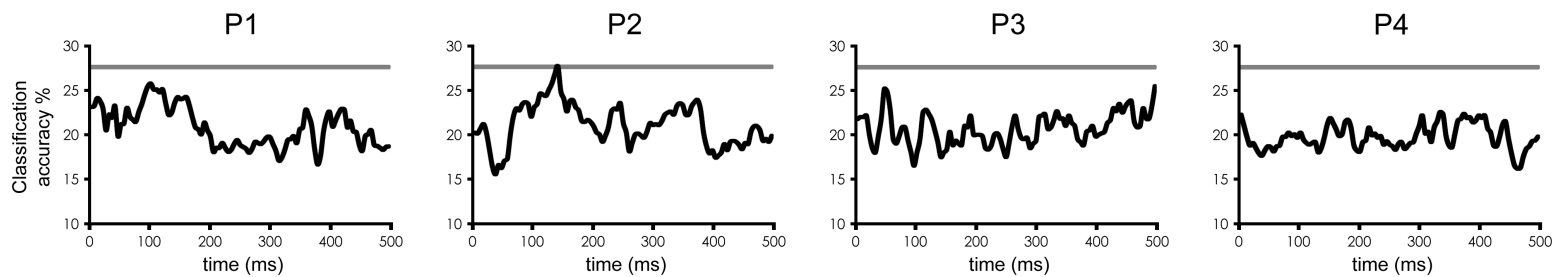
Supplementary Figure 4

ERPs from electrodes with d' > 1.5 due to faces showing less activity than other categories

(A) ERP from electrode in the second column of P1 in Figure S1.

(B) ERP from electrode in the first column, top row of EP4 in Figure S3.

These electrodes were excluded from the analyses in the main text because they were not deemed to be in FFA due to the lower amplitude signal for faces relative to other categories.

Supplementary Figure 5

Face expression classification

Five-way classification accuracy for facial expressions (angry, fearful, sad, happy, and neutral) over time in experiment 2. Grey line indicates p < .05 corrected for multiple comparisons based on the permutation test.
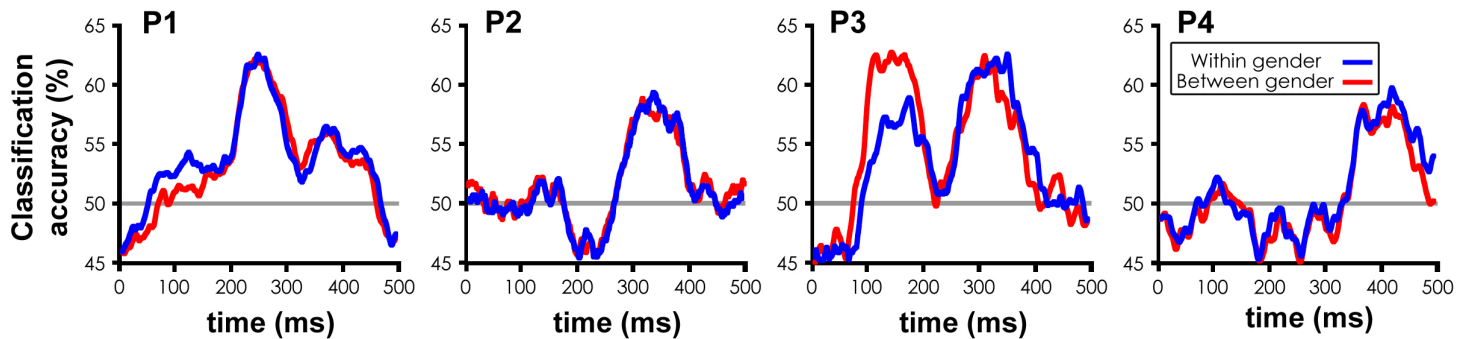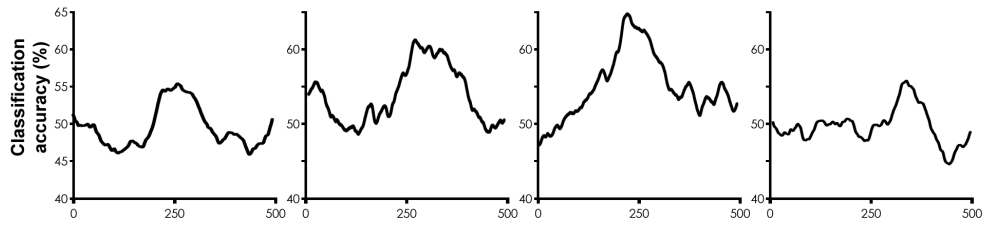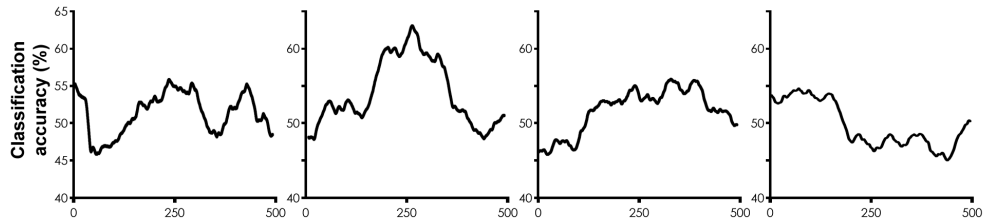
Supplementary Figure 6

