Does hearing an emotion alter how we see emotion in a face and the corresponding physiological stress response?

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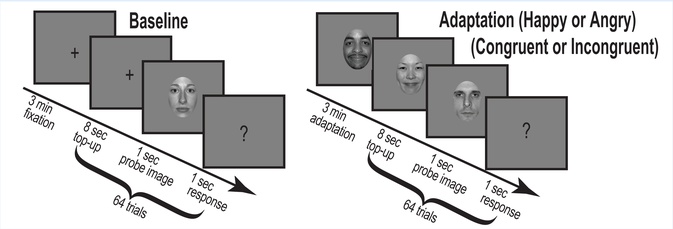
BACKGROUND

Faces convey a variety of important information such as gender, identity or emotional state. Much of this social information is provided in the exquisite detail of the visual features and visual statistics of a given face. However, our other senses can also convey important emotional information.

We used a face adaptation paradigm to examine how the seen emotion in a face is altered by a concurrent heard emotion, when visual and auditory information is congruent (angry faces and negative sounds or happy faces and positive sounds) versus incongruent (angry faces and positive sounds or happy faces and positive sounds). We quantified how the valence of emotional information across the senses alters (1) perception of each subject's emotionally neutral face and (2) the corresponding salivary cortisol stress response.

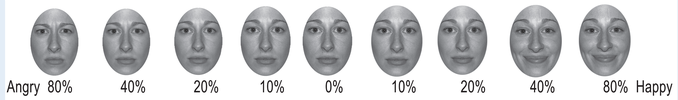
We predicted auditory emotional information would have the strongest influence on perceived visual emotional information when congruent, with a weaker influence when incongruent. We also predicted the strongest decrease in cortisol from the strongest positive emotions (congruent happy faces and positive sounds) and the weakest decrease in cortisol from the strongest negative emotions (congruent angry faces and negative sounds).

METHODS



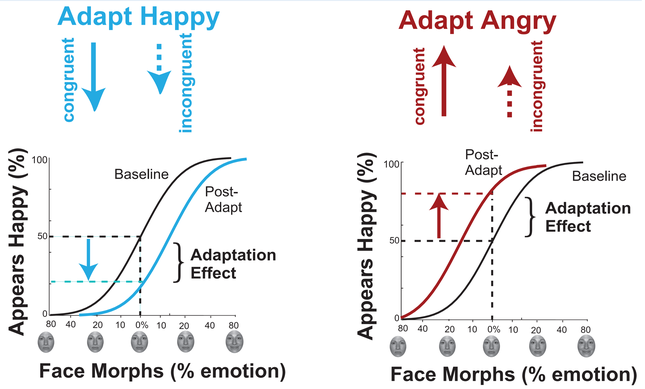
Participants viewed a series of morphed faces and rated faces as happy or angry in a 2-AFC button-press paradigm. Based on these responses, we established each participant's baseline point of subjective equality (PSE), where they perceived the face equally happy and angry. Then participants were adapted to a series of either 100% happy or 100% angry faces with a concurrent sound that was positive or negative, matching the emotional valence of the face (congruent) or the opposite emotional valence (incongruent). Following adaptation, participants viewed and rated the same morphed faces and we quantified the change in PSE. These methods were adapted from previous work (Ng, Ciaramitaro et. al., 2006).

Probe Stimuli



Face stimuli were selected from the NimStim database (Tottenham et al., 2009). Adaptation included 30 unique faces (15 female) either 100% happy or angry. Probe images included a subset of the adaptation faces, 8 unique faces (4 female), morphed along an emotional continuum of angry to neutral to happy (80%, 40%, 20% 10% or 0% of a given emotion). Auditory stimuli were non-linguistic crowd sounds, containing male and female voices.

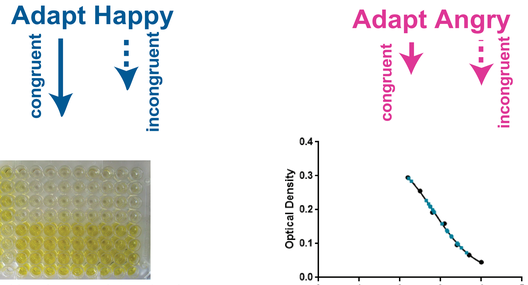
PREDICTIONS FOR BEHAVIOR



PSE at baseline is a 0% morph. After adaptation, the same morph appears 25% angrier.

PSE at baseline is a 0% morph. After adaptation, the same morph appears 25% happier.

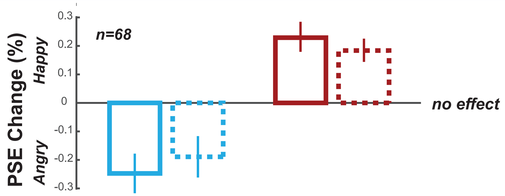
PREDICTIONS FOR CORTISOL



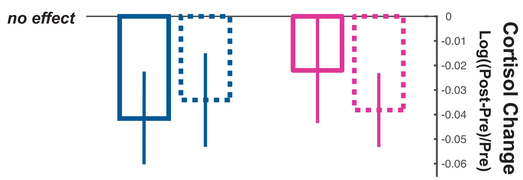
Cortisol levels were determined by measuring the intensity of transmitted light via spectroscopy. Color development was a by product of an enzymatic reaction. Higher color intensity indicate lower cortisol concentrations.

To quantity salivary cortisol:
(1) 7 known standards were measured and fit with a 4 parameter logistic function.
(2) unknown concentrations were determined by interpolation given known measures.

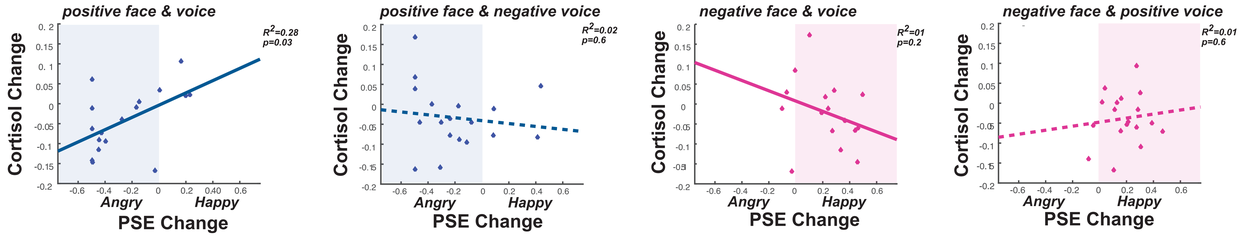
BEHAVIORAL RESULTS



CORTISOL RESULTS



BIOBEHAVIORAL CORRELATION



CONCLUSIONS

In a total of 68 participants, we assessed how emotional information can alter visual perceptual experience and the corresponding stress response.

1.We find a trend for the effects of adaptation to emotional information to be supramodal, such that aftereffects from exposure to emotion in a face are enhanced if the corresponding emotional sound has a matching emotional valence. These results are not due to adapting to individual face identity, as 30 unique adapting face images were used, nor do they rely on forming face-voice pairs, or the influence of word meaning as the emotional sound was a non-linguistic crowd sound.

2.We also find a trend for exposure to positive emotional information to lower cortisol levels more than exposure to negative emotional information.

3.The correlation we find between psychophsycial and physiological measures albeit weak, are suggestive that perceptual changes may be more dependent on the emotional content of visual information, while changes in the cortisol stress response may be more susceptible to the influence of emotional sounds. More research is needed to elucidate these influences and underlying mechanisms.

SAMPLE REFERENCES

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