



Gender Differences in the Ability to Recognize Basic Emotions in Masked Faces

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Introduction

This study aims to investigate whether the facial occlusion caused by mask-wearing affects individuals' ability to recognize basic emotions, potentially leading to reduced sensitivity to emotional perception. Additionally, it explores whether **different emotional expressions** are affected differently by mask-wearing, and whether there are **gender differences** in recognition ability.

Literature Review

- **Basic Emotion Theory:**
 - **Happiness, disgust, fear, sadness, anger, and surprise** (Ekman, 1971).
 - Human Emotion Processing Theory: Visual facial features provide key signals for the rapid identification of basic emotions (Ekman, 1999).
 - Lower face – Disgust
 - Upper face – Fear, Sadness
 - Upper face (eye corners) + Lower face (mouth corners) – Happiness
- **Gender Differences:**
 - **Women** generally have **higher accuracy** in facial emotion recognition compared to men (Hall & Matsumoto, 2004; Thayer & Johnsen, 2000).
- **Mask Effect:**
 - Facial occlusion caused by masks led to an overall decline in emotion recognition accuracy. Disgust was the most affected emotion, followed by anger, sadness/neutral, surprise/happiness, and fear (McCrackin, et al., 2022).
- **Present Study:**
 - We replicated their research (McCrackin, et al., 2022). In addition, participant **gender** was included as a variable, and changes in **response time (RT)** were also examined.

Experimental Design

- **group(2) * gender(2) * emotion(4)**
 - **IV1 : group - mask / no mask (between)**
 - **IV2 : participant's gender - male / female (between)**
 - **IV3 : emotion -**
A : surprise , S : sad , D : disgust , H : happy (within)
 - **DV1 : Hu - unbiased hitting rate (Wagner, 1993)**
$$H_u = \frac{\text{(frequency of correct responses for a target emotion)}}{\text{(the number of stimuli representing)} \times \text{(the overall frequency of this category being chosen)}}$$
 - **DV2 : RT**

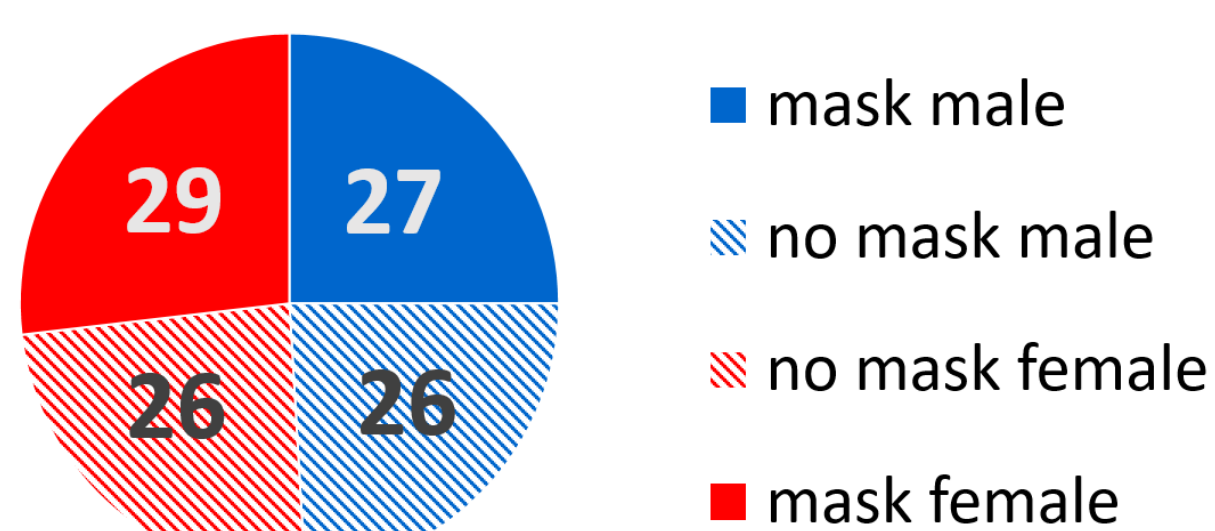
Materials

- **Facial images were generated using AI (Generated Photos) :**
 - Equal number of male and female faces
 - Asian facial features (matching participants' ethnicity)
 - Apparent age from 18 to 25 years (matching participants' age group)
 - All faces were front-facing with direct eye gaze
 - No obstructions or accessories on the face
- **Image Processing :**
 - grayscale
 - Pupil diameter was set to 0.5 cm, with facial images resized proportionally.
 - Masks were uniformly scaled, with a top width 12 times the pupil diameter.

