

Nonlinear Processing of Emotional Information: behavioral evidence and neurophysiological correlates

ABSTRACT:

Background

Little is known about how continuously changing emotional expressions are perceived, but it has been hypothesized that specific characteristics of emotional processing can be profitably explored within the framework of the non-linear dynamic systems theory. Recent studies based on such framework report perceptive "jumps" when *continua* of morphed facial expressions of emotion are presented. Specifically, emotions displayed in the middle of the continua seem to be more frequently decoded accordingly to the initial emotion, being consistent with a Hysteresis effect.

Aim

In this study we further explore the non-linear properties of emotional processing and examine its EEG correlates.

Method

We developed six *continua* of 11 frames each, of morphed expressions between pairs of emotions (anger, fear, sadness, happiness). During an EEG recording session, 55 healthy participants observed these *continua*, from emotion X to Y, Y to X and in random order, and were asked to identify the emotion being presented in each frame.

Results

Behavioral data revealed a *remanence* effect, with participants still perceiving the initial emotion beyond the mid-point of the continua, resulting in perceptual bimodality of the morphed expressions that are in the vicinity of the turning point between emotional categories. Different N170 mean amplitudes were found for mid-point frames of the continua Anger-Sadness and Sadness-Happiness, while for Fear-Sadness such difference was found for the LPP of the frame-related brain potentials.

Conclusion

Results suggest a generalized hysteresis effect in the processing of facial expressions of emotion, and the same expression seems to induce different brain responses, depending on preceding stimuli.

Keywords

Emotions, Facial Expressions, Hysteresis, EEG, ERP

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