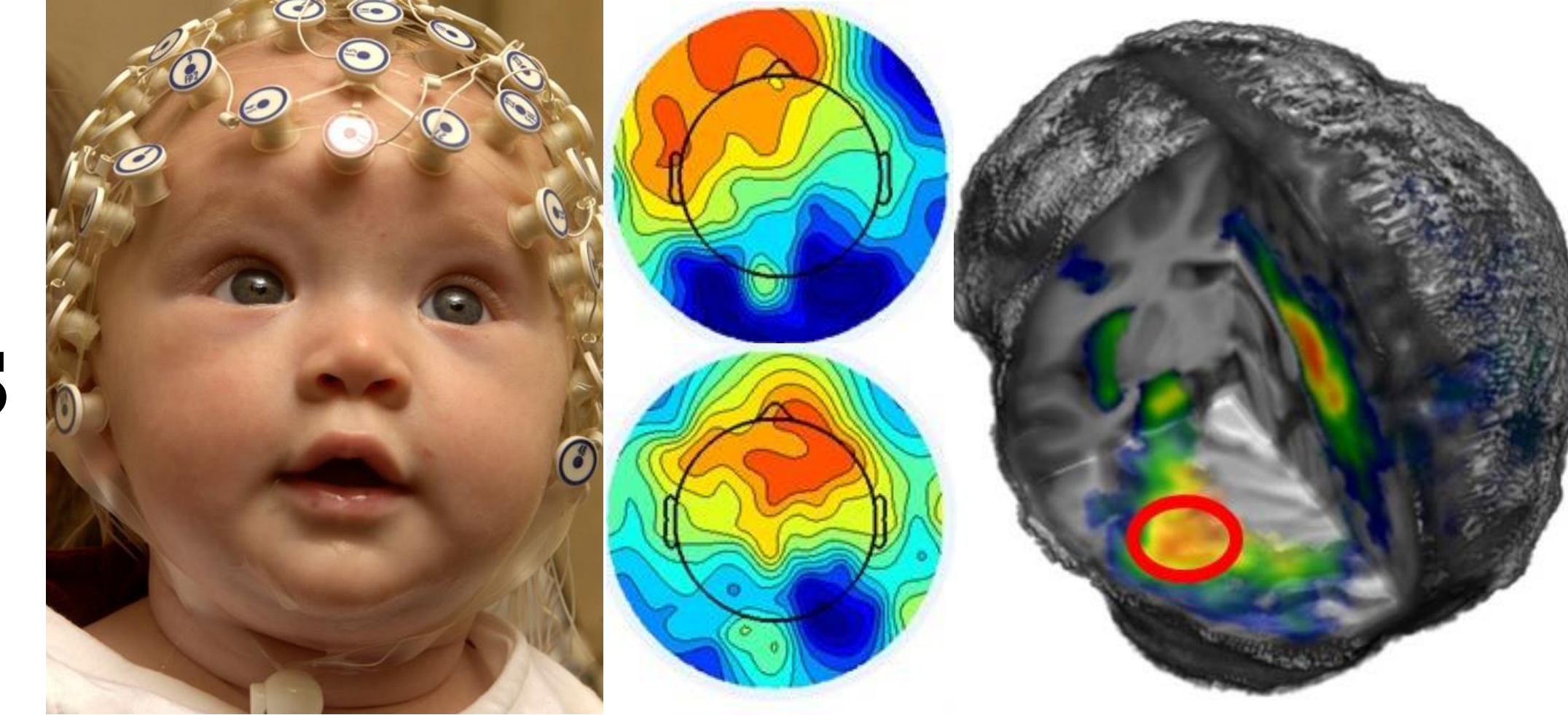


Brain changes in response to faces in the first year

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<http://jerlab.psych.sc.edu/jerpdf/srcd2017brainchanges.pdf>



Abstract

Infant's behavioral responses to faces changes over the first year. The current study examined the neural response of infants to pictures of faces and objects from 4.5 months through 12 months with event-related potentials (ERP) and cortical source analysis with realistic head models. The infants were presented with brief pictures of women's faces or infant-oriented toys. The ERPs in response to the stimuli were calculated for the P1 and N290 components. We found the P1 amplitude at about 100 ms post-stimulus-onset was larger for faces than toys overall, but the difference between faces and toys increased over age, especially from 6 to 12 months. Similarly, the N290, a negative deflection in the ongoing ERP about 290 ms following stimulus onset, also showed this increasing differentiation in responses to faces and toys, becoming larger over age to the face stimuli. The neural source of the ERP components were identified with cortical source analysis in "regions-of-interest" (ROIs) theoretically involved in face processing. The sources of the P1 component were generally found in the lateral occipital and posterior-lateral temporal areas (e.g., lateral inferior occipital gyrus; posterior portion of the inferior temporal gyrus). The sources of the N290 were in the middle fusiform gyrus, anterior fusiform gyrus, parahippocampal gyrus, and temporal pole. By 9 and 12 months of age the CDR amplitude in the fusiform gyrus and adjacent neural areas differed for faces and toys, and also showed an enhanced peak around the time of the N290 peak amplitude.

