

EEG Measures of Adult Response to Infant Emotion

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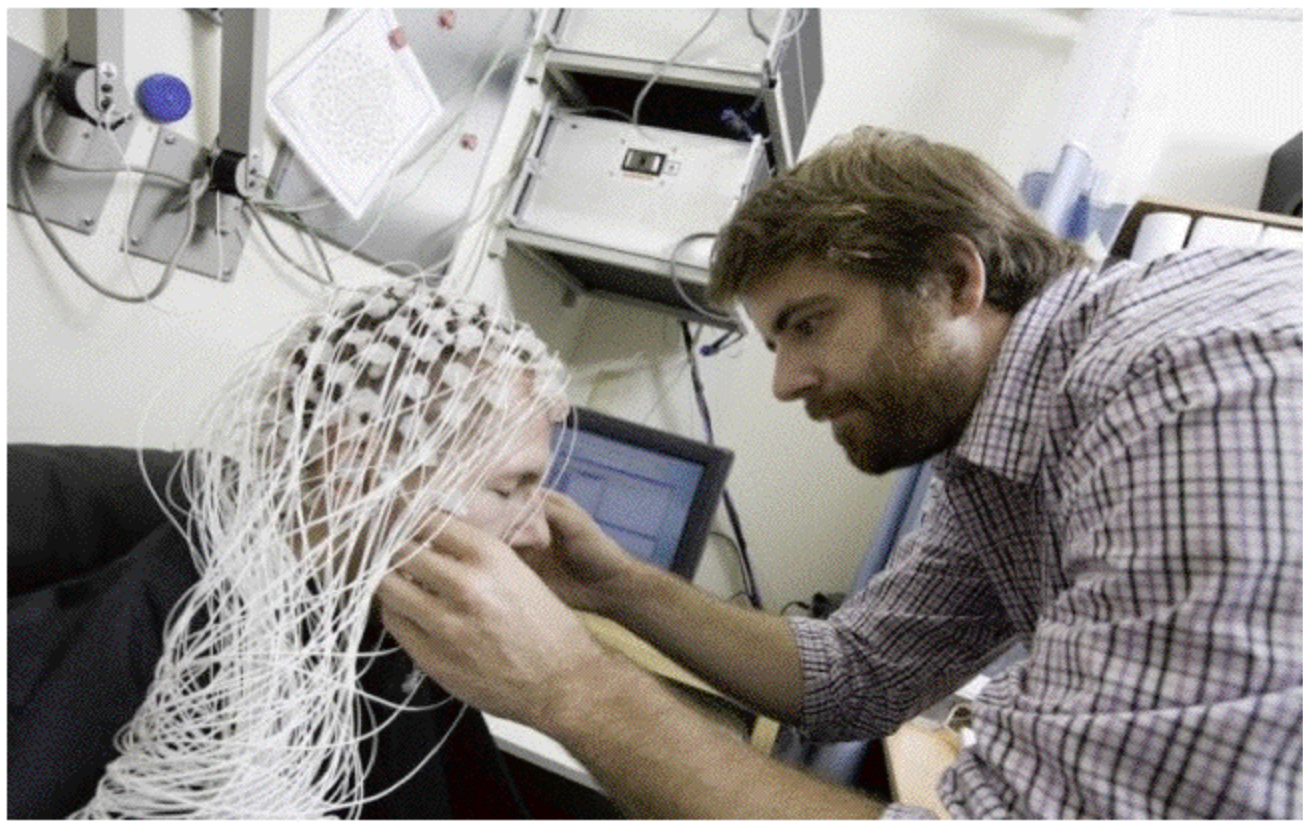
Yale Child Study Center



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Background

- Infant-caregiver relationships fundamentally influence infant well-being and developmental processes.
- Elemental to this relationship are processes of communication, especially facial expressions and vocalizations.
- Emotional infant faces and cries are highly salient stimuli employed to elicit responses in adults.
- Investigating neuronal activation patterns using ERP allows insight into immediate mechanisms of perception, relevant to infant-caregiver interaction.