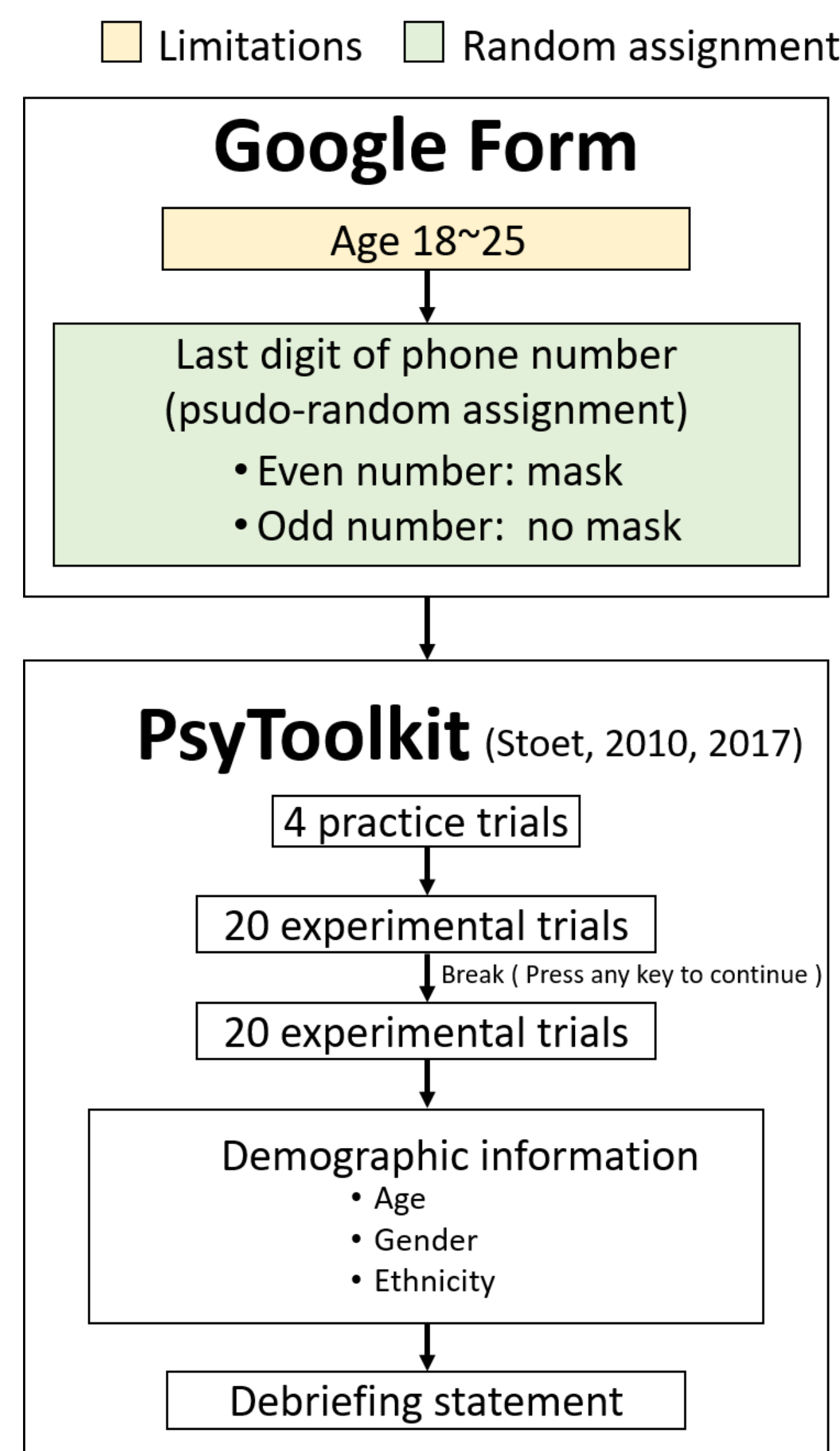


Participants

- **Initial sample:** 123 participants
- **Exclusion criteria:** >10% trials with RT < 600 ms or ≥ 5000 ms
- **Final sample:** 108 participants ($M = 20.5$, $SD = 1.78$ years, all Chinese ethnicity)
- **Exclusion rate:** 12%

