

## Introduction

### Mooney face Perception

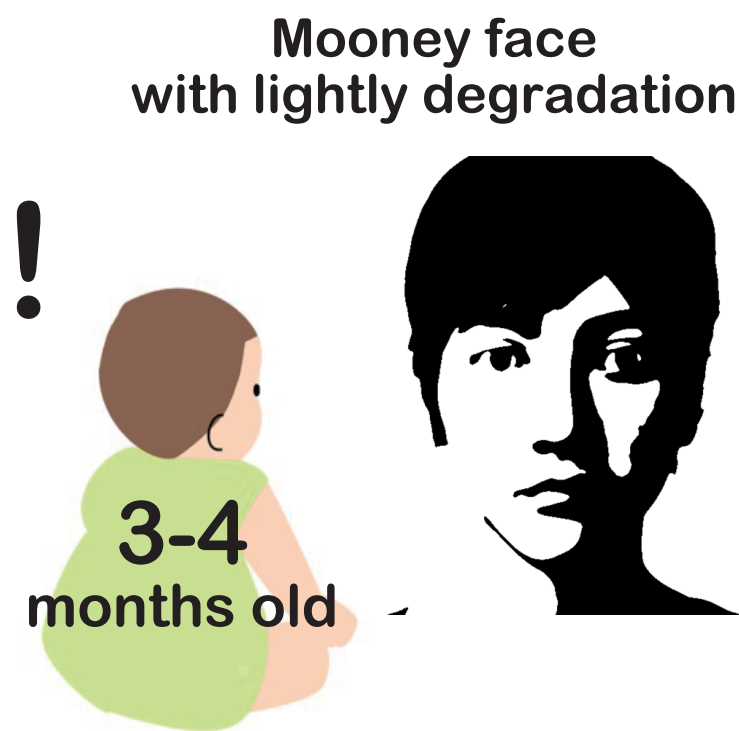
Humans can perceive faces even from black-and-white binary images known as Mooney faces, which challenge the visual system to recognize facial structures with limited cues (Kanwisher et al., 1998; George et al., 2005).



(Kanwisher et al., 1998)