Study Methods

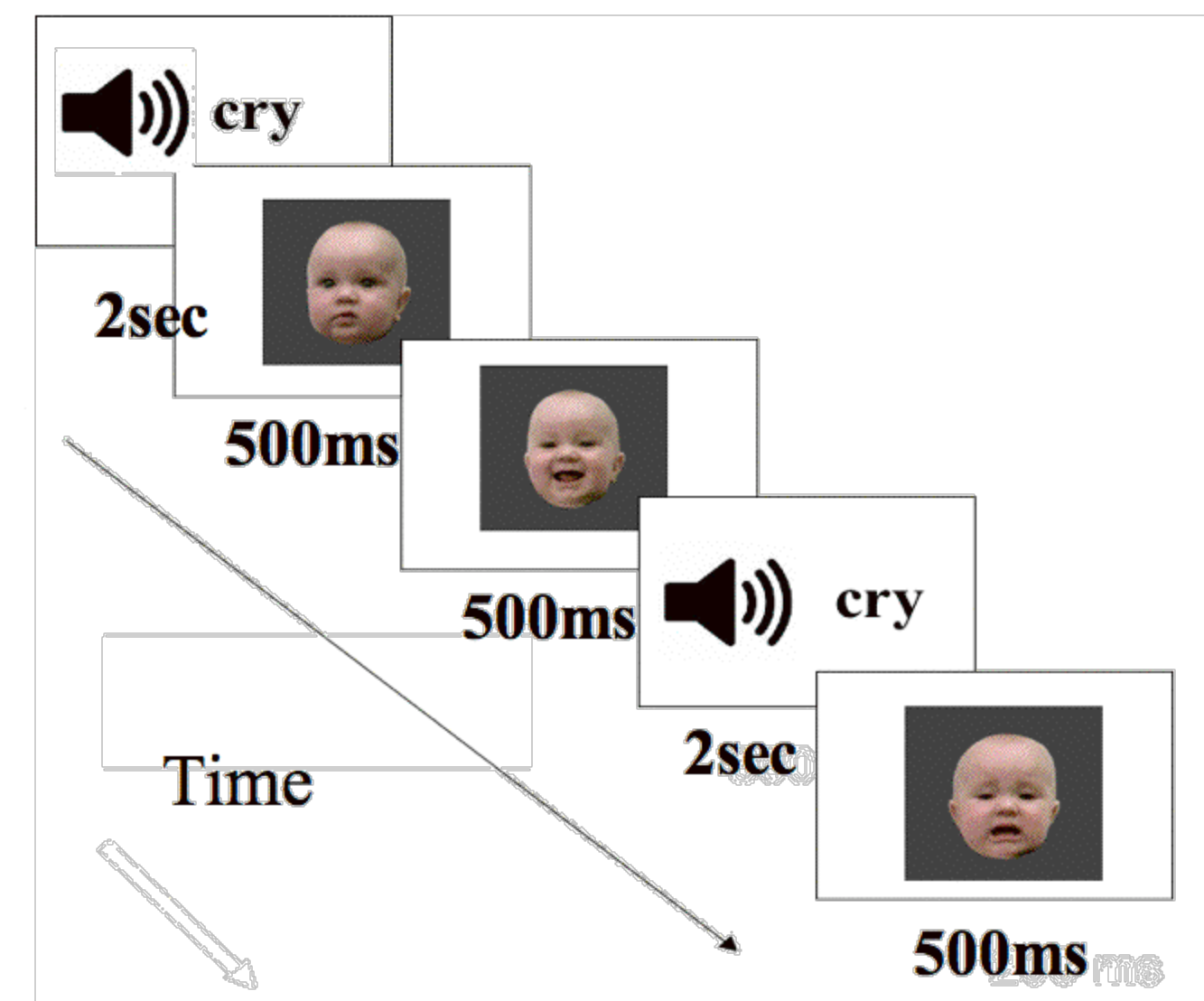
Participants

20 Caucasian females (mean age = 23.5)

Experiment

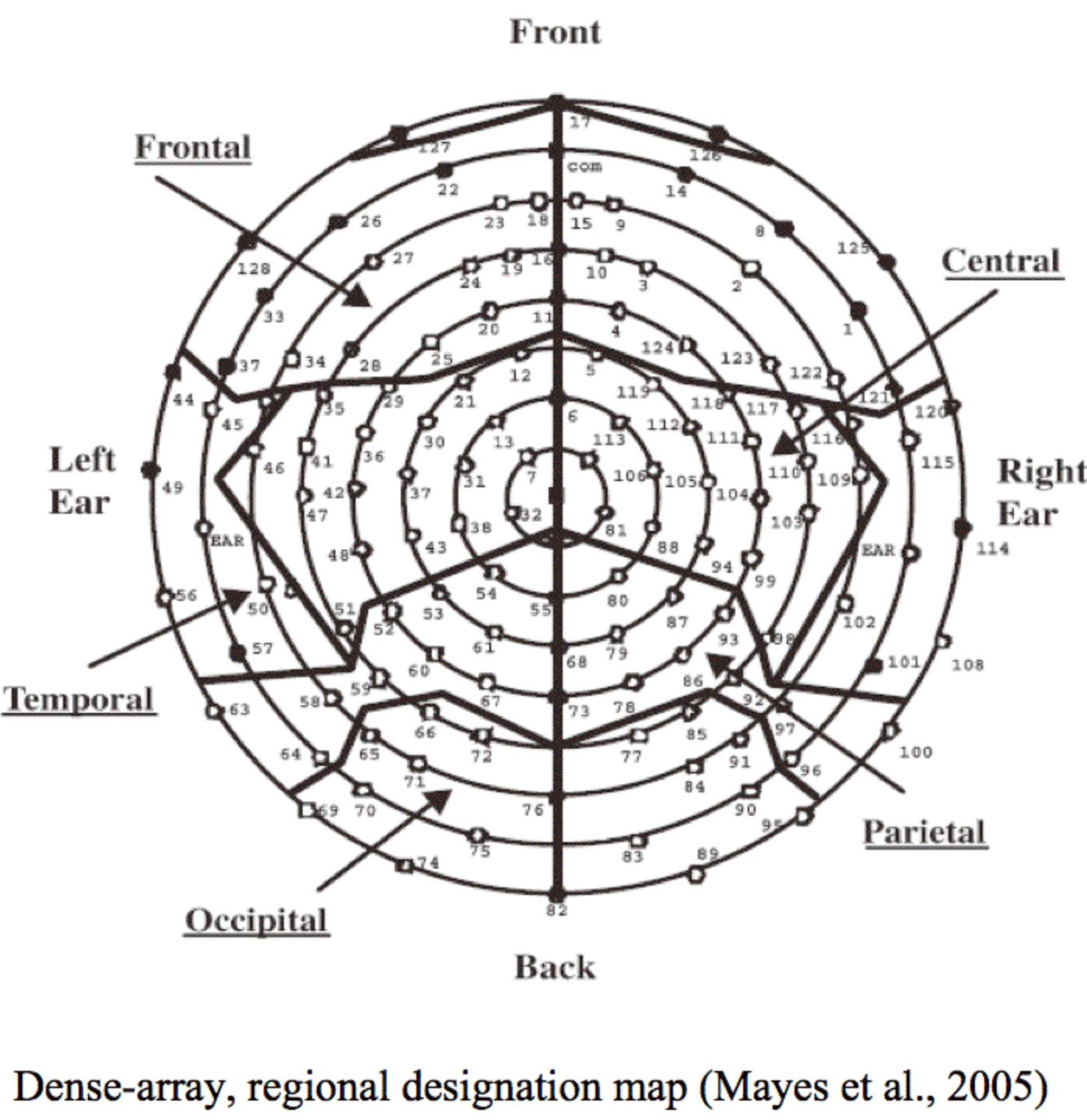
- 128-electrode, dense array nets recorded electrical activity using an EGI platform.
- Infant faces and cries were intermixed and presented in randomized succession with brief intervals.
- Conditions: high distress cries, low distress cries, pink noise (not reported), happy, sad, and neutral faces.
- Instructions were given to make a button-press response, judging whether the stimuli were the same or different from the one prior.

