Human Facial Perception of Primates Through ERP Measurement

Abigail West[1], Dr. Charisse B. Pickron[2]

[1]Department of Psychology, University of Minnesota, Twin Cities

[2]Institute of Child Development, University of Minnesota, Twin Cities

Background

- Humans are far more adept at recognizing human faces when compared to non-human primates[1].
- Perceptual research spanning across non-human primate species is limited.
- We utilized EEG technology to compare the amplitude and latency of the P1 and N170 components in adults when exposed to chimp, macaque, and human faces.

Central Research Question

- This research evaluates whether adult humans will demonstrate similar face processing expertise for non-human primate faces
- Hypothesis: Adult humans would show an inversion effect for both human and chimp faces, but not macaque faces.

Methodology

- 38 participants (mean age = 19.4 years)
- Photos of human, chimpanzee, and macaques were used (50 per species).
- Human faces included three different races
- Face images were presented via E-Prime.
- Participants saw 600 faces total, divided into eight blocks
- Faces each displayed on the screen for 1000 ms (ITI was jittered).
- Participants wore a 64-channel ANT Neuro Waveguard™ Net[3]
- Data was processed through MATLAB[7]
- Four 2x2x3 ANOVAs were conducted for the P1 and N170 amplitudes and latencies using R[5].

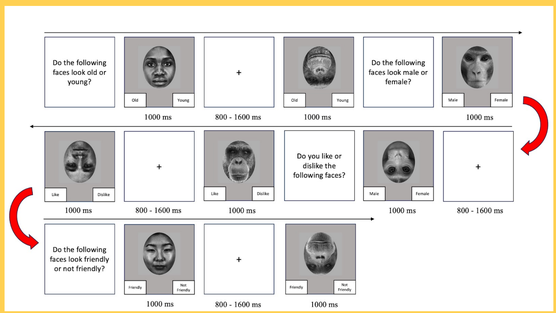

Fig 1. Experimental Procedure. Flowchart of experimental procedure showing different instructions, timing, and faces

Results

P1 Component

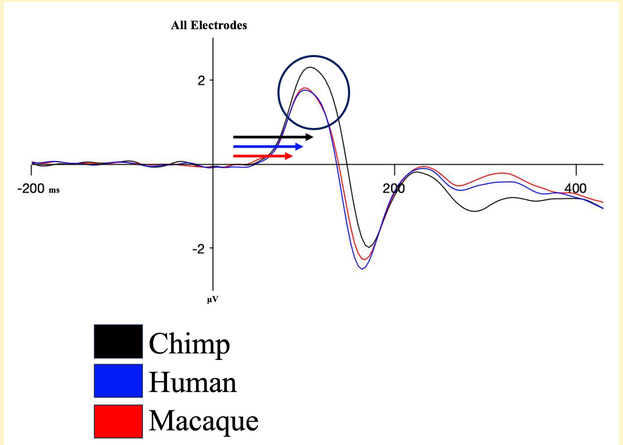

Fig 2. P1 Amplitude and Latency. P1 amplitude and latency effects shown by species. Chimps had a significantly higher amplitude.

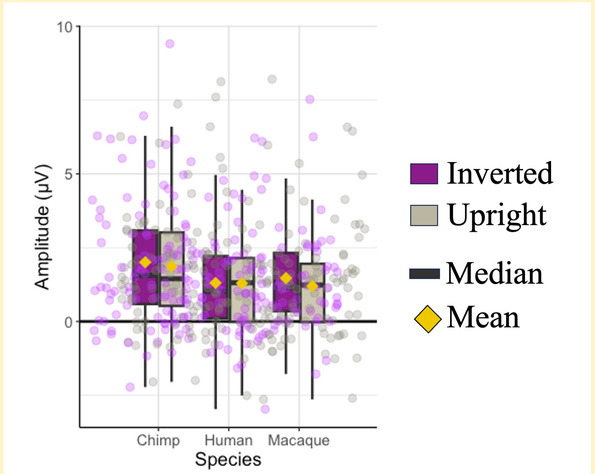

Fig 3. Boxplot of P1 Amplitude Values. Boxplot of P1 amplitude with mean and median shown. Participant values are represented by the points on the plot.