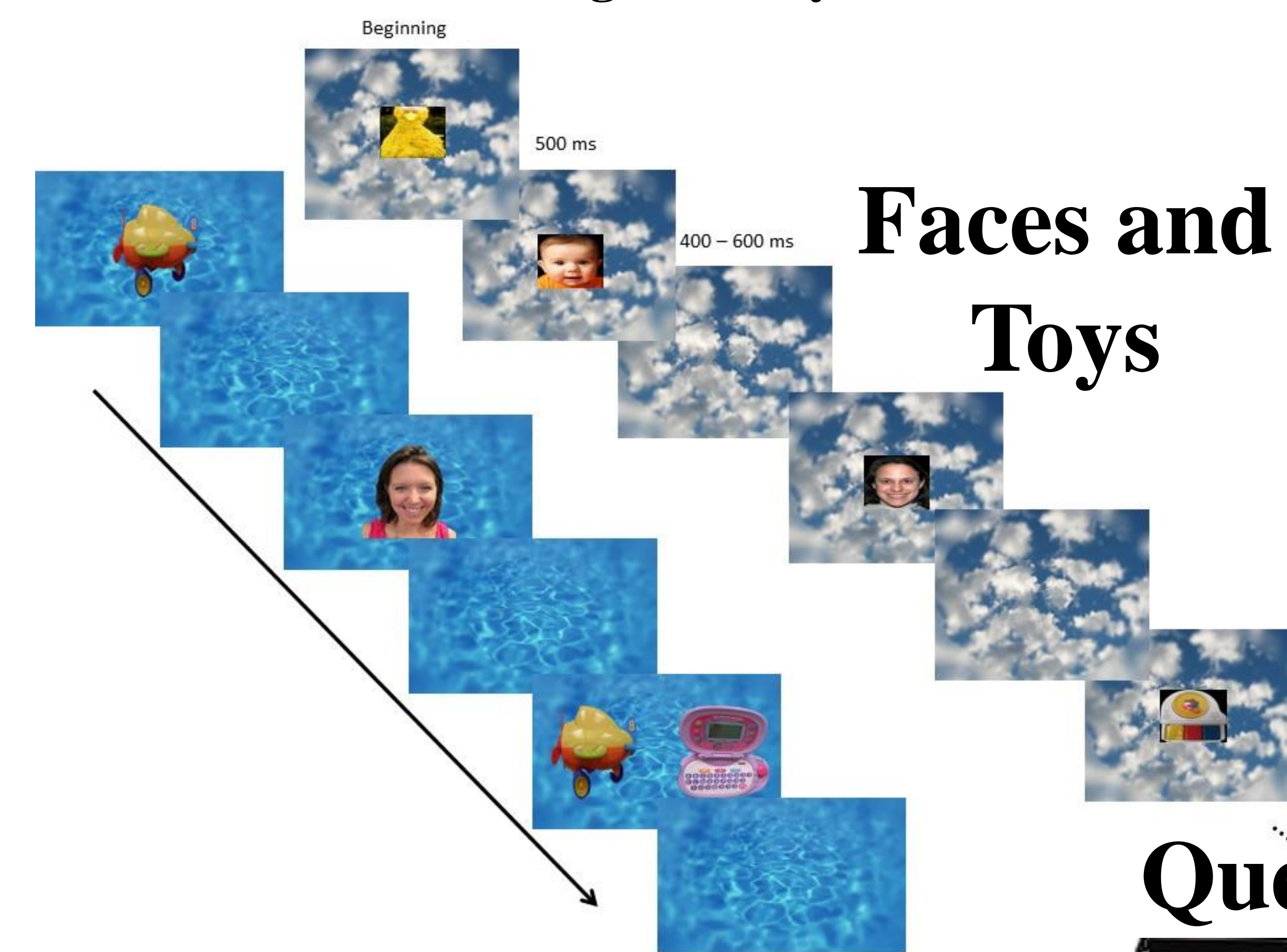
Methods

Participants

4.5 (N = 30), 6-0 (N = 33), 7.5 (N = 13), 9.0 (N = 8), 12.0 (N = 24) months

ERP Procedure

Infant passively viewed brief stimulus presentations (500 ms) & paired comparison trials (4 s) while seated on parent's lap in darkened room
Recorded EEG from high-density EGI HGSN/GSN nets