Presentation



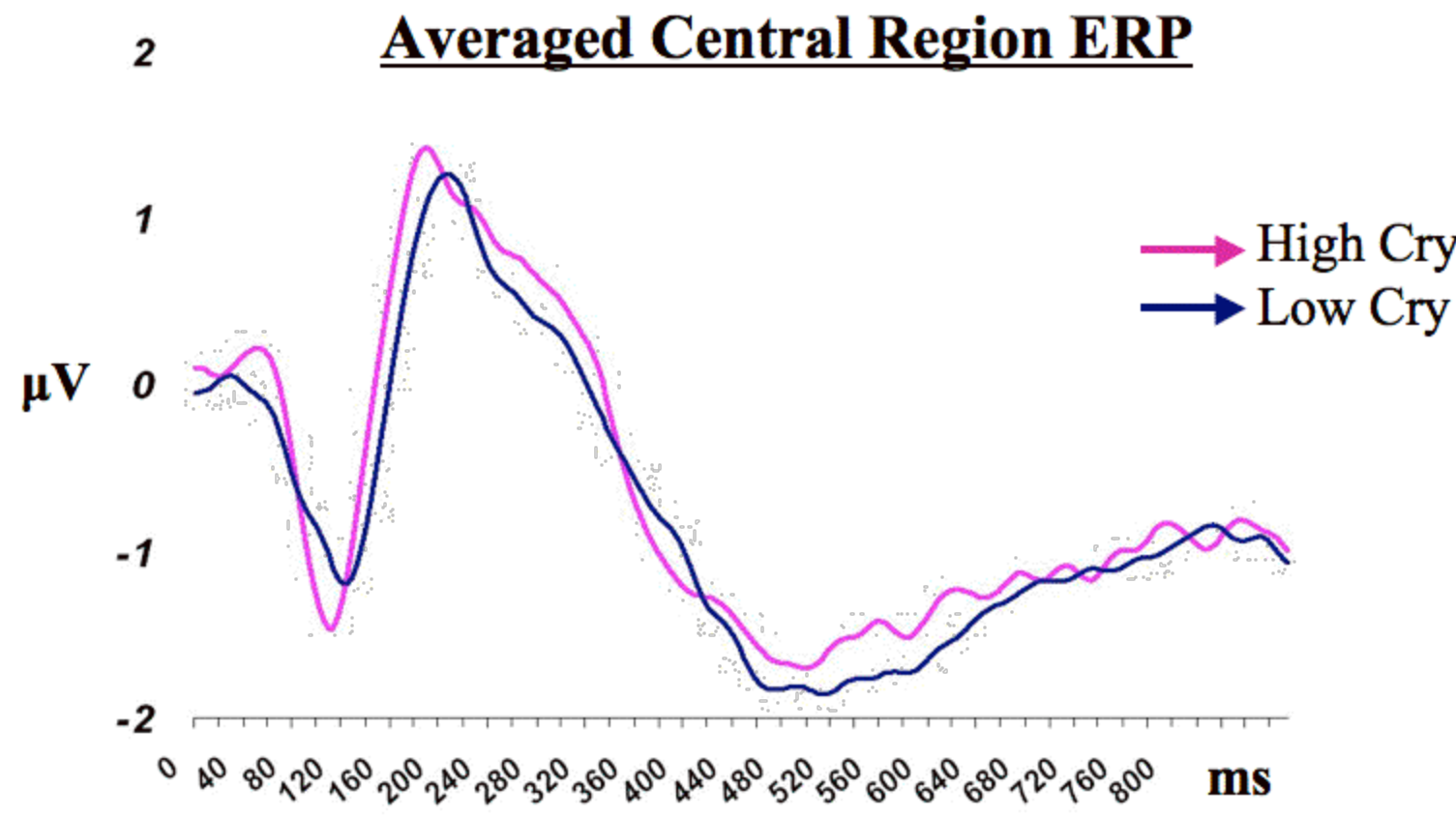
Analysis

- Grand averaged EEG data was processed using a combined PCA and visual peak assessment.
- PCA: Recorded waveforms were converted into factor scores, which were analyzed to determine the characteristic temporal window for each component.
- The factor loading scores of relevant ERP components were analyzed using a within-subjects, repeated measures ANOVA, applying the Greenhouse-Geisser correction with pairwise comparison post hoc analyses for significant findings (significance < 0.05).



