Early ERPs to faces and objects are driven by phase, not amplitude spectrum information: evidence from parametric, test-retest, single-subject analyses

Magdalena M. Bieniek, Cyril R. Pernet, Guillaume A. Rousselet

Supplementary Material

1. Supplementary Tables

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Table 1. Behavioral percent correct of all subjects (rows) in both sessions of Experiment 1. Interestingly, one subject (KWI) responded texture in only 51 to 71% of trials. However, KWI did not consistently and correctly categorized textures by relying on their amplitude spectra: on trials where textures were categorized as faces or houses, this subject categorized face amplitude spectrum textures as faces equally as often as houses (15% vs. 14% of trials) in session 1 and even more often as houses than as faces (39% vs. 9% of trials) in session 2. This subject’s categorization strategy was inconsistent also for house amplitude spectrum textures: these were categorized more often as faces compared to houses (17% vs. 14% of trials) in session 1, but more often as houses compared to faces (18% vs. 9% of trials) in session 2. Finally, noise images with mean face-house amplitude were sometimes categorized by this subject as houses (26% and 35%) and sometimes as faces (11% and 14%).
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<thead>
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<th>Subject</th>
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Table 2. Beta coefficients associated with each predictor of the first regression model of experiment 2. Results are reported at the electrode and the latency of the max $R^2$. Numbers 1 and 2 after the subjects’ names indicate the session.
Table 3. Unique variance explained by phase spectrum. Median ERP variance uniquely explained by phase in the P1, N1 and P2 time windows for faces and houses with 95% percentile bootstrap confidence interval in brackets. Data are reported for the max $R^2$ electrode and for the envelope (max across all electrodes).

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<th>N1 Faces</th>
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Table 4. Unique variance explained by amplitude. Median ERP variance uniquely explained by amplitude in the P1, N1 and P2 time windows for faces and houses. See Table 6 caption for details.

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Table 5. Beta coefficients associated with each predictor of the second regression model of experiment 2, at the electrode and the latency of the max $R^2$. Numbers 1 and 2 after the subjects’ names indicate the session.
2. Supplementary Figures
Figure 1. Experiment 1 – Color-coded results of the single-trial 3x3 ANOVA after correction for multiple comparisons (alpha=0.05) for session 1 (columns 1-3) and session 2 (columns 4-6). Each subplot shows significant F values at all electrodes (Y axis), in the -100 – 500ms time window (X axis): phase, in columns 1 and 4, amplitude in columns 2 and 5, and phase x amplitude interaction in columns 3 and 6. Non-significant data points appear in grey. Subject CMG took part in only one experimental session; all the other seven subjects were tested twice.

Figure 2. Experiment 1 - Scalp distributions of sensitivity to phase spectrum. Sensitivity is expressed in color-coded F values, from non-significant effects in dark blue to the strongest significant effects in dark red for session 1 and session 2. Each row represents one subject. The effects are shown between time 0 and 500ms post stimulus. Rows containing only completely red maps indicate lack of the effect for that subject in the whole time window.
Figure 3. Experiment 1 - Scalp distributions of sensitivity to amplitude spectrum. See Figure 2 caption for details.
Figure 4. Experiment 1 - Scalp distributions of sensitivity to phase x amplitude interaction. See Figure 2 caption for details.
Figure 5. Experiment 2 - Scalp distributions of sensitivity to phase spectrum in face stimuli. Effects are expressed in color-coded F values: from non-significant effects (dark blue) to the strongest significant effects (deep red) for session 1 and session 2. Each row represents one subject. The effects are shown between time 0 (=stimulus presentation) and 500ms post stimulus.
Figure 6. Experiment 2 - Scalp distributions of sensitivity to phase spectrum in house stimuli. See Figure 5 caption for details.
Figure 7. Experiment 2 - Scalp distributions of sensitivity to amplitude spectrum in face stimuli. See Figure 5 caption for details.
Figure 8. Experiment 2 - Scalp distributions of sensitivity to amplitude spectrum in house stimuli. See Figure 5 caption for details.
Figure 9. Experiment 2 - Scalp distributions of sensitivity to phase x amplitude interaction in face stimuli. See Figure 5 caption for details.
Figure 10. Experiment 2 - Scalp distributions of sensitivity to phase x amplitude interaction in house stimuli. See Figure 5 caption for details.
Figure 11. Experiment 2 - ERPs and beta coefficients from the main model for session 1, faces stimuli. Data at the max $R^2$ electrode (columns 1, 2, 4, 5) and the electrode with max amplitude effects (columns 3 and 6) for all subjects (rows). Column 1 - ERPs for 8 levels of phase averaged across all amplitude levels; columns 2, 3 – ERPs for 11 levels of amplitude averaged across all phase levels; columns 4, 5, 6 – time courses of beta coefficients on all electrodes (grey lines) with betas for the max R2 electrode (columns 4, 5) or max amplitude effect electrode (column 6) highlighted with a thick black line. Red horizontal lines show time windows where the effects were significant. The number in upper left corner of each box tells which electrode was the max R2 electrode (columns 1, 2, 4, 5) and max amplitude effect electrode for that subject.
Figure 12. Experiment 2 - ERPs and corresponding beta coefficients (main model) - data for session 2, faces stimuli. See Figure 11 caption for details.
Figure 13. Experiment 2 - ERPs and corresponding beta coefficients (main model) - data for session 1, houses stimuli. See Figure 11 caption for details.
Figure 14. Experiment 2 -ERPs and corresponding beta coefficients - data for session 2, houses stimuli. See Figure 11 caption for details.
Figure 15. Experiment 2 - Cross-session reliability of beta coefficients associated with phase and amplitude spectra for faces and houses from the main regression model. Beta coefficients for the two sessions are plotted in black (session 1=solid; session 2=dashed) and the difference between them is plotted in red. Horizontal lines indicate time windows of significant beta coefficients (session 1=thick black; session 2=thin black; difference=red).
Figure 16. Experiment 2 - Cross-session reliability of beta coefficients (main model). See Figure 15 caption for details.
Figure 17. Categorical interaction analysis results for subjects GAR, KWI, MAG and TAK. For each subject, the results are presented in 10 subplots, with 2 sessions in columns, and 5 predictors in rows. Each subplot shows colour-coded F values at all electrodes along the Y axis, and from -100 to 500ms along the X axis. Non-significant effects are indicated with a grey background.
Figure 18. Categorical interaction analysis results for subjects WJW, CMG, CXM and BTM. See Figure 17 caption for details.
Figure 19. Electrode map for the Biosemi Active Electrode Amplifier System with 128 electrodes with corresponding labelling from the 10/10 system (circled electrodes).