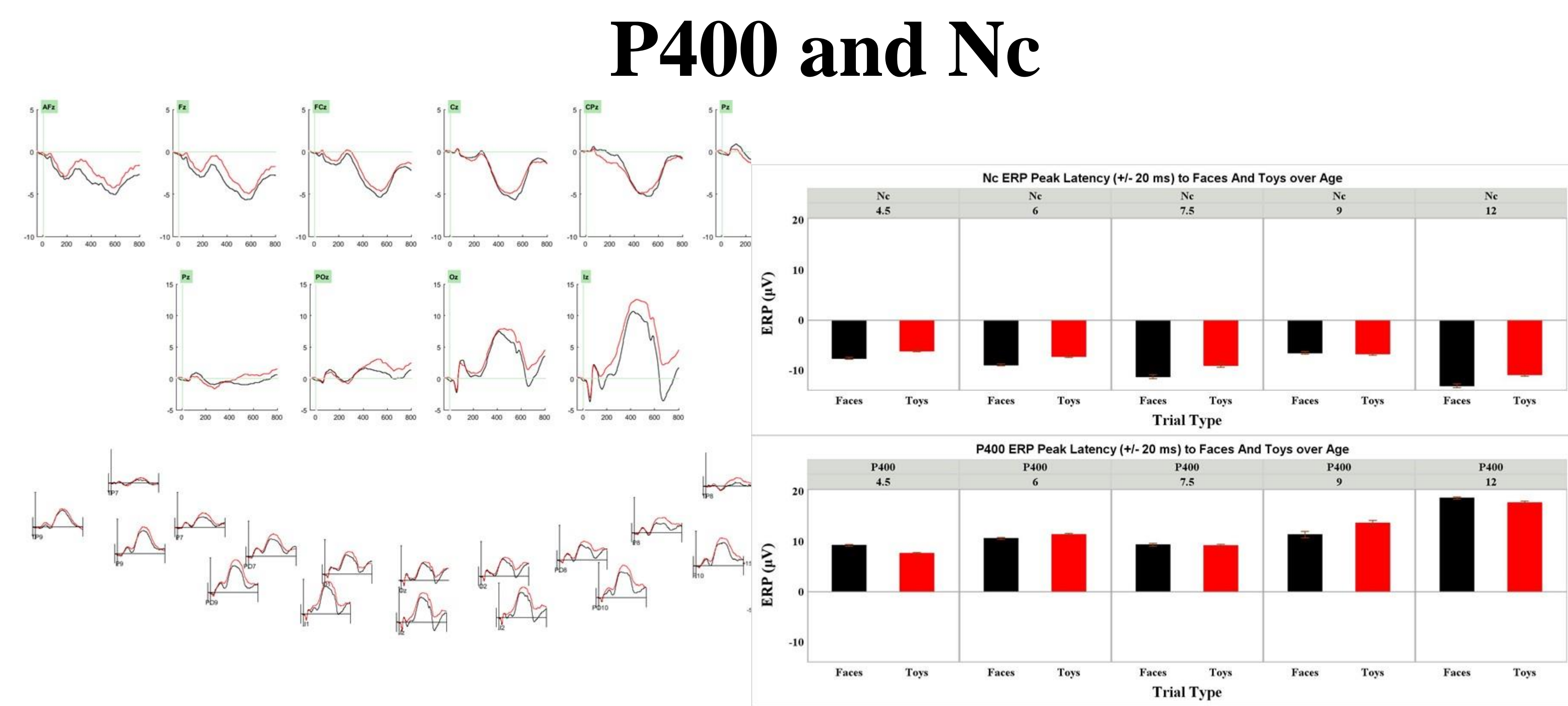
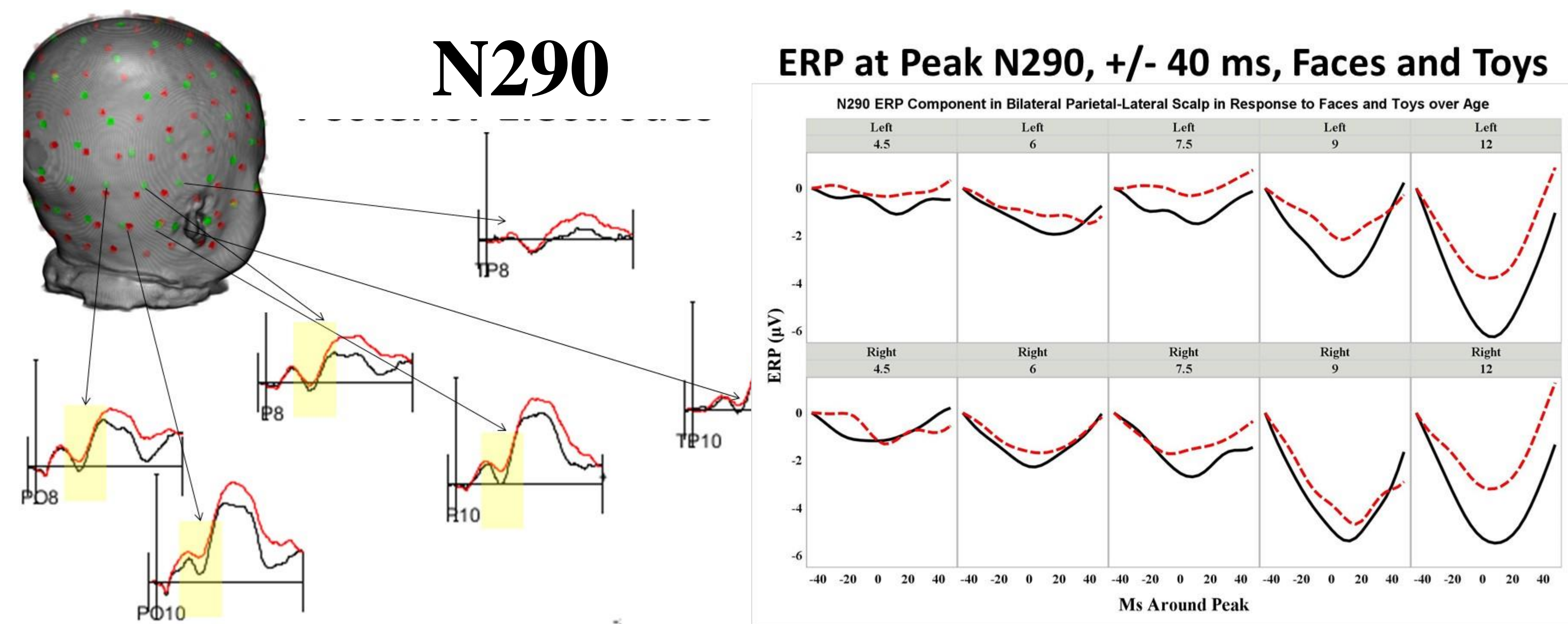
