The Difference in Behavioral and ERP Responses to Static and Dynamic Facial Expression Portraying Threat

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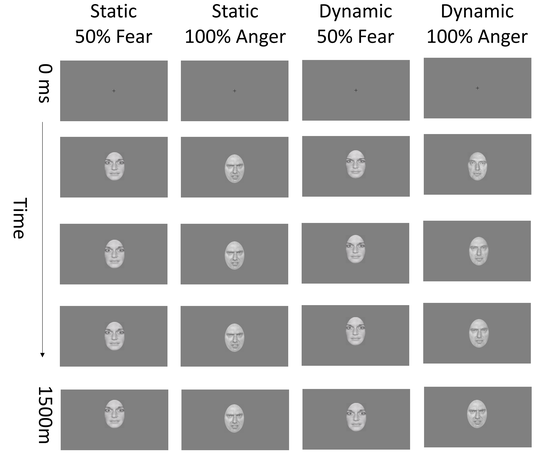
Introduction

The movement of facial muscles impacts the perception of emotional intensity (Tessier, Gingras, Robitaille, Jackson, 2019). This view of the perception of emotional intensity is derived from the idea that as more facial features become active the stronger the emotion someone is portraying. Therefore, a specific sequence facial feature movements yields the highest ratings for measures of realism (Tessier, et al., 2019). The dynamic perception of expressive features recruits specialized processing resources to direct appropriate actions in response to observed sequences in facial motion (LaBar, Crupain, Voyvodic, & McCarthy, 2003). This system includes the amygdala, which is activated in fMRI studies (LaBar, et al., 2003) and amygdala lesions alter expression identification (Adolphs, Tranel, Damasio, & Damasio, 1994). Two experiments were conducted to compare the behavioral and brain responses to static and dynamic facial expressions portraying threat (fear and anger). Experiment 1 assessed the differences in subjective perception of emotional intensity for static and dynamic facial expressions. Experiment 2 assessed the differences in brain responses elicited by the same facial expressions. Previous neuroimaging studies have demonstrated differences in neural response to static and dynamic presentation of facial expressions (LaBar, et al., 2003), but have not investigated whether these differences lead to changes in subjective perception.

Experiment 1

- 28 (14 Females; M=19.89 years old, SD=1.34) undergraduate Keene State College students participated in this study.
- Participants completed two emotional rating tasks.
  - One hundred and eighty static stimuli were presented with fear, anger, & neutral facial expressions
  - Ninety dynamic stimuli were presented that changed from neutral to either a fear or anger facial expression.
  - Participants rated how intense the facial expression was based on a 0-9 scale (0 = neutral, 9 = very intense).
  - Order of tasks (fear or anger) was randomized for each participant
  - The facial stimulus was used from the Ekman series (Ekman and Friesen, 1976; Matsumoto and Ekman, 1989).



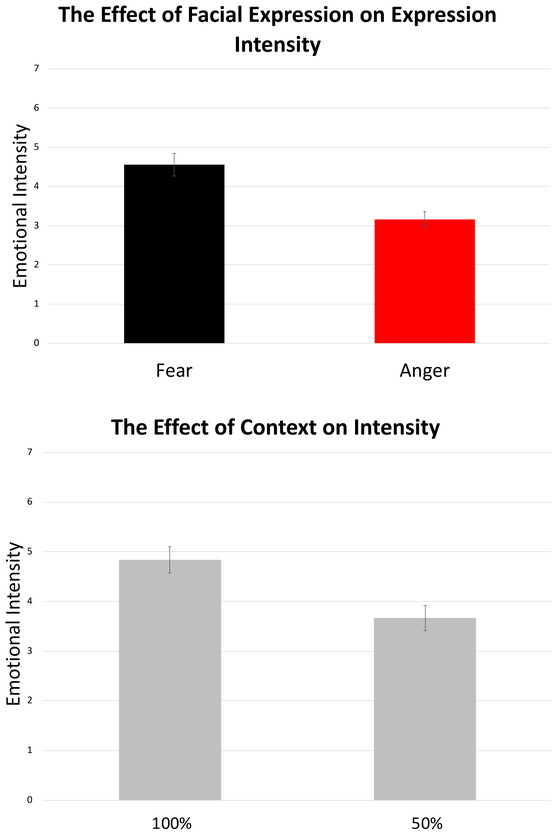
Discussion

In this experiment we looked at facial expression, emotional expressiveness and stimulus movement on rating of emotional intensity.