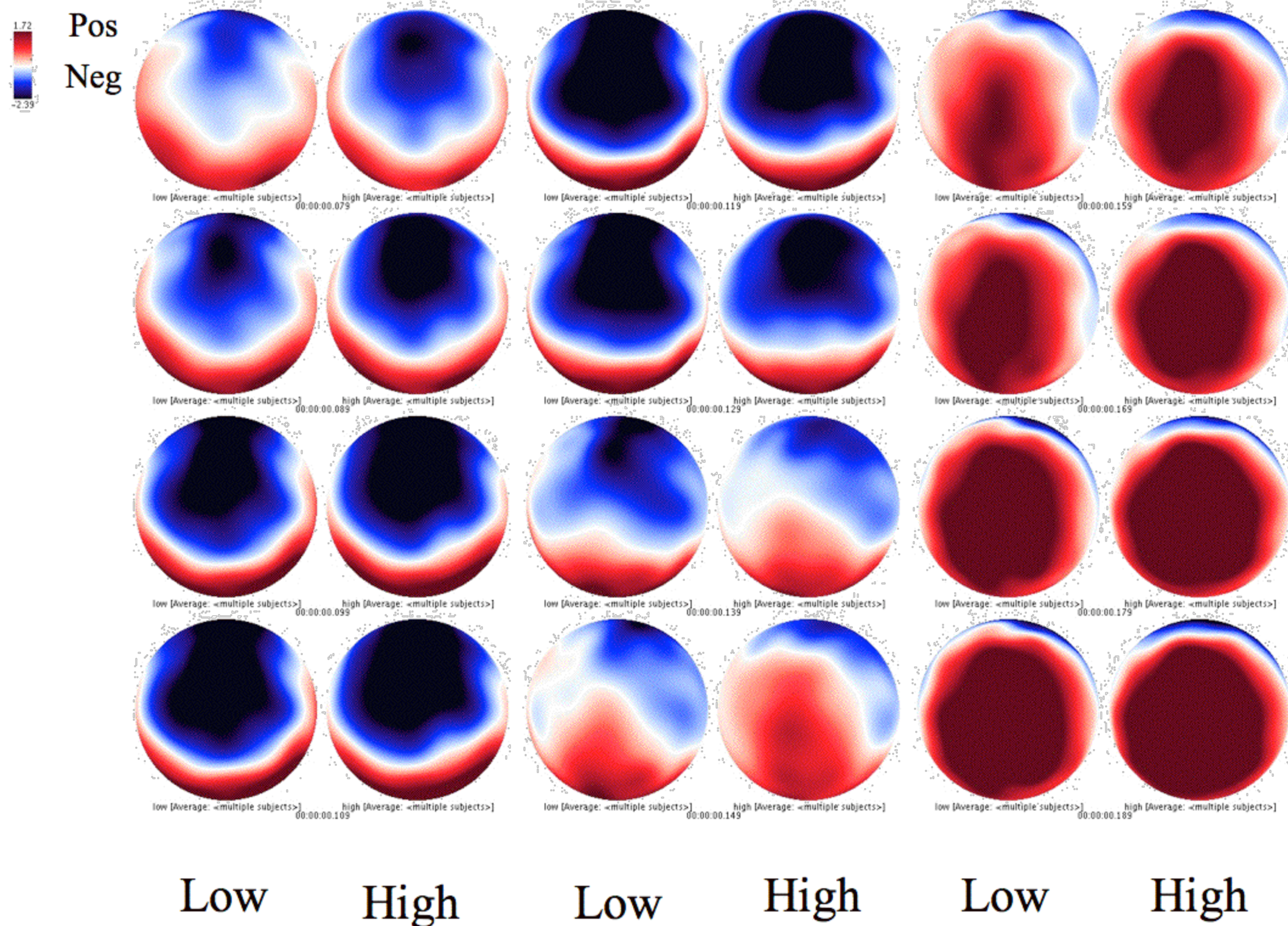
Results: Cries

Only 2 previous ERP studies have been conducted regarding infant cries (Purhonen et al., 2001; 2008). Consistent with these findings, we found a significant N1 effect in central region electrodes and evidence of a P2 ERP was also present (shown below). PCA revealed 15 factors accounted for 96.66% of the total variance.



Significant condition differences for the N1: factor 6 (72-132ms), $F(1,19) = 4.216$ ($p = 0.054$) and P2: factor 5 (116-206ms), $F(1,19) = 14.196$ ($p = 0.001$)

Pairwise comparisons revealed a significant condition difference in response to high cries, showing an earlier and more negative amplitude than low cries at the N1 peak and an earlier, more positive P2 peak.