N170 Component

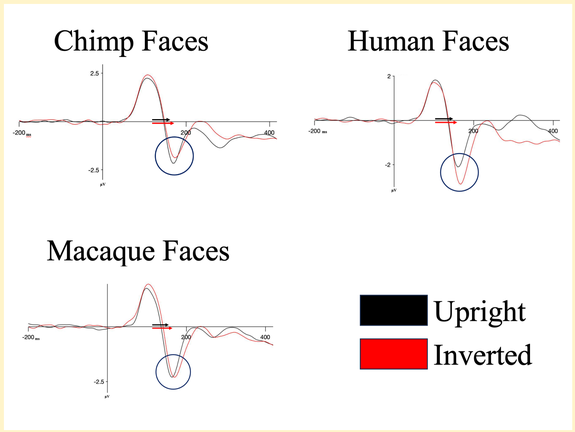

Fig 4. N170 Amplitude and Latency. Human, chimp, and macaque face plots. Upright faces demonstrated shorter latent periods.

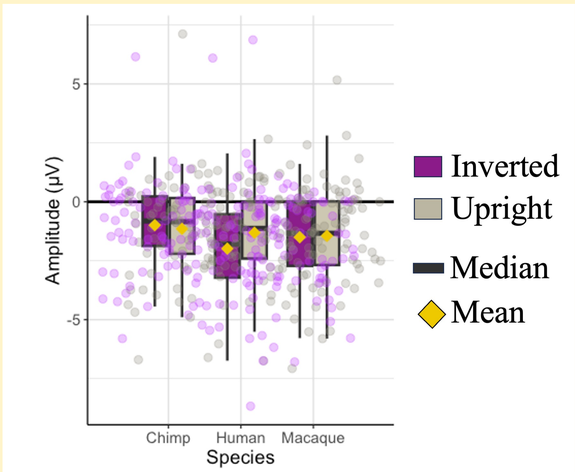

Fig 5. Boxplot of N170 Amplitude Values. Boxplot of N170 amplitude. Participant values are represented by the points on the plot.

Discussion

- Macaque faces reflected a faster P1 latency
- Chimp faces showed a faster N170 latency.
- P1 = Larger amplitudes for chimp faces
- N170 = Larger amplitudes for human faces
- Human face trials demonstrated a larger N170 amplitude for inverted faces.
- Chimp and macaque faces did not have an inversion effect.
  - Chimp faces had a larger N170 amplitude for upright faces
- The orientation effects from this data are consistent with findings in previous N170 inversion effect research.
  - Inverted human faces exhibit larger N170 amplitudes and longer latencies[6].
  - Inverted animal faces will only have an effect on N170 latency[6].

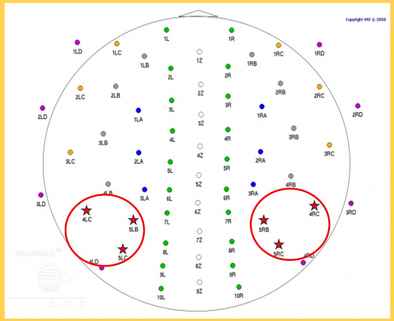

Fig 6. Electrode Map. ANT Neuro electrode map with specific channels used in data analysis circled

Conclusion

- Large N170 amplitude for humans aligns with other animal/human facial research[6]
- Large P1 amplitude for chimps could be because chimp stimuli were perceived as more threatening than other stimuli
  - P1 enhances when viewing threatening or fearful faces[9]
- Slow latency for human faces could be due to an effect caused by the racial distribution of faces used.
  - Research indicates that other-race faces are processed slower[2, 4]
- Overall, results didn't indicate evolutionary influences of facial perception
- More research needs to be conducted on these topics to fully understand the effect of species on face perception

References

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