Enhanced Emotional Responses to Live Facial Expressions

Chun-Ting Hsu[1], Wataru Sato[1], Sakiko Yoshikawa[1]; Kokoro Research Center, Kyoto University

Background

- We investigated the difference in subjective perception and spontaneous facial mimicry when observing live vs. pre-recorded dynamic facial expressions.
- Facial expressions of emotion are indispensable communicative signals to create and maintain social relationships in real-life.
- The observation of emotional facial expressions automatically induce subjective and physiological responses (e.g., mimicking facial muscle activation and autonomic arousal)[1].
- Most of prior research presented pre-recorded photos or videos of facial expressions, which compromised the potential for "live" interactions, the generalizability and ecological validity of their results[2].

Research Questions

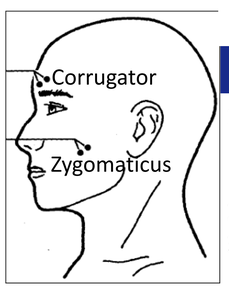
- Whether emotional responses (subjective feeling and spontaneous facial mimicry) is stronger when observing live vs. pre-recorded dynamic facial expressions.

Hypotheses

1. Watching Eyes Effects: genuine eye-contact increases arousal, captures attention, delivers the intention to communicate, and activates the Theory of Mind network[3, 4, 5].
2. Emotion Contagion: social attention, facial mimicry, emotion recognition and emotion contagion are closely associated. Previous studies have demonstrated that video of dynamic facial expressions enhanced facial mimicry and emotion contagion[6].
3. We propose that live interaction could be even more effective for emotion contagion.

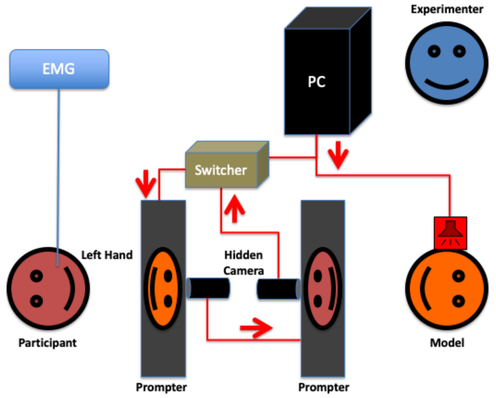
Subjects and Materials

- Subjects: 23 female adults. Mean age = 22.48 ± 2.27 years, ranged from 18 to 27.
- Two female models aged 20. Each model recorded 15 positive (smiling) and 15 negative (frowning) clips of dynamic facial expressions for the video trials.
- Facial Electromyogram (EMG) was recorded for Zygomaticus major (ZM, the muscle for smiling) and Corrugator superciili (CS, the muscle for frowning) via the BrainVision amplifier and recorder.

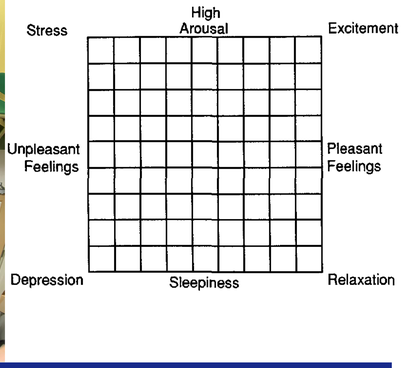


Contact: Chun-Ting Hsu
(hsuchunting@gmail.com)