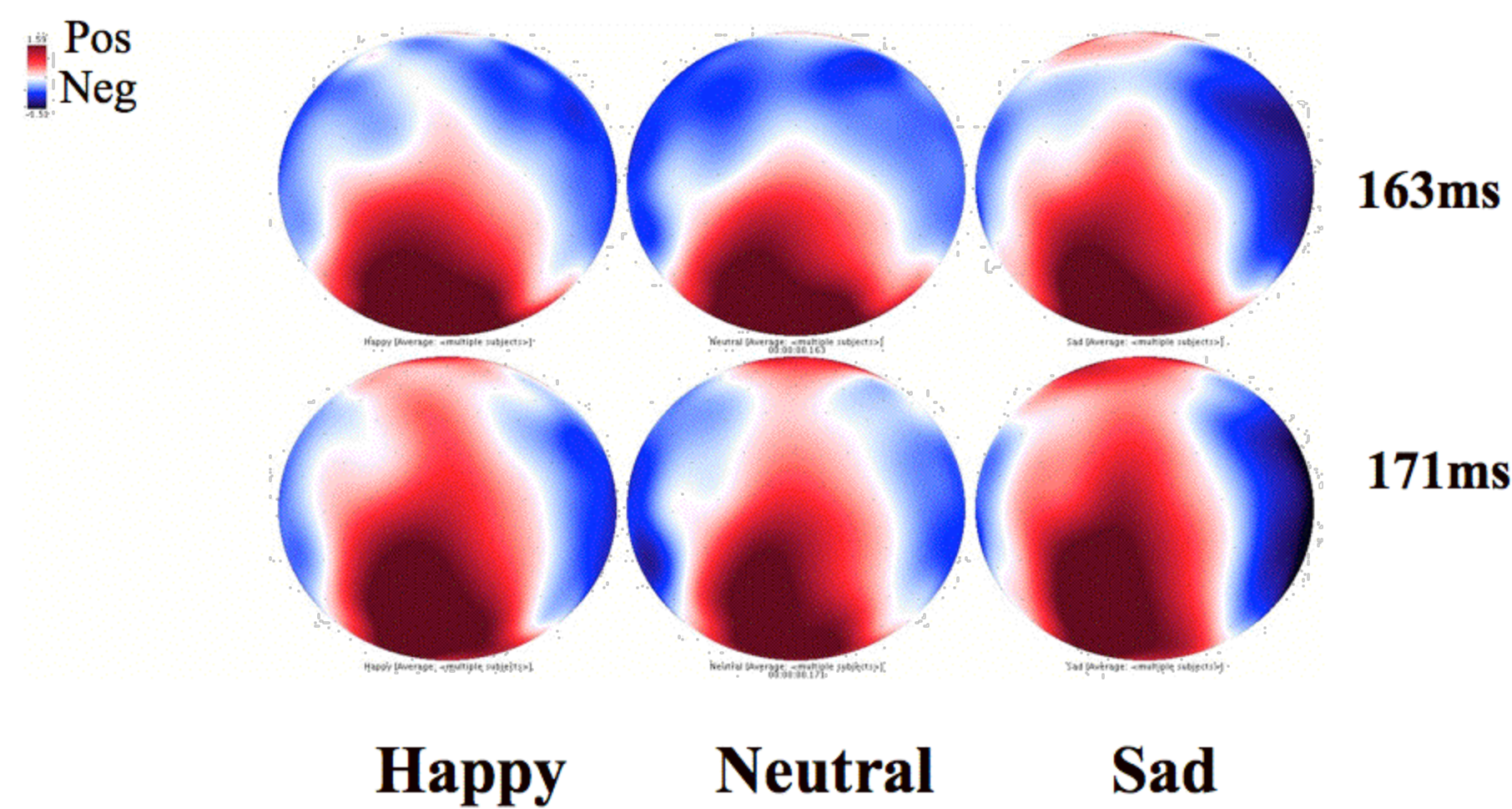
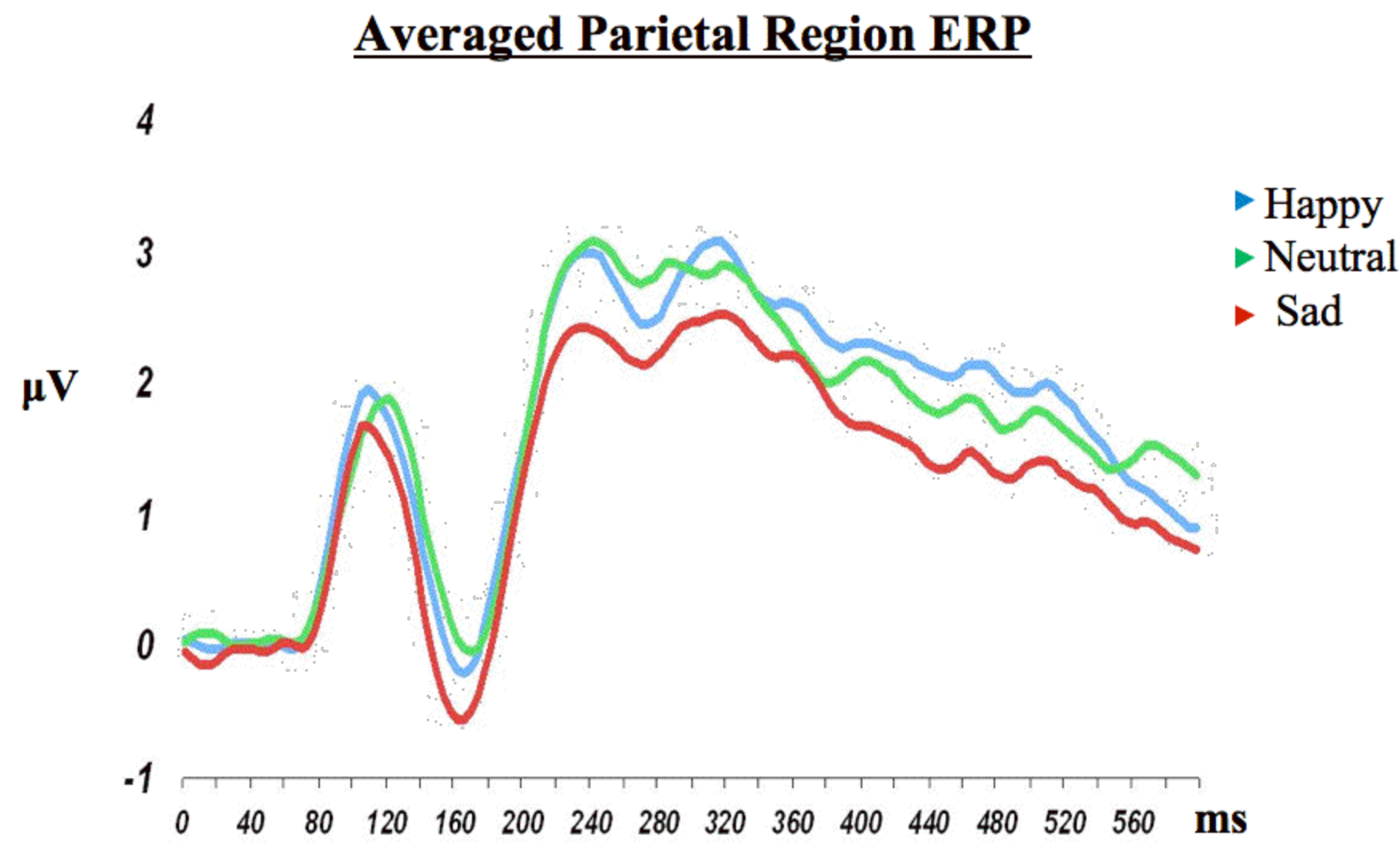