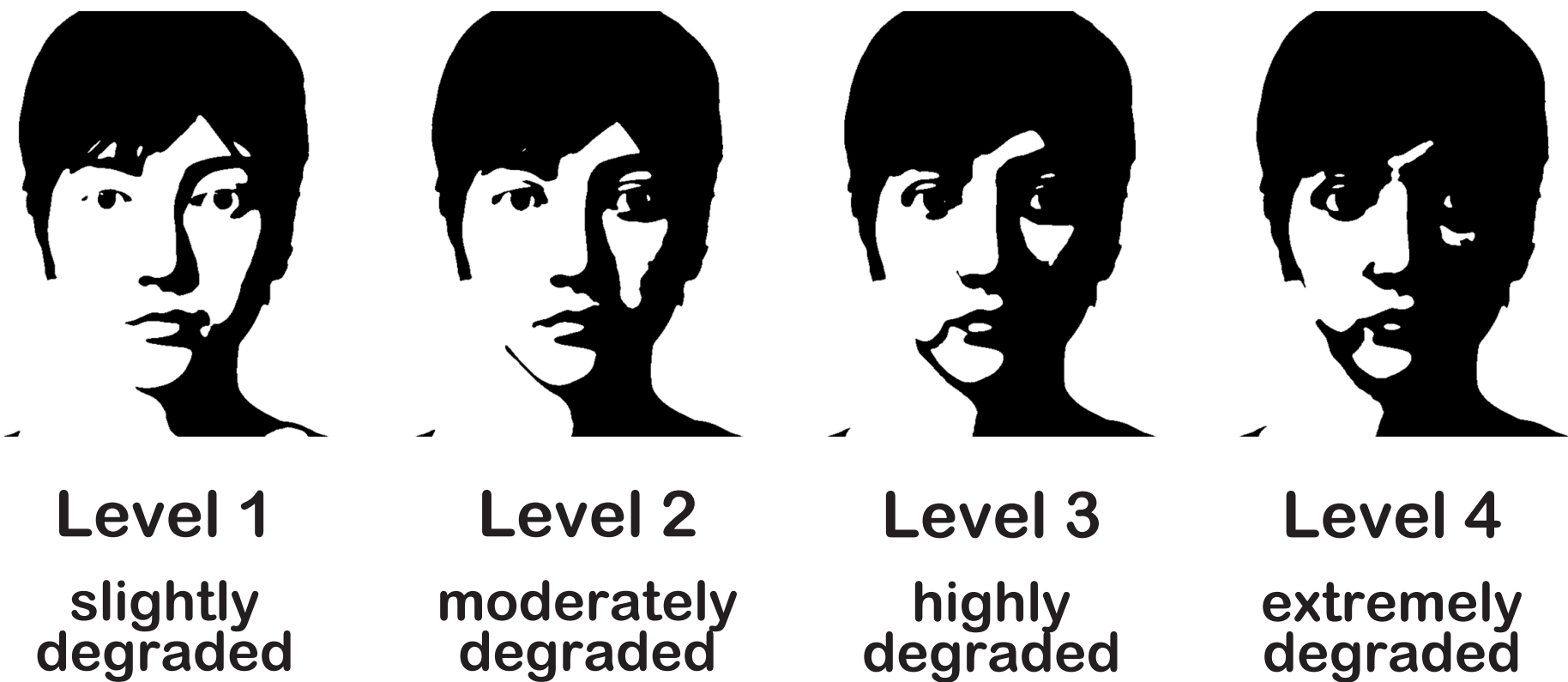
### Previous Studies in Infancy

Previous studies indicate that at 3-4 months old, infants can perceive Mooney faces when the facial features are relatively lightly degraded (Otsuka et al., 2012). However, by 18 months old, infants can perceive Mooney faces even with relatively highly degraded features (Doi et al., 2009).



### Purpose of the Present Study

This study aims to investigate the developmental trajectory of Mooney face perception between 6 and 11 months of age, focusing on how infants perceive faces with the features degraded at four levels.



## Experiment 1

### Method

#### Participants

- 22 infants aged 6-8 months (mean and SD age = 209.32±19.56 days) and
- 23 infants aged 9-11 months (mean and SD age = 292.00±20.92 days)

#### Stimuli

- Mooney faces is created for the original images of two male and two female models (available 3D models) (17°×19°)
- The original images were binarized their luminance values into black and white.
- We used four thresholds to create the Mooney faces with four different levels of degradedness of individual features: Level 1 (slightly degraded), Level 2 (moderately degraded), Level 3 (highly degraded), and Level 4 (extremely degraded).

