Investigating the automaticity of face learning from exposure to multiple images using fast periodic visual stimulation (FPVS)

Sara Verosky, Megan Beehler, Skye Slade, Asa Bry, Alvaro Barquero Rodriguez, Waka Shimada, & Rohini Bharat
Department of Psychology, Oberlin College

Background

- People are better at recognizing familiar vs. unfamiliar faces (Johnston & Edmonds, 2009)
- This effect is pronounced when using images in real-world settings (ambient images) (Oruc et al., 2019) (Jenkins et al., 2011)
- Face learning is improved by using variable images of a person's face (Andrews et al., 2017; Koca & Oriet, 2023)
  - Suggests that learning to recognize a face across different settings is important for face learning

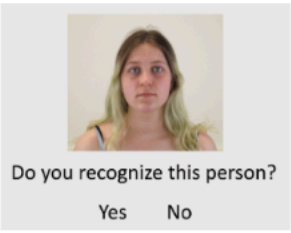
Will brief and passive exposure to faces influence neural responses to facial identity measured with FPVS?

Methods

12 possible base, 48 possible oddball identities

oberlin students submitted 40 candid photos

- Recognized identities were not used.



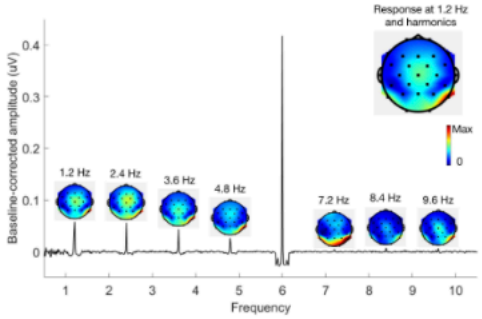
- This experiment utilized Fast Periodic Visual Stimulation (FPVS), with images shown at a rate of 6 Hz.
- *This experiment utilized the Oddball Paradigm, with every fifth face being a different identity from the base face.*
  - *Oddball identities were shown at a rate of 1.2 Hz. (6 Hz/5=1.2 Hz)*

FPVS Task Design

- Two trials for each of 8 base identities, Learn 1 and Learn 2.
  - Learn 1: 16 images of base identity; 4 oddball identities.
  - Learn 2: 16 new images of base identity; 4 new oddball identities.
- Each individual image shown 21 times during a run.
- Data recorded from 32 electrodes (Brain Products GmbH, Germany)
- Participants instructed to attend to a red fixation cross in the center of the screen and press a button when the cross turned blue at random intervals.
  - *Participants were never instructed to attend to the faces.*

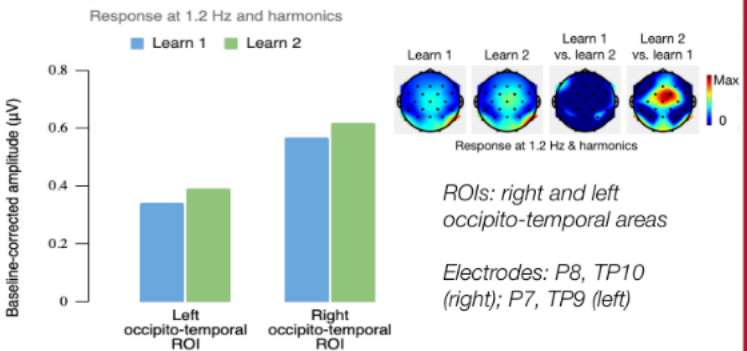
Results

Oddball response at 1.2 Hz and significant harmonics



*The response at 6Hz is not included in the sum because it is confounded with the presentation frequency

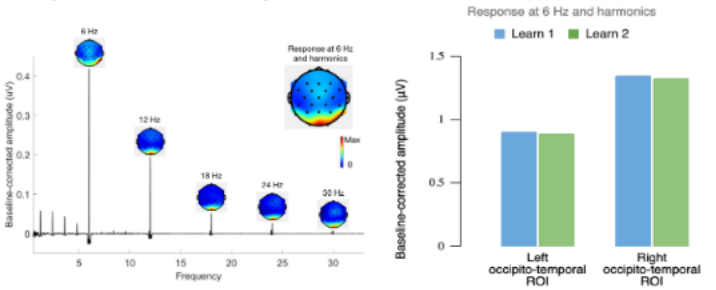
Response at 1.2 Hz increases from Learn 1 to Learn 2



ROIs: right and left occipito-temporal areas

Electrodes: P8, TP10 (right); P7, TP9 (left)

Response at 6 Hz stays the same from Learn 1 to Learn 2



- *Slight decrease in right and left occipito-temporal ROIs at 6 Hz from trial 1 to trial 2, but this effect was not significant*

Behavioral results

- Accuracy on fixation cross task increased fro learn 1 to learn 2 (even though the task didn't involve facial recognition)
  - If face learning was due to increased attention, opposite effect would occur

Discussion

As expected, participants displayed a general visual response at 6 Hz across trials.

- Interestingly, the 6 Hz response only numerically decreased across trials; the change in amplitude was not significant

Participants displayed increased oddball response at 1.2 Hz from trial 1 to trial 2

- *Participants passively learned to recognize the base identity from repeated exposure to ambient images*