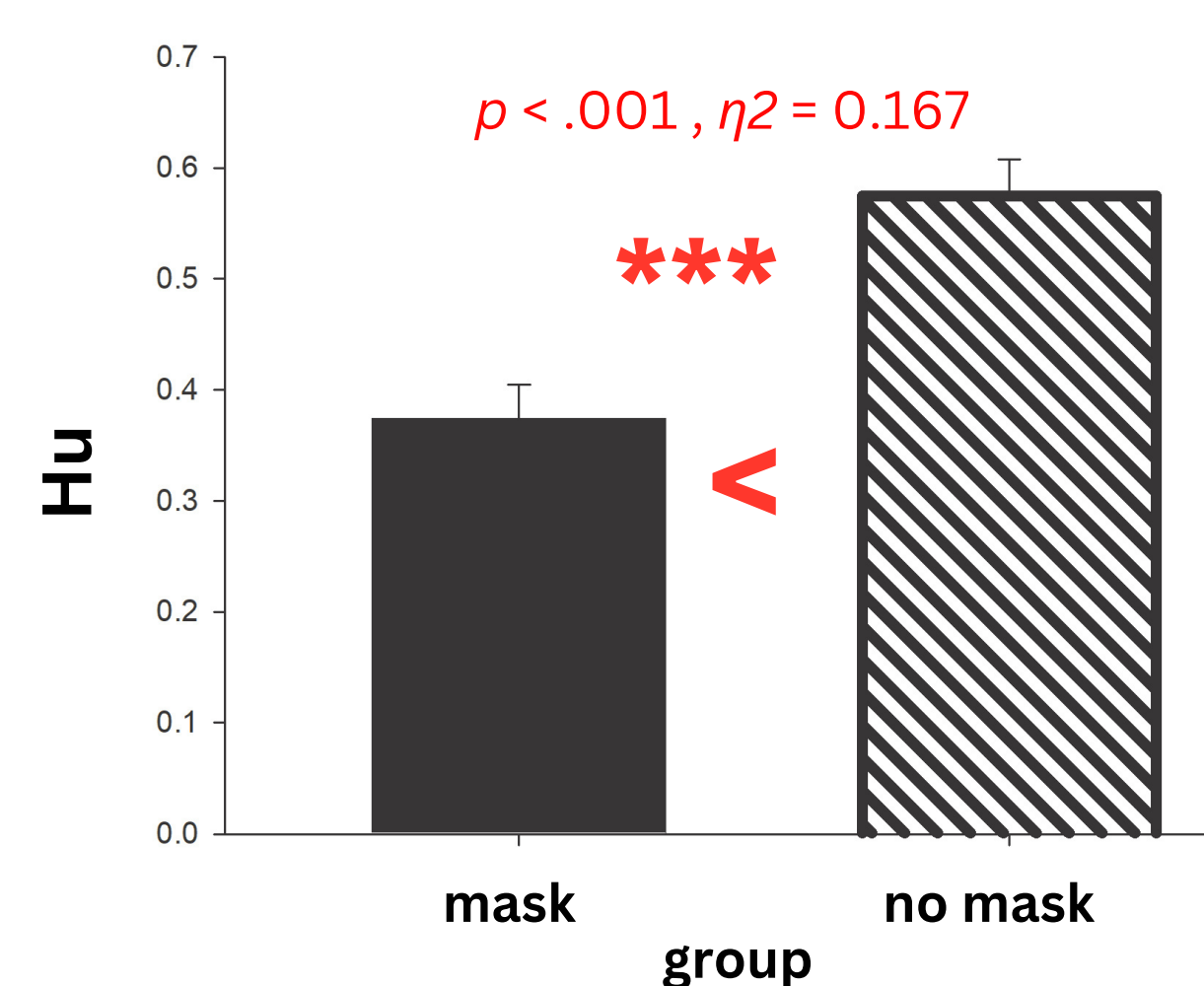


Procedure

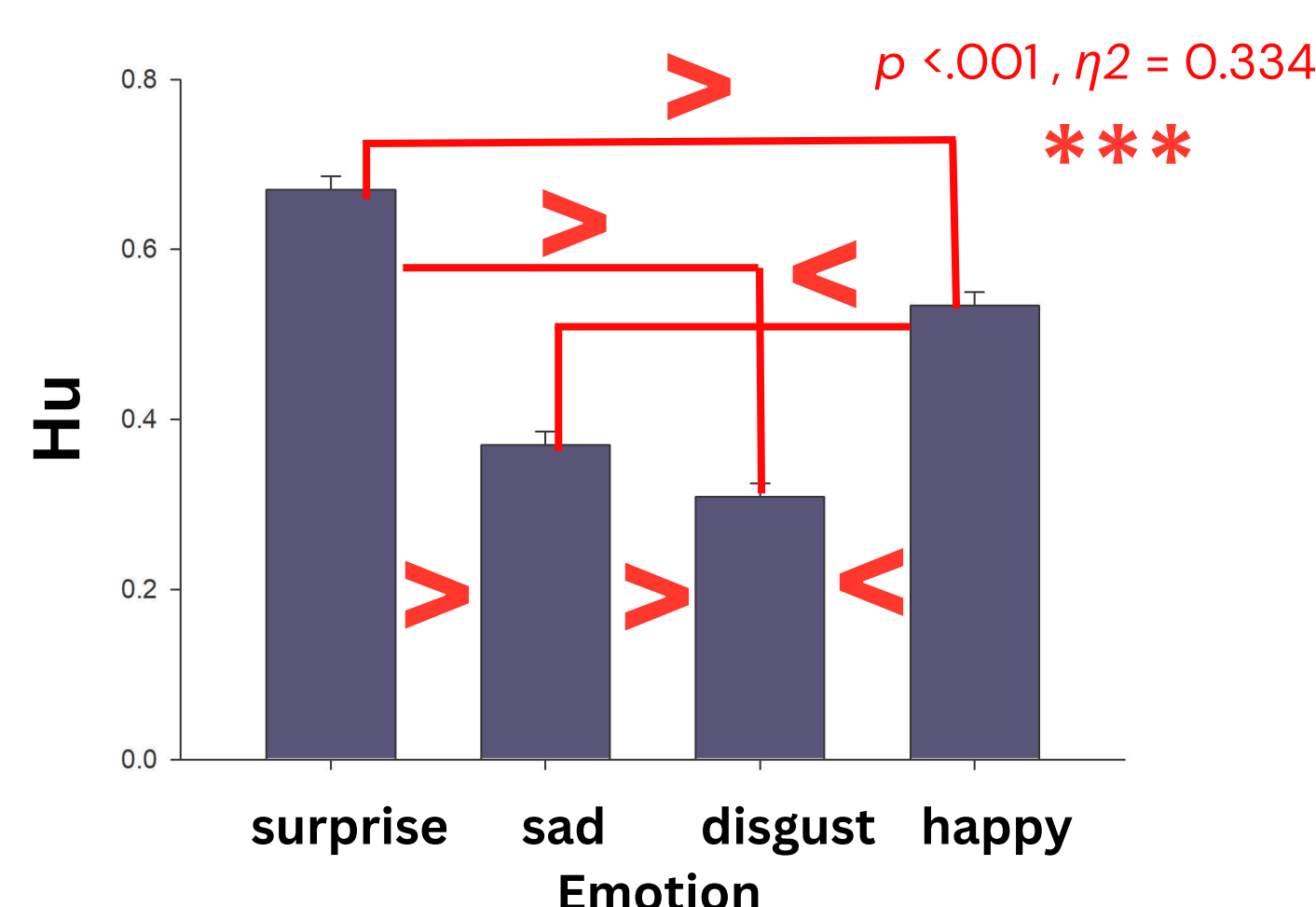


Result

Effect of Masks on Emotion Recognition Accuracy
replicate (McCrackin et al, 2022; Parada-Fernández et al, 2022)