#### Procedure

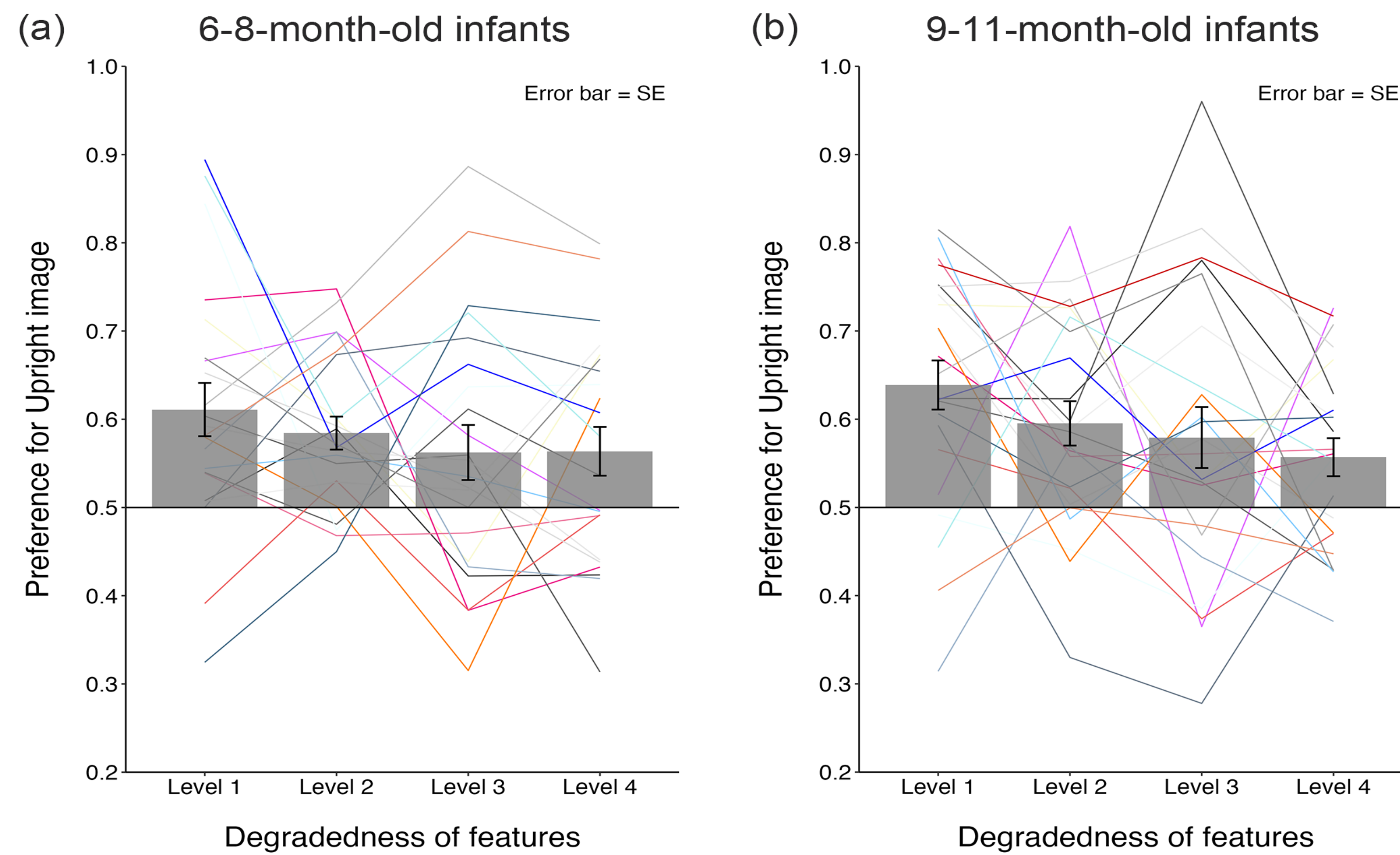
- Preferential looking paradigm (remote experiment (Shirai et al., 2022))
- In each trial, upright and inverted Mooney face images were displayed side by side for 10 sec.
- Because two trials were conducted for each of the four degradedness conditions, each infant participated in a total of 8 trials.



### Result

- Preference scores were:  
*Total time looking at uzpright / Total time looking at upright and inverted faces*

**Infants showed significantly higher preference score for upright faces in Level 1 (6-8 mo:  $p = .011$ , 9-11 mo:  $p < .001$ ) and Level 2 (6-8 mo:  $p = .002$ , 9-11 mo:  $p = .008$ ).**  
(after Bonferroni correction)



## Experiment 2

### Method

#### Participants

All infants participated in Experiment 2 the day after participating in Experiment 1.

- 21 infants aged 6-8 months (mean and SD age = 209.48±22.69 days) and
- 21 infants aged 9-11 months (mean and SD age = 297.43±21.75days)

#### Stimuli

- The stimuli were the originally grayscale facial images without binarization manipulation.