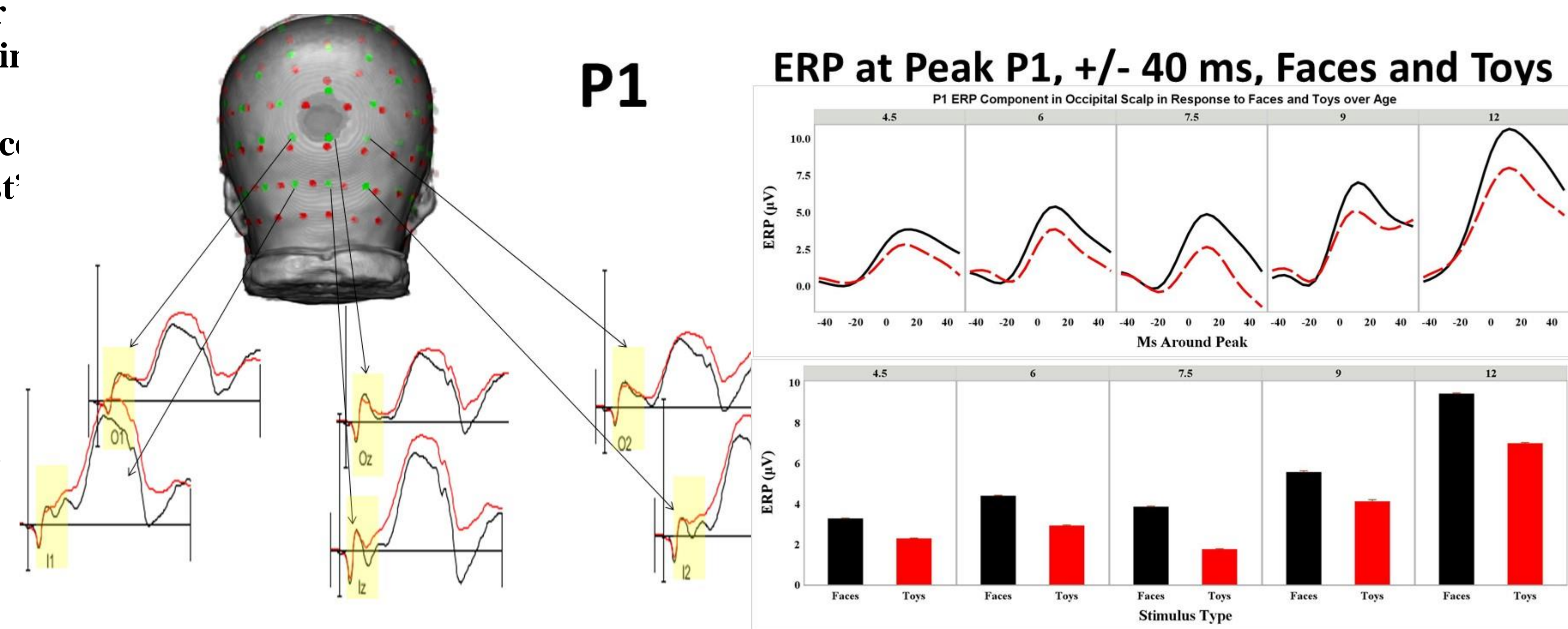