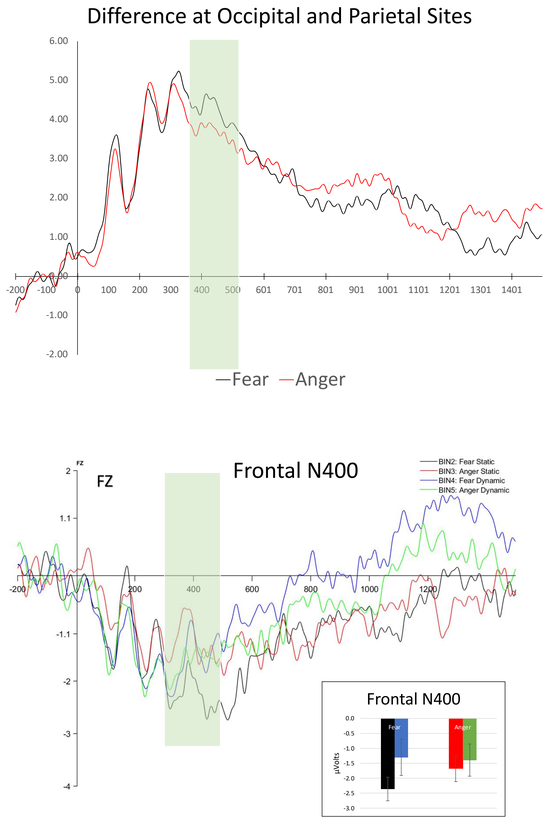
- Demonstrating the validity of our dependent measure participants rated 100% intensity expressions higher than 50% intensity expressions.
- Participants perceived fear expressions more intense then anger expressions suggesting increased sensitivity to ambiguous threats compared to direct threats.
- Participants perceived dynamic facial expressions more intensely then the static facial expression. However, this effect was based upon the gender of the participant.
  - Female participants perceived dynamic stimuli more intense then static, but male participants did not.
  - This suggests that there may be gender differences in the integration between the expression processing and visual motion processing systems in the brain.

Results

Experiment 1



Experiment 2



Experiment 2

- 18 (14 Females, 5 Males; M=21.7 years old, SD=5.27) undergraduate Keene State College students participated in this study.
- Participants completed one target detection tasks.
  - The task was composed of 15 block of fear and anger face stimuli which were randomized with in the task.
  - There is 270 trails with only one level of expressiveness (neutral, 50% and 100%).
  - Each stimuli type has 16 neutral, static, and dynamic stimuli for both facial expressions fear and anger showing both 6, 10, and none degrees presented in the task.
  - The facial stimulus was used from the Ekman series (Ekman and Friesen, 1976; Matsumoto and Ekman, 1989).
  - Order of tasks (blocks 1-15) was randomized for each participant

Discussion

In this experiment we looked at stimulus and electrode on ERP responses to emotional intensity.

- Participants EPR response to stimulus was larger than the electrode site.
  - For fear static there was a larger ERP response then for dynamic.
  - For anger there was no difference between static and dynamic.
  - For fear static there was a larger ERP response than for anger static.
  - For dynamic there was no difference between fear and anger.
- Participants ERP response to expression was larger across occipital and parietal sites.
  - There was a larger ERP response for fear then anger by expression

Overall Discussion

In these experiments we looked at expression, expressiveness, stimulus movement, stimulus type and electrode sites.

- The results indicate a significantly larger response to fearful faces then anger faces in both experiments.
  - In the first experiment participants rated fearful expression as more intense than anger faces.
  - In the first experiment participants perceived dynamic facial expressions more intensely the static facial expression (effected based on gender).
  - In the second experiment participants had a larger ERP response at the occipital and parietal site for the expression fear then anger.

References

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