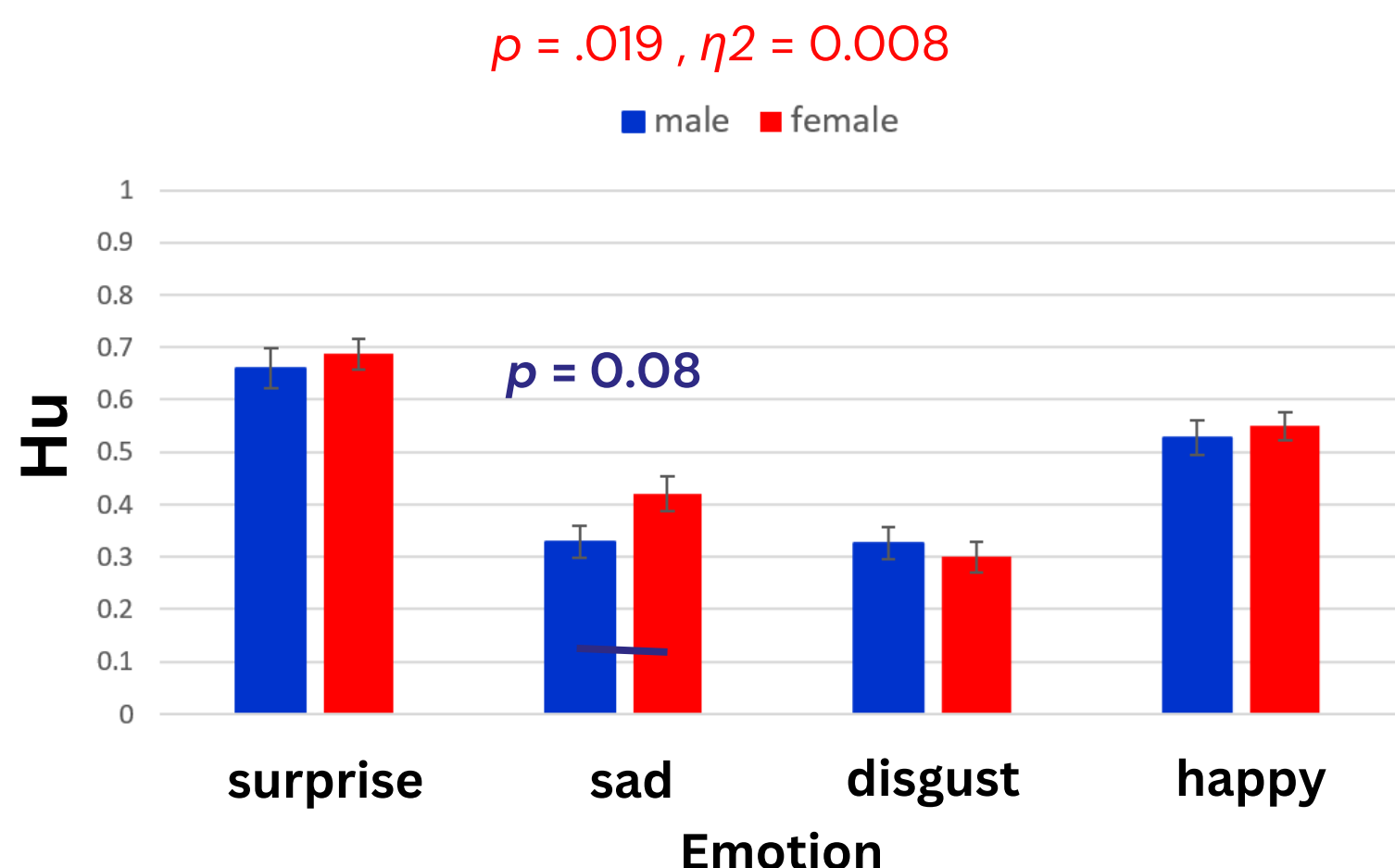
Recognition Accuracy Across Emotion Types



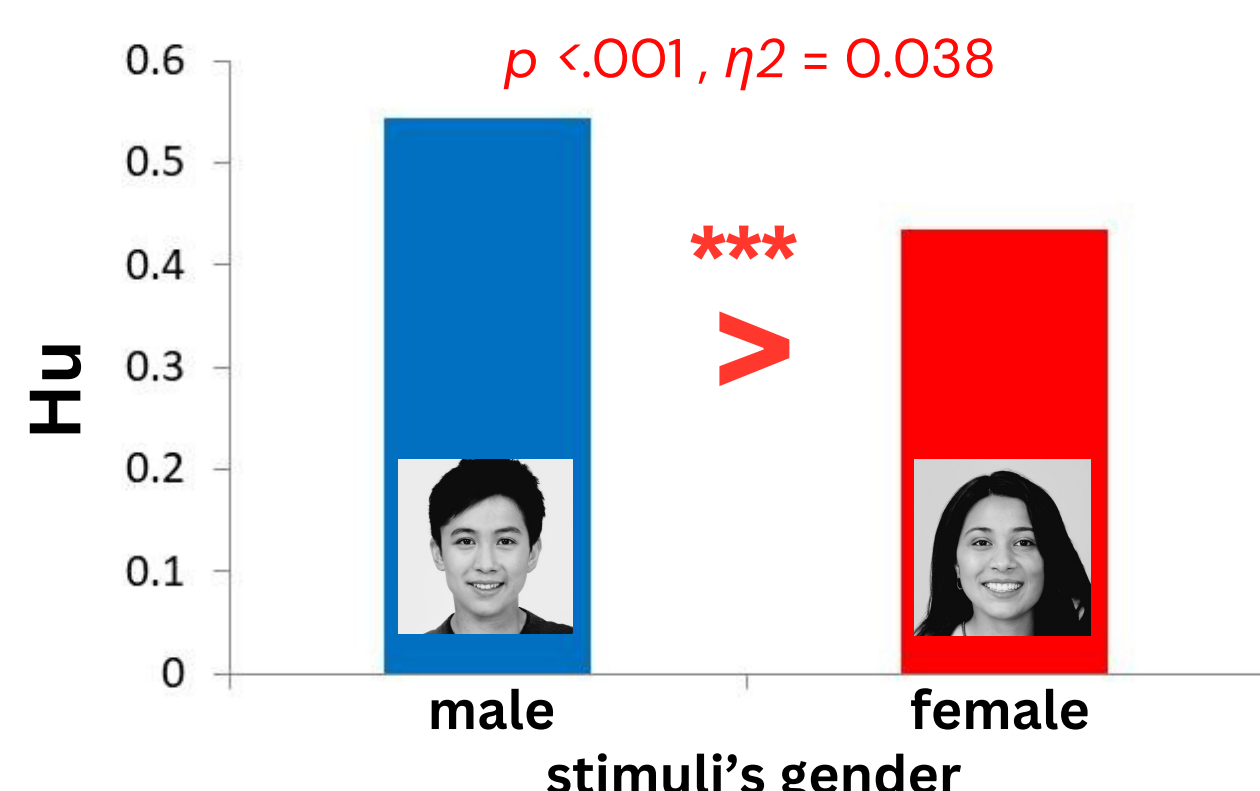
Interaction Between Mask and Emotion Type