Topo Map: Progression from a pattern of central negativity at 79 ms through the positive ERP rebound at 189 ms.

Results: Faces

The N170/160 ERP component has previously been associated with response to faces (Proverbio et al., 2006) and some have argued its relation to emotional processing. Significant condition by hemisphere effects were found in a cluster of occipito- and temporo-parietal electrodes (shown below).

11 factors accounted for 95.521% of the total variance
Significant condition by hemisphere (right) effects for the N170/160 component: factor 4 (136-192ms), $F(2,34) = 10.203$ ($p = 0.000$)



Topo Map: Visual representation of significant pairwise comparison findings. Sad faces elicited a more negative ERP compared with happy and neutral faces. Happy faces elicited a more negative amplitude than neutral.

Conclusions

- Our affective infant cry stimuli elicited the N1 component in central channels, consistent with previous research which employed comparable stimuli, and a central P2 component was also discovered, consistent with prior ERP findings of its association with auditory stimuli (Chen et al., 2008).
- Our affective infant face stimuli elicited the N170/160 component in temporo-parietal and occipito-parietal channels. These electrodes also displayed a condition effect in right hemisphere, significant for happy and sad compared with neutral and also between happy and sad conditions.
- Ongoing research is examining maternal response to infant cries and affective images in cocaine addicted and non-addicted moms.

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