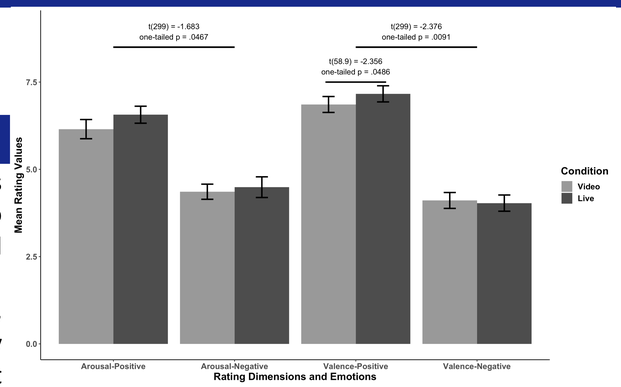
Paradigm for Live Interaction



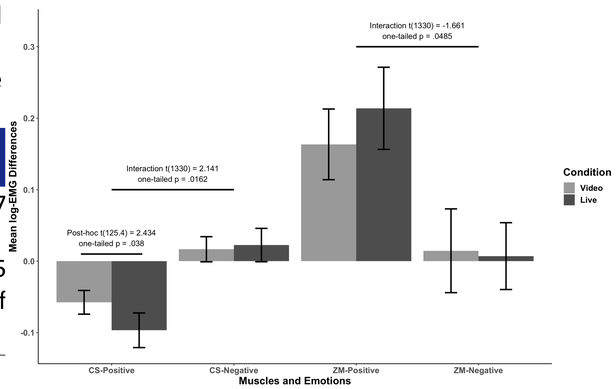
- 2-by-2 design:
  - Factor 1: Live - Video vs. Live
  - Factor 2: Emotion - Positive vs. Negative
- **Passive Viewing**: 15 trials per condition, totally 60 trials. EMG was recorded.
  - Instruction: real person or video, 1.25 s
  - Video or live expression: neutral expression for 1 s, dynamic expression change for 1 s, maximal expression for 1 s, totally 3 s
- **Rating**: 4 trials per condition, totally 16 trials
  - Instruction for 1.25 s
  - Video or live expression for 3 s
  - Affective Grid Ratings (Valence & Arousal)[7]



Results



- **Arousal Ratings**
  - Emotion: $t_{(23)} = 4.865$, $p < .001$
  - Live: $t_{(23)} = 1.628$, $p = .0586$
  - Interaction: $t_{(299)} = 1.683$, $p = .0467$
- **Valence Ratings**
  - Emotion: $t_{(23)} = 8.203$, $p < .001$
  - Interaction : $t_{(299)} = 2.376$, $p = .0095$
  - Post-hoc positive-live vs positive-video: $t_{(58.9)} = 2.356$, $p = .0486$



- **Corrugator superciili**
  - Emotion: $t_{(23)} = -3.043$, $p = .0029$
  - Interaction : $t_{(1330)} = -2.141$, $p = .0162$
  - Post-hoc positive-live vs positive-video: $t_{(34.8)} = -2.434$, $p = .038$
- **Zygomaticus major**
  - Emotion: $t_{(23)} = 2.16$, $p = .0258$
  - Interaction: $t_{(1330)} = 1.661$, $p = .0485$

Data Analysis

- EMG data preprocessing: notch filter around 60 Hz and the multitudes of 60 Hz, high-pass filter at 20 Hz and low-pass filter at 500 Hz. For each trial, the signal was detrended, baseline removed, and the absolute values were log-transformed.
- Linear Mixed Effects Models and model comparisons were performed in R (v 3.6.1) with the following packages: lmer4 1.1-21, lmerTest 3.1-1 and emmeans 1.4.4.
- Optimizer: BOBYQA
- Formula: Y ~ 1+emotion*live + (1+emotion+live | subject)
- Dependent variables (Y) included valence ratings, arousal ratings, difference between the neutral phase and maximal phase during dynamic facial expression observation of EMG measures of CS and ZM.
- Significant interactions were followed by post-hoc pairwise comparisons and corrected with the tukey method.

References

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Summary

1. Significant main effect of Emotion in rating and EMG data validated the pre-recorded and live stimuli in this study, and replicated previous results of spontaneous facial mimicry (enhanced ZM and relaxed CS activity in the positive conditions) when observing dynamic facial expression.
2. Participants are more aroused when they view live dynamic facial expressions.
3. Live factor significantly interacted with the Emotion effect. Smiling were rated as more arousing and more positive in live conditions. The interaction observed in CS was consisted of more relaxation in the Positive-Live than in the Positive-Video condition and more enhancement in the Negative-Live than in the Negative-Video condition. The interaction observed in ZM consisted of more contraction in the Positive-Live than in the Positive-Video condition.
4. Our hypothesis was supported that live interaction enhanced the effect of emotion contagion.

Acknowledgments

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