ERP Analyses

Electrodes clustered into virtual "10-10" electrodes

P1, N290, P400, Nc ERP components

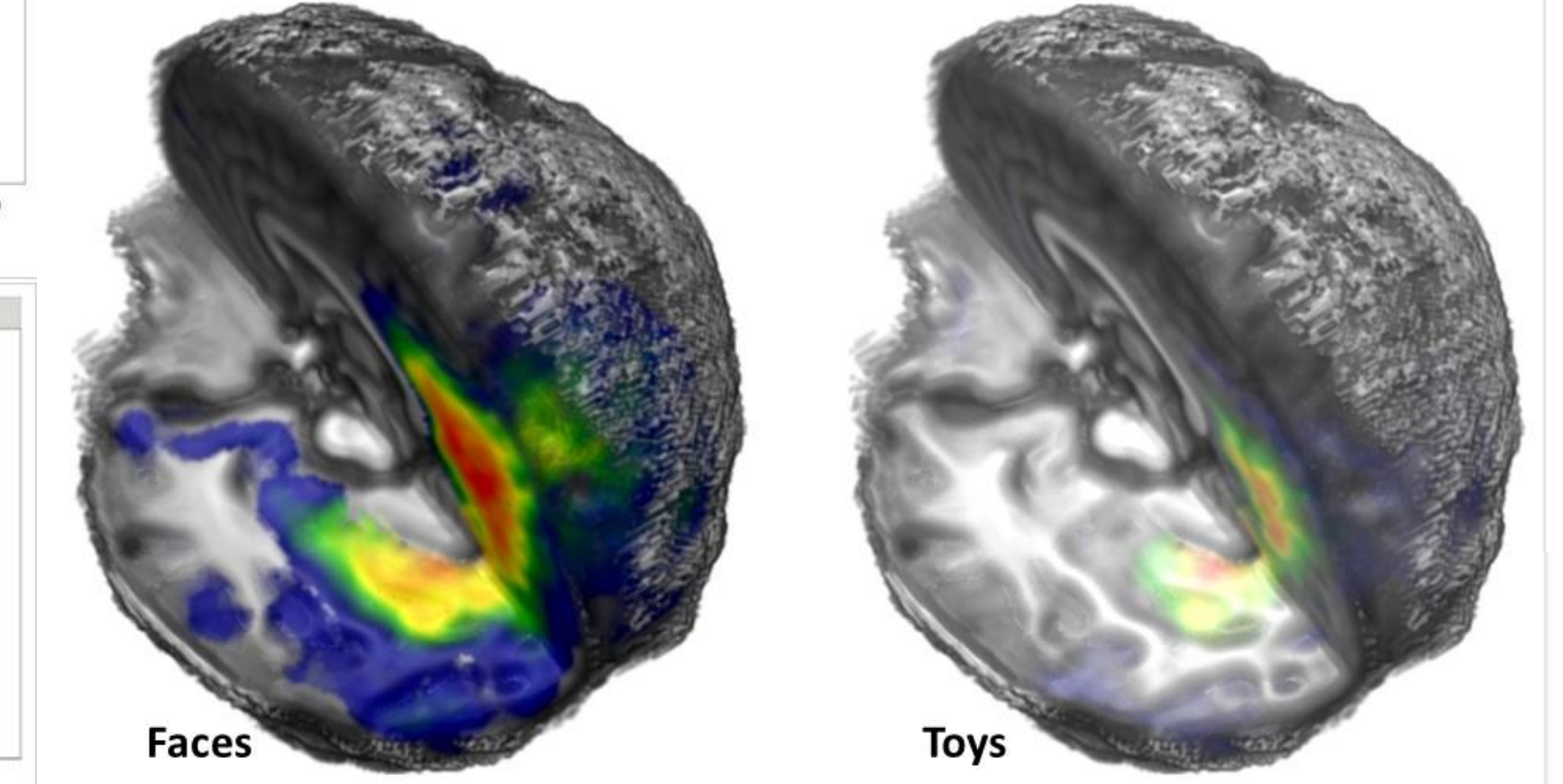
Individualized peaks at appropriate electrode sites