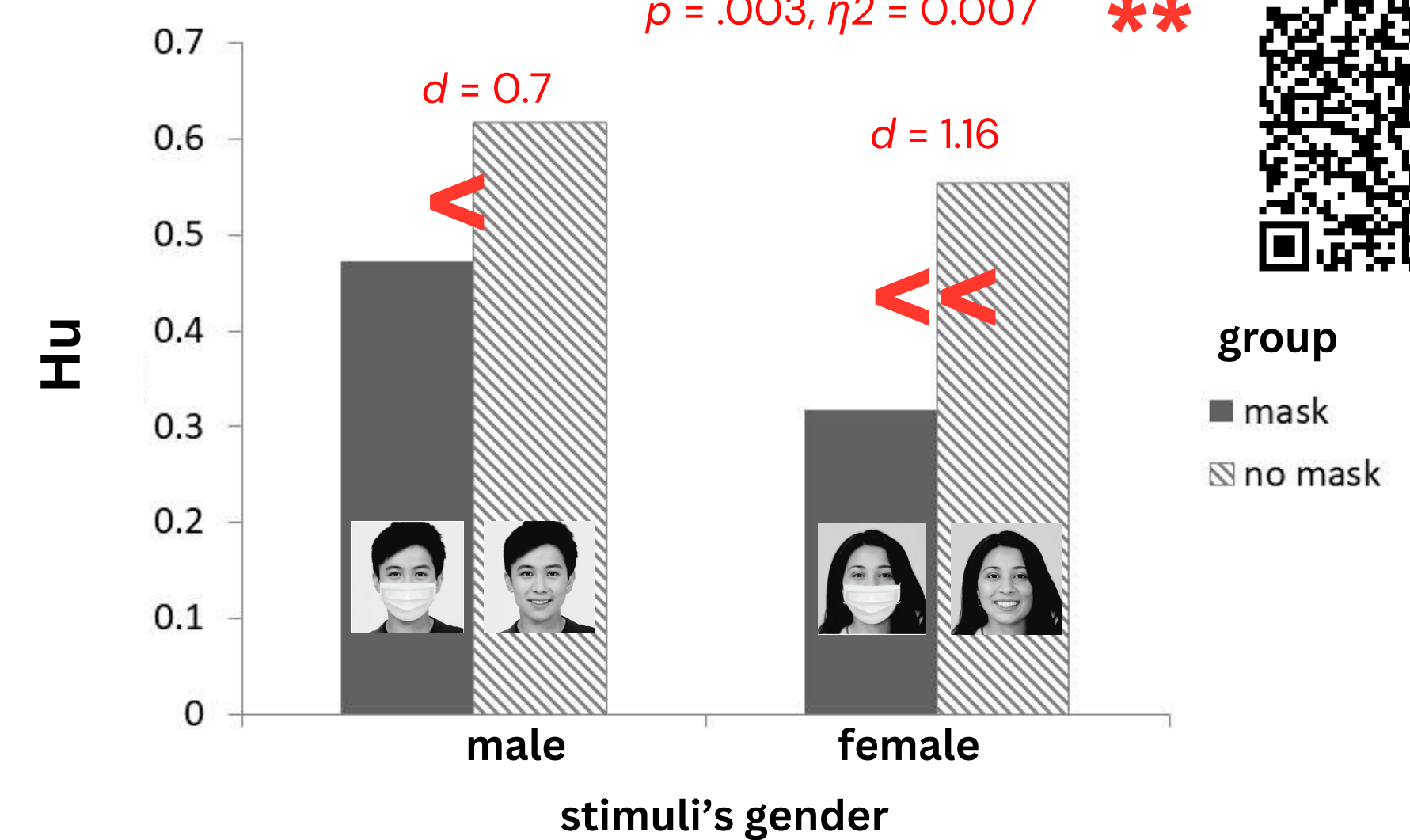
Interaction Between Gender and Emotion Type