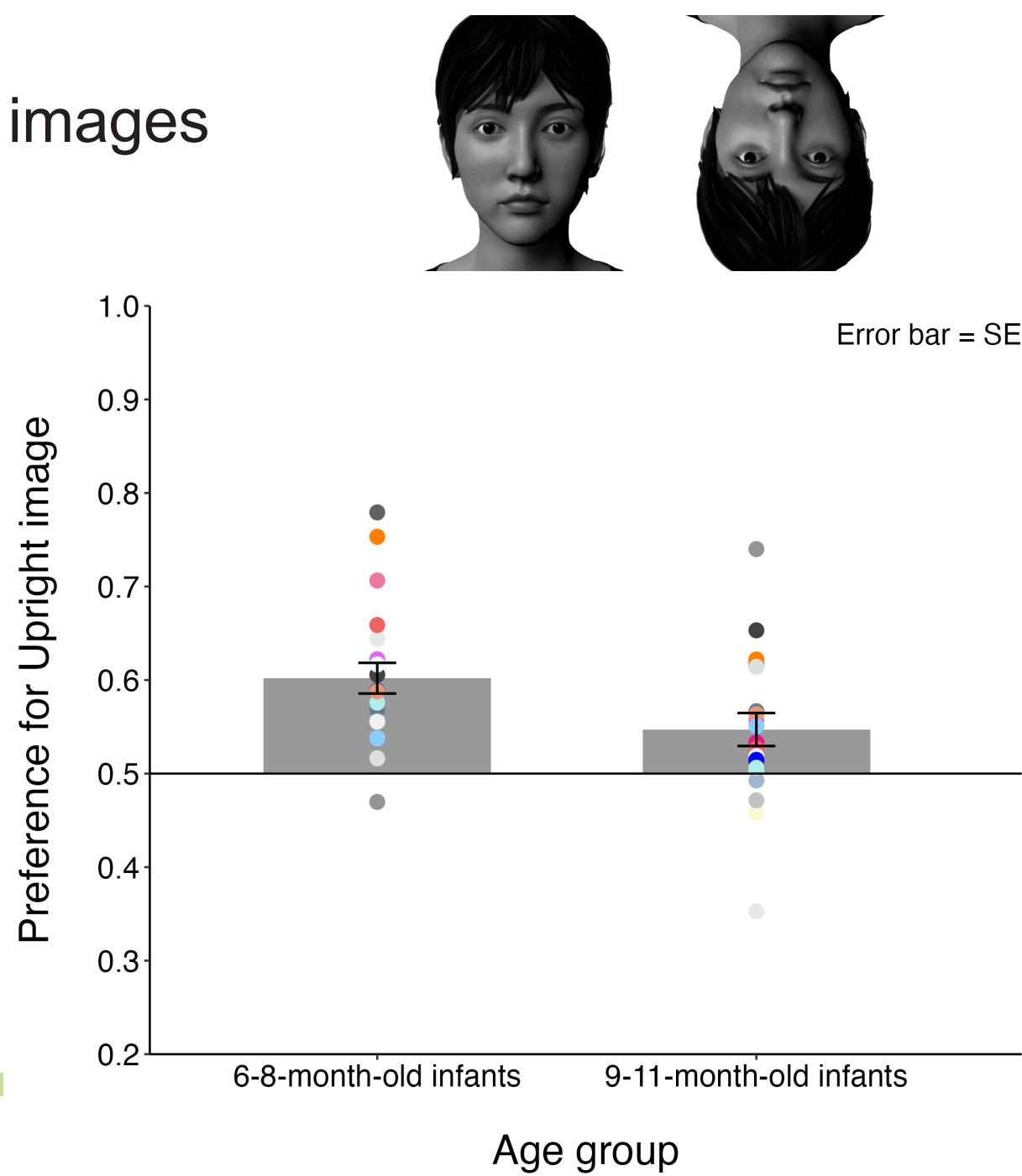
#### Procedure

- Preferential looking paradigm
- In each trial, upright and inverted Mooney face images were displayed side by side for 10 sec. Each infant participated in a total of 8 trials.