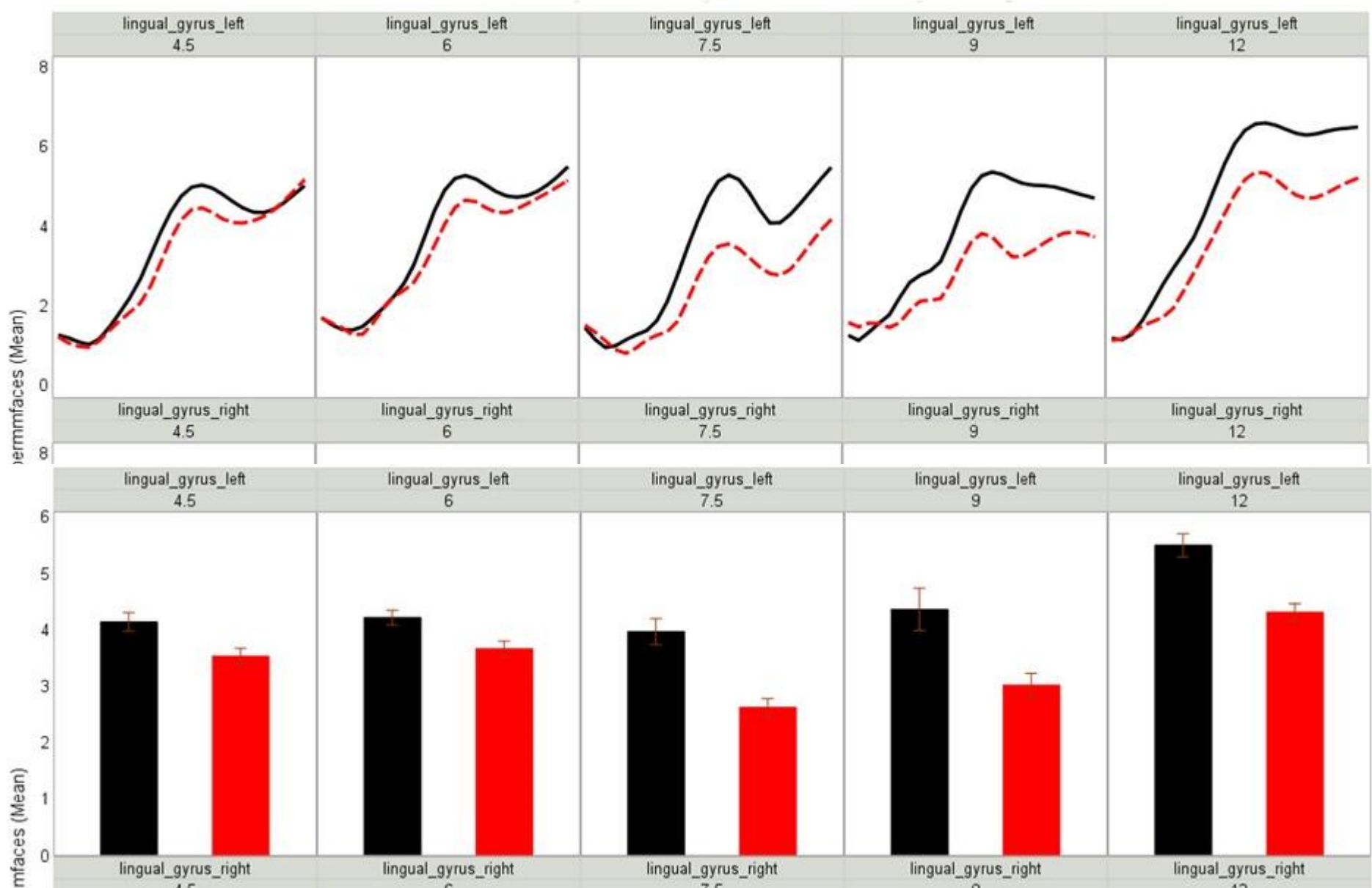
Current Density Reconstruction

Structural MRIs from a subset of participants. Realistic head models were created for the MRIs, in which materials within the head were identified, segmented, and assigned a relative conductivity. CDR of the ERP component was done with head models, from the infant's own MRI, or MRI from an infant with similar age and head size, anatomically defined ROIs