Effects of task demands on face individuation

Time course of individuation level face classification accuracy divided by within (blue) and across (red) gender classification in each participant. . This shows, given two faces, how accurately we could predict which one the participant was viewing based on the neural data plotted against the beginning of the 100 ms sliding window. For within gender classification, all training and test faces were the same gender and for between gender classification, the two training faces were of different genders. If individuation was driven by task demands, only between gender classification would be greater than chance. The similarity between within and between gender classification suggests that individuation during the 200-500 ms time period was not driven by task demands.

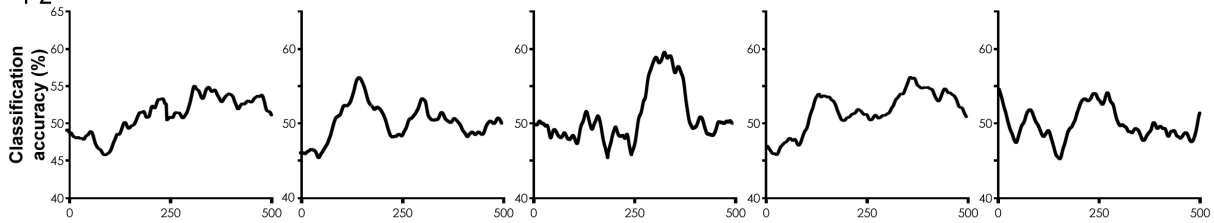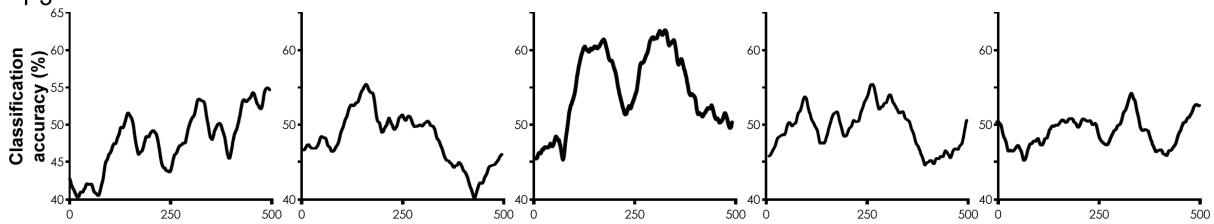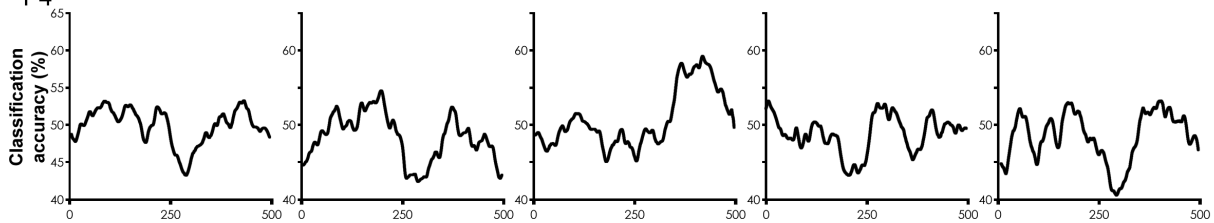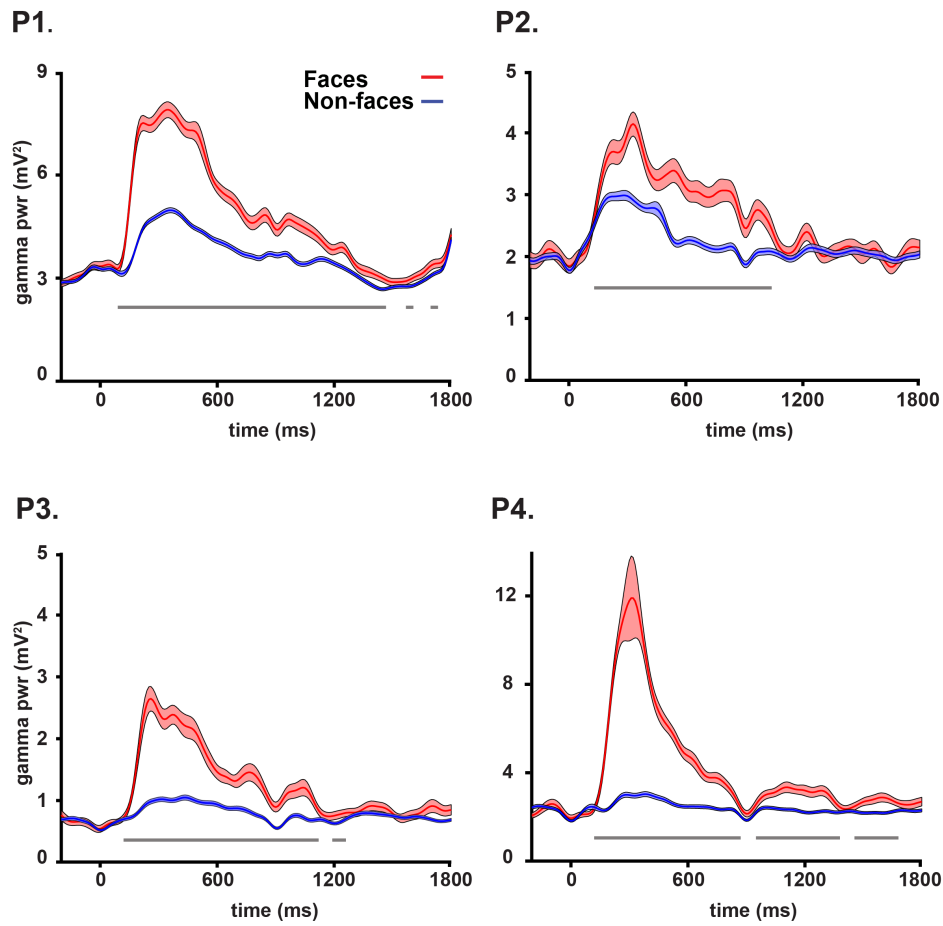**Supplementary Figure 7**