### Result

**Infants showed a significant upright preference for the original facial images.**

(6-8 mo:  $p < .011$ , 9-11 mo:  $p = .029$ , after Bonferroni correction)



## Conclusion

### Purpose

We investigated the developmental trajectory of Mooney face perception between 6 and 11 months of age.

### Results and Discussion

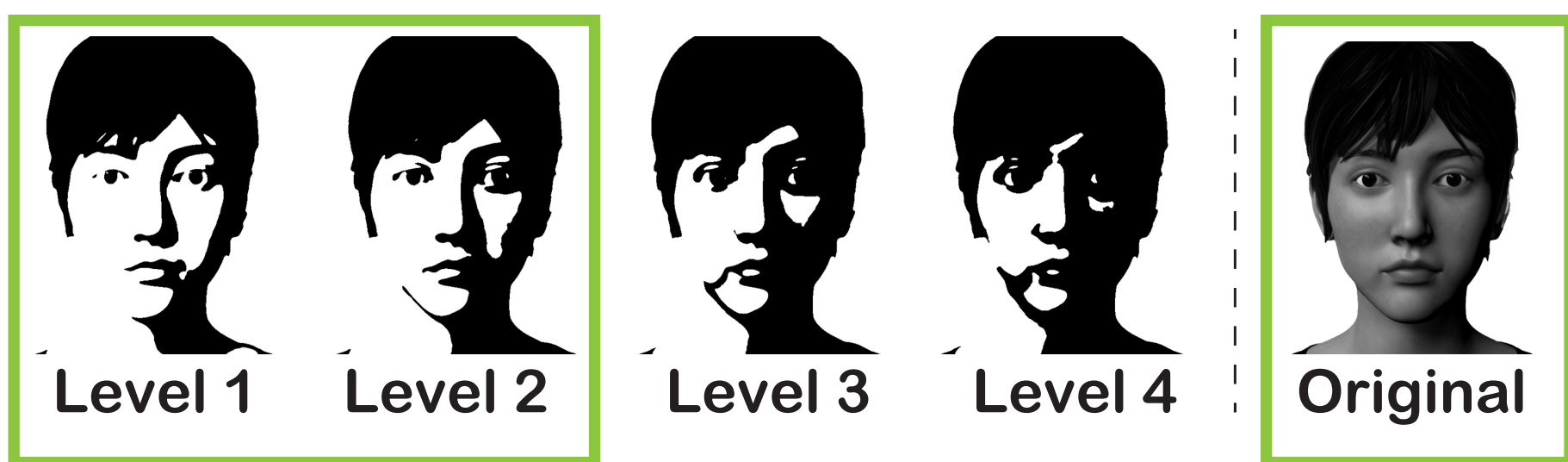
**Exp 1:** The upright preference for Mooney faces

The infants aged 6-11 months showed significant upright preferences under Level 1 and Level 2 conditions.

**Exp 2:** The upright preference for original facial images

The infants aged 6-11 months showed significant upright preferences.

The results suggest although the infants aged 6-11 months consistently showed the upright face preference even for Mooney face images with relatively modest degradedness, their ability to detect face figures from Mooney face figures was still immature.



	Lightly degraded	Highly degraded
3-4 months	○ (Otsuka et al., 2012)	× (Otsuka et al., 2012)
6-11 months	○	×
18 months		○ (Doi et al., 2009)

### Reference

Doi et al., Neuroscience Research, 2009; George et al., Brain Research, 2005; Kanwisher et al., Cognition, 1998; Otsuka et al., Journal of Experimental Child Psychology; Shirai et al., The Japanese Journal of Psychonomic Science, 2022

### Acknowledgements

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