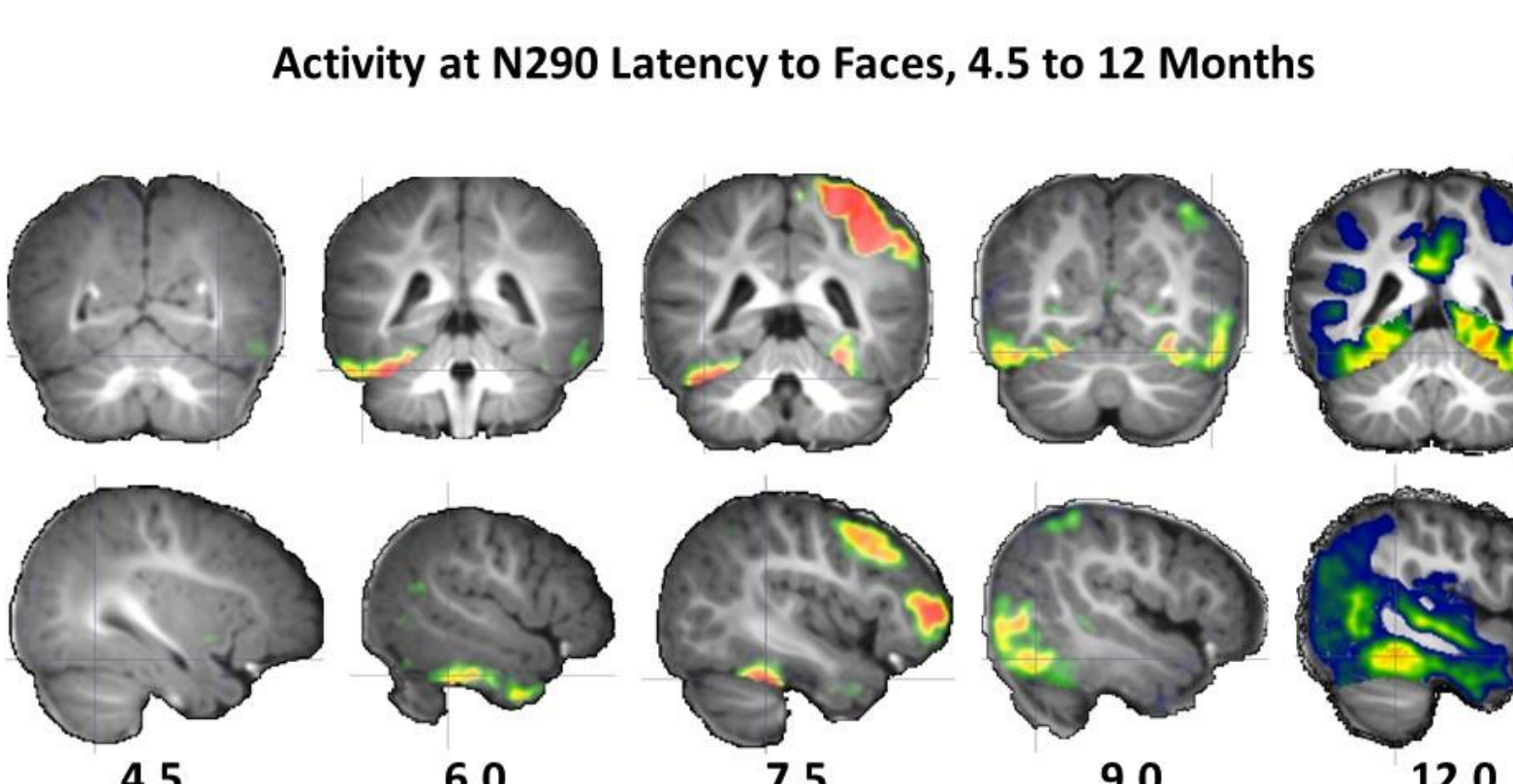
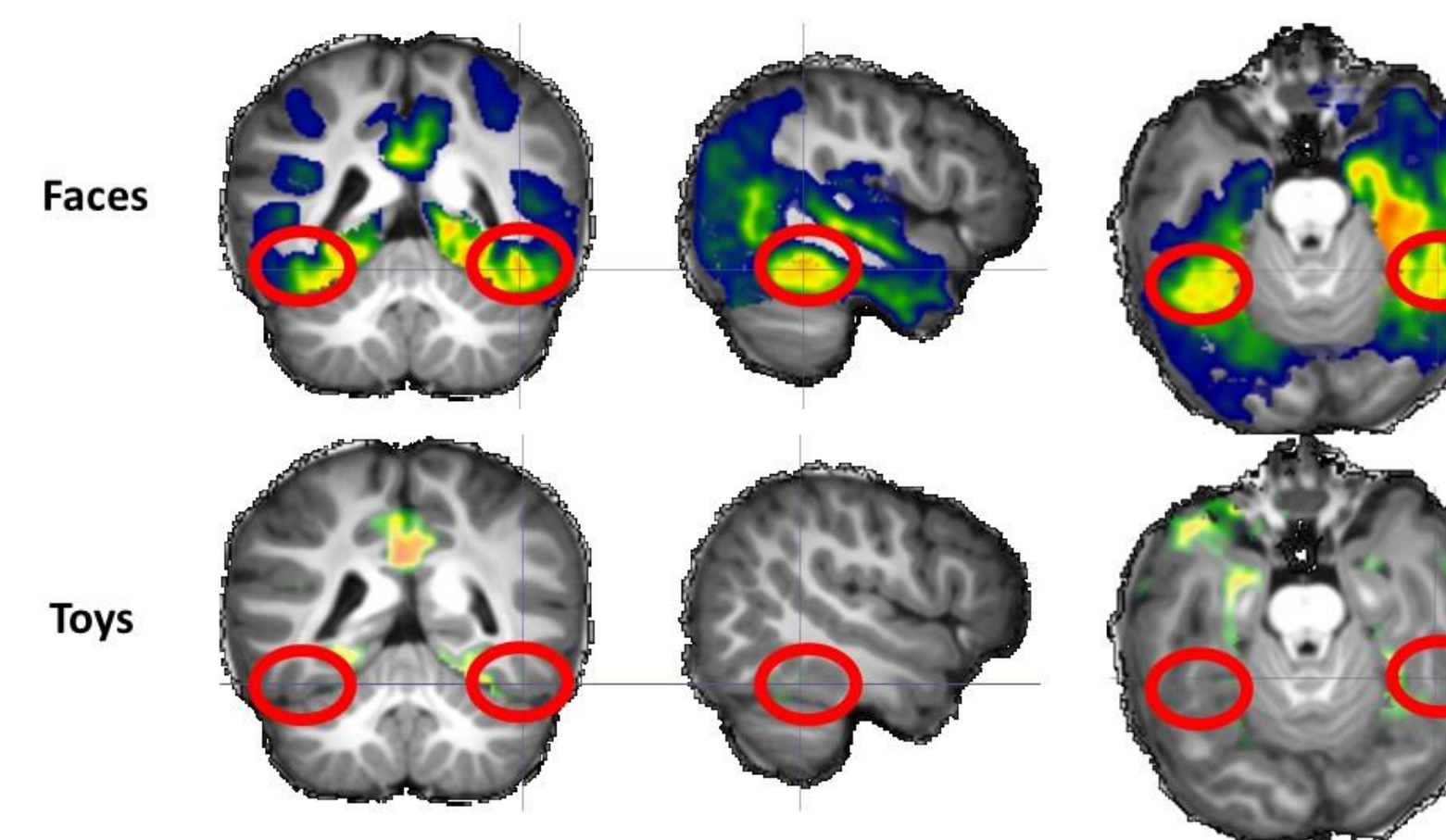
Lingual Gyrus CDR at P1 Peak, Faces and Toys