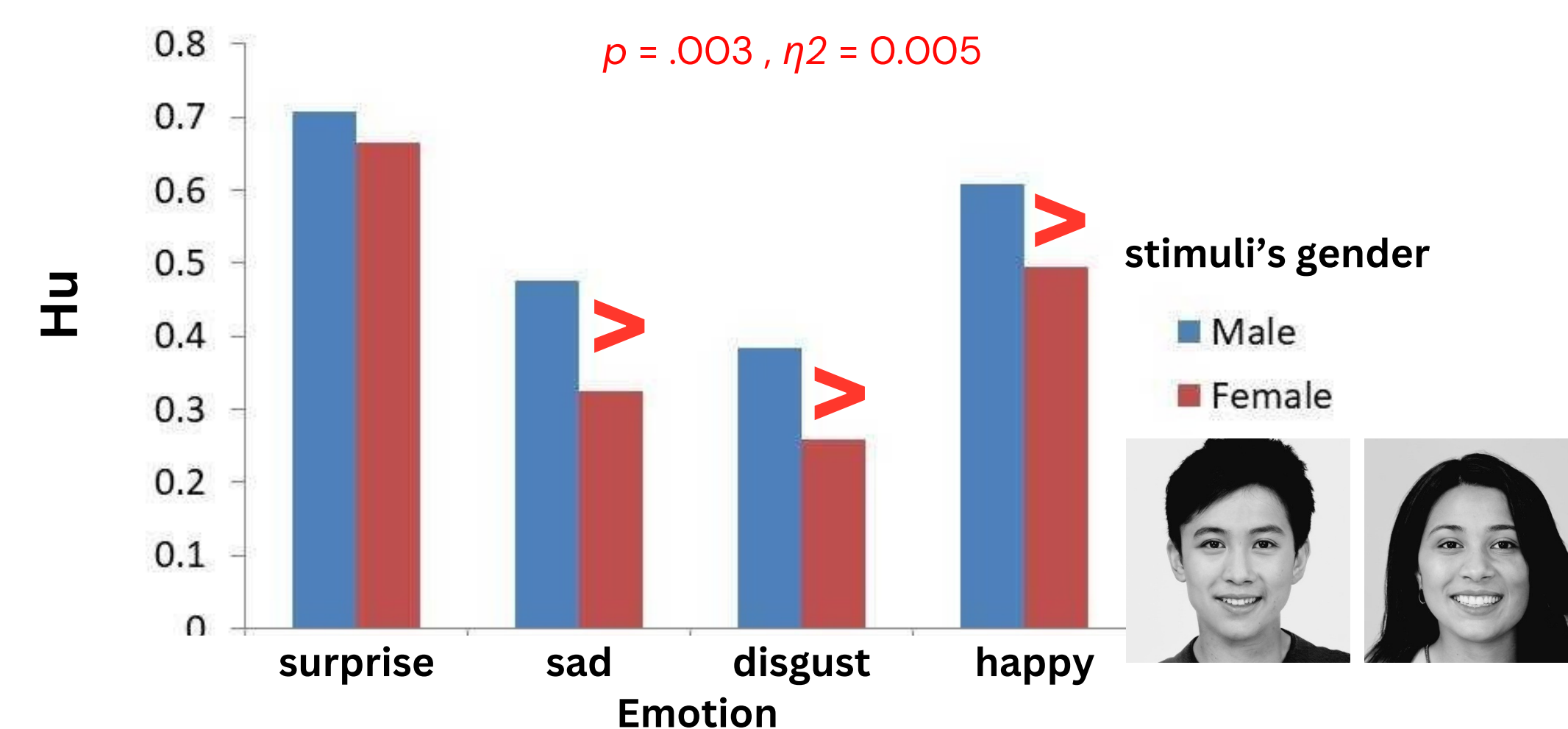
Recognition Accuracy for Stimuli's Gender