Face individuation in all electrodes from P1-P4

Time course of individual level face classification accuracy based on single trial voltage

potentials in each participant. This shows, given two faces, how accurately we could

predict which one the participant was viewing based on the neural data, plotted against the beginning of the 100 ms sliding window. P = .05, corrected for multiple time comparisons is at 57%. The layout of electrodes is the same as in Figure S1. In P1 for the analyses in the main text, the signals second and third electrode from the top row and the second electrode in the second row were averaged prior to classification, canonical correlation analysis, gamma power analysis, etc.

Supplementary Figure 8

Face specific gamma power in each participant

Mean and standard error of gamma band (40-90 Hz) power for face and non-face trials in each participant in experiment 1. Grey bars indicate p < .05 using an across trial t-test between face and non-face objects.

Supplementary Table 1

Classification accuracy in the 100-250 ms time window for non-face objects

Cells contain the true positive rate/the false positive rate for each condition. Bold cells

indicate p < .01 classification accuracy. Face classification accuracy was significant at p

< 10^{-5} in all sessions based on the binomial test.

Category	P1		P2		P3		P4
	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2	Session 1
Faces	**93 / 0**	**82 / 1**	**88 / 8**	**54 / 8**	**73 / 6**	**77 / 1**	**67 / 8**
Bodies	29 / 22	33 / 23	31 / 15	35 / 24	**59 / 14**	17 / 5	30 / 21
Hammers	11 / 15	32 / 30	23 / 11	7 / 18	28 / 23	17 / 9	27 / 23
Houses	22 / 11	37 / 17	15 / 5	31 / 15	10 / 10	23 / 4	33 / 16
Shoes	37 / 26	48 / 30	**44 / 17**	32 / 14	53 / 36	**57 / 24**	23 / 26
Phase scr faces	7 / 22	12 / 10	32 / 19	0 / 8	17 / 8	10 / 12	20 / 9