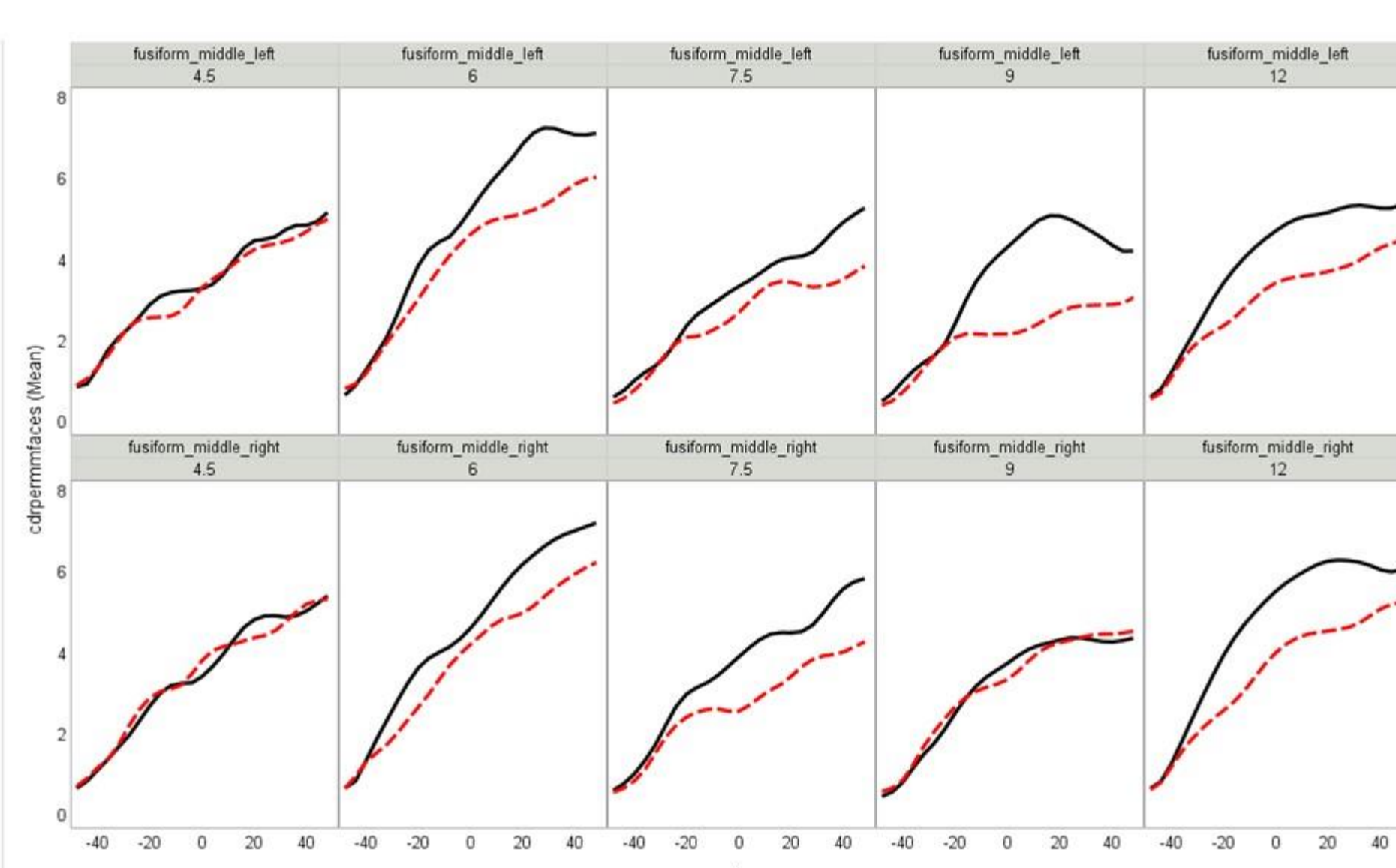
Lingual Gyrus, ROI over Time at Peak P1



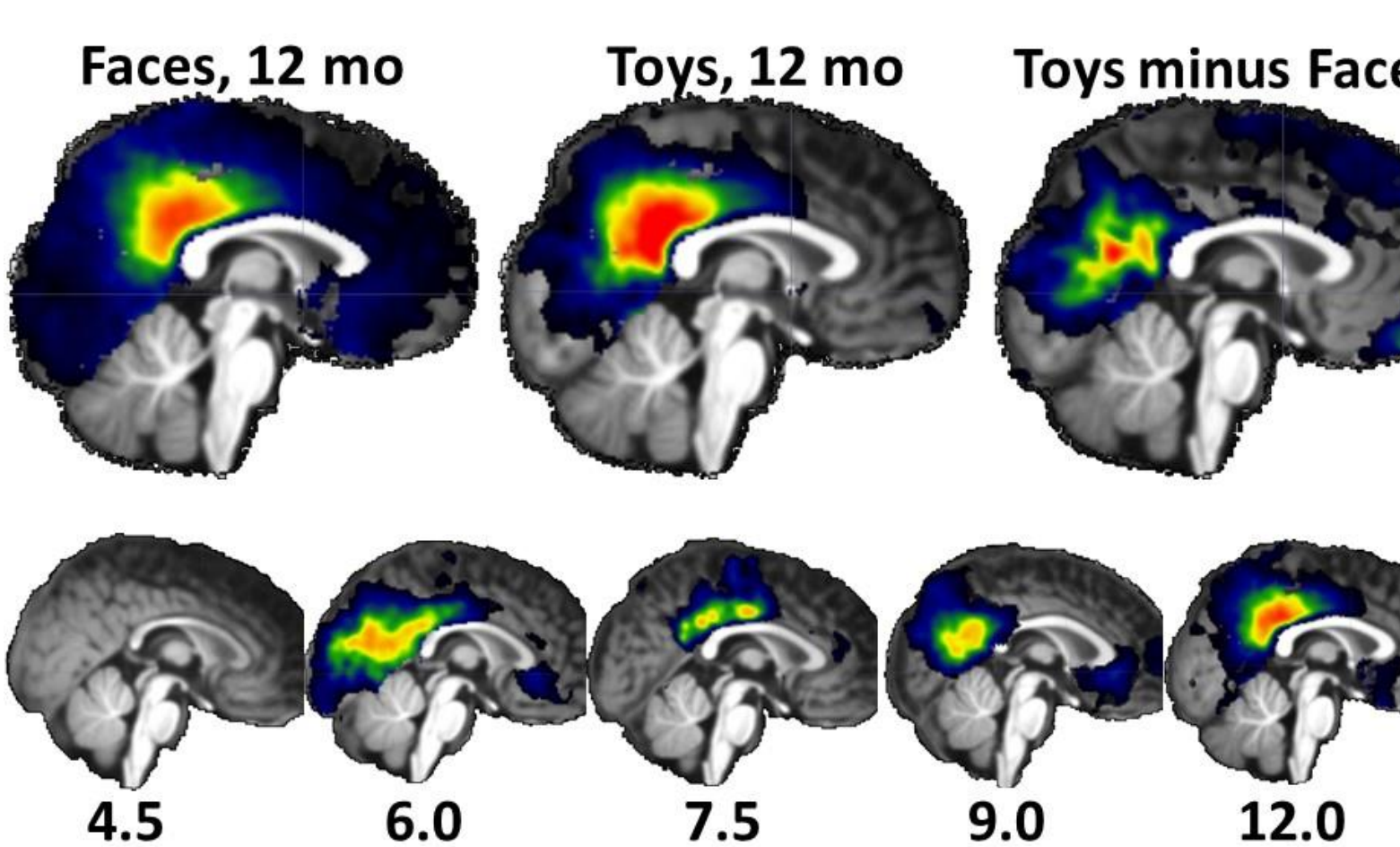
Face- and Toy-Related Activity, Middle FFG, N290 Latency, 12 Months



Middle FFG, ROI over Time at Peak N290



Posterior Cingulate Gyrus CDR Activity at Peak P400 Latency



Posterior Cingulate Gyrus, ROI over Time at Peak P400

