Let’s Face It—N170 Rules: Temporal Processing of Facial Features in the Brain Using Event-Related Potentials

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Introduction: The Purpose of Replication

- The reproducibility of experiments is a fundamental part of the scientific method (1), necessary to draw reliable and generalizable conclusions about data. However, with the rapid increase of new research, scholars have discovered that many scientific studies are nearly impossible to reproduce (2). In the year 2010 (3), this controversial phenomenon was coined the Replication Crisis.
- The field of psychology has been at the center of the controversy. In 2015, Open Science Collaboration estimated that only 36% of 100 replicated studies in psychological science showed significant findings, compared to 97% significance found by the original studies (4).
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Significance: This study reveals that the human brain has a higher processing power for identifying human faces. Even objects like a car, which could be said to have human-like features, are not processed in the same way.

Procedure:
- Chosen at random by the computer, one of the four images is presented for 300 ms
- After participant response (click one button for face, other button for car), a black screen with white dot is presented for a random time between 1100-1300 ms
- Then the next image chosen at random is presented for 300 ms
- Then the black screen with white dot for 1100-1300 ms
- The process continues... for a total of 43 trials/block, 8 blocks total.
- Each participant views a total of 40 faces, 40 cars, 40 scrambled faces, 40 scrambled cars in the end, and ERPs are averaged.

Results: Observing N170

Conclusion: In the FFA, represented here by three Temporal-Parietal electrodes, a negative-going peak was observed between 140-200 ms. This means that when a face was presented, facial processing in the brain occurred ~170 ms later.

Waves for cars, scrambled faces, and scrambled cars did not follow this waveform trend. This means that the brain does not process objects (i.e., cars) or textures (i.e., scrambled images) in the same way that it processes faces.

Therefore, my study using 4 participants was a successful replication of previous research.

Application: This research can give better understanding of diseases, birth defects, and injuries that cause abnormal or inhibited facial recognition in people. It can also give us insight into our daily processing in human interaction and communication. In the context of learning and education, interventions and curriculum can be designed with the salience of human faces in mind to make information and instruction more memorable for students of all ages.

Future Research: A similar study with focus on the processing of objects in the PPA. Then, further investigations of the neural connections and processing relationships between the IFJ and both FFA and PPA.

References
(1) Stadd, John (2017) Scientific Method: How science works, fails to work or pretend to work. Taylor and Francis.