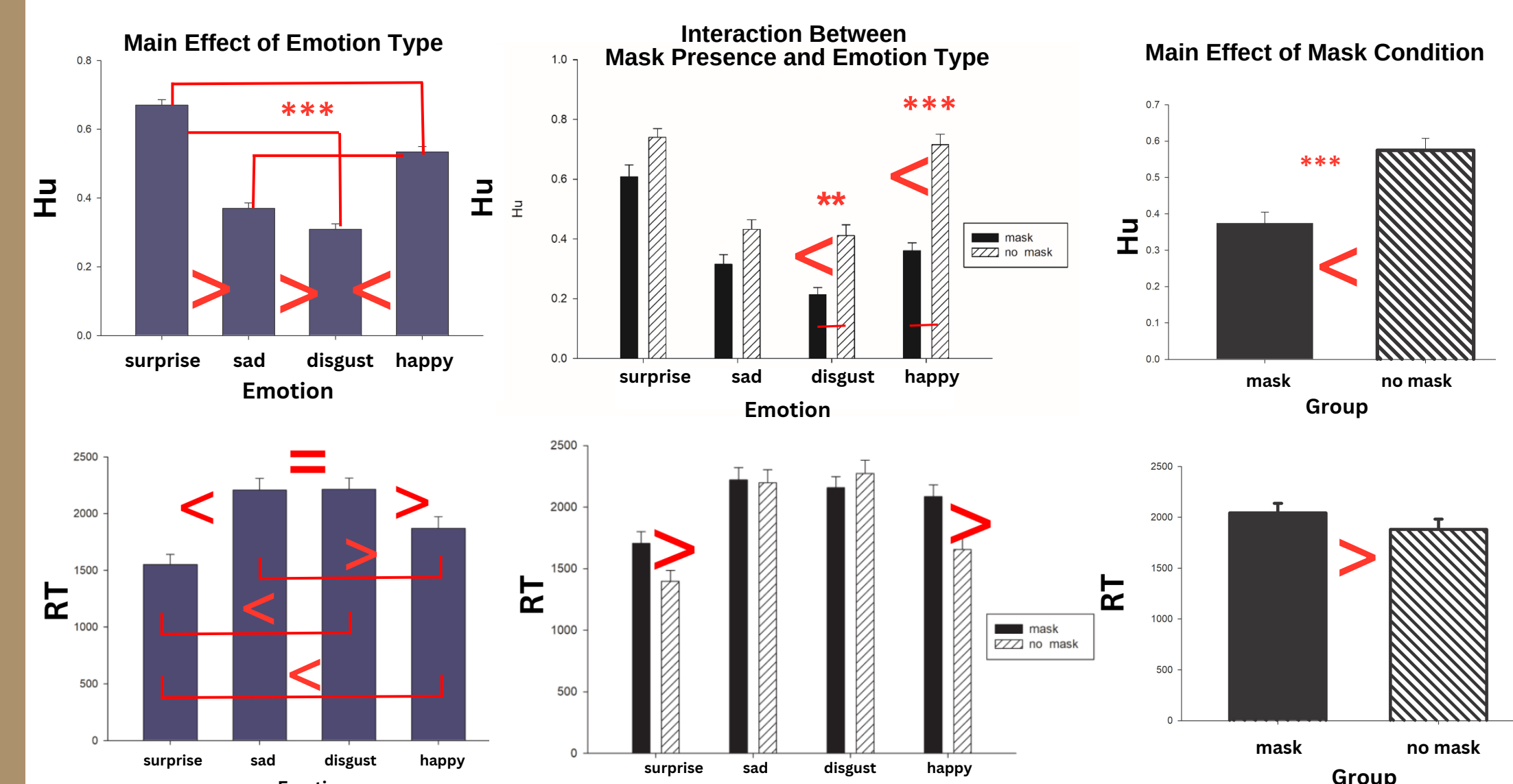
Effect of Masks Across Stimuli's Gender poster :



Effect of Emotions Across Stimuli's Gender



No Speed-accuracy tradeoff



Accuracy Results (Hu)

- No-mask > Mask
- Emotion types: Surprise > Happy > Sad > Disgust
- Only happiness and disgust were affected by mask-wearing.
- Gender differences were found; females showed a trend toward better recognition of sadness.
- Emotions expressed by female faces were more difficult to recognize.
- No Speed-accuracy tradeoff

Discussion & Conclusion

- The unbiased hit rate (Hu) proposed by Wagner (1993) was used as the index of emotion recognition accuracy.
- The findings support the view that specific facial regions contribute differently to the recognition of basic emotions (McCrackin et al., 2022):
 1. Disgust relies more on lower-face features.
 2. Surprise and sadness rely more on upper-face features.
- This study replicated results from Parada-Fernández et al. (2022):
 1. Mask effect was found.
 2. Surprise was not affected by mask-wearing.
 3. No main effect of gender on overall emotion recognition.
 4. A significant interaction between gender and emotion type was found.
- Gender differences were observed in recognizing specific emotions:
 - Female participants showed a better trend in recognizing sadness, partially replicating Kret and De Gelder (2012).
- Our results support the **holistic facial emotion recognition perspective**:
 - Mask-wearing affects people's emotion recognition accuracy (Freud et al., 2020).

References

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