



# The Effects of Stimulus Familiarity on Infants' Facial Processing

Emily W. Touchstone and Melanie J. Spence  
The University of Texas at Dallas



## Abstract

This study explored 6- and 10-month-old infants' categorization of one positive (happy) and one negative (disgust) expression when viewing dynamic female faces. Categorization was assessed using an infant-controlled habituation procedure that presented 3 faces in repetition for no more than 20 trials. Subsequently, 2 within-category and 2 between-category test trials were presented. Infants ( $n=82$ ) were separated into 2 groups: those who habituated in 6-9 trials, and those who habituated in 12-15 trials. Results reveal that infants in both groups detected new faces, but that infants with more familiarization trials were less likely to detect the new emotion.

## Introduction

### Role of motion in identity versus emotion

*Motion facilitates face recognition in infants*

- Four-month-old infants (Otsuka, in press)

*Motion affects adults' recognition of faces*

- (Lander & Bruce, 2000)
- (Roark, Barrett, Spence, Abdi & O'Toole, 2003)

*Motion and emotion*

- Use of multimodal stimuli effective in affect processing (Kahana-Kalman & Walker-Andrews, 2001; Soken & Pick, 1999)
- Adult neuroimaging studies indicate different pathways for processing moving affective faces (LaBar, Crupain, Voyvodic & McCarthy, 2003)

### Individual differences in infant attention to visual stimuli

• Individual differences in processing speed related to cognitive performance (Jacobson et al., 1992; Kail, 1991; Rose et al., 2001, 2002).

• Short lookers process information with less familiarization time than long lookers (Colombo, Freeseaman, Coldren, & Frick, 1995)

Total looking time during habituation decreased odds of categorization (Arterberry, & Bornstein, 2002)

Increased familiarization resulted in improved featural processing for 6-mo-olds (Orlian & Rose, 1997).

## Purpose

The purpose of this study is to investigate the effect of facial familiarity on infants' identity discrimination and categorization of emotional expressions.

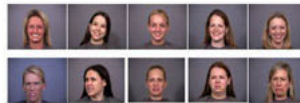
## Methods

### Participants

- 6 month-olds ( $N= 44$ ;  $M$  age= 188 days;  $SD= 20$  days)
- 10 month-olds ( $N= 37$ ;  $M$  age= 316 days;  $SD= 15$  days)

### Facial Expression Stimuli

- 5 Happy & 5 Disgust female faces, dynamically portrayed
- Naturalistic emotions captured while adults watched videos chosen to elicit a variety of different emotions
  - DOD/DARPA Human ID project (O'Toole, Harms, Snow, Hurst, Pappas & Abdi, 2005)
- Adult agreement/judgments of expression > 95%



## Procedure

### Habituation Paradigm

- Series of 3 faces repeated during habituation
- Habituated to happy or disgust
- Habituation criterion: 3 consecutive trials decreased 50% or below 1<sup>st</sup> 3 trials of habituation
  - (Habit 2000; Cohen, Atkinson & Chaput, 2000)
- Three Test Trials
- Within-Category test trials: 2 novel faces portraying the SAME facial expression
- Between-Category test trials: 1 novel face portraying DIFFERENT expression

### Design

- Infants familiarized with happy or disgust expressions
- Data analyzed based on number of trials during habituation phase
- Familiarity with stimuli (fixed scale of 3)
  - Less familiar: 6 & 9 trials during habituation
    - Total fixation  $M = 54.4$
  - More familiar: 12 & 15 trials during habituation
    - Total fixation  $M = 110.03$

## Results

### 6-mo results

Repeated Measures ANOVA: **Condition** (Less familiar vs. more familiar) X **Trial Blocks** (End Hab vs. Test Trials 1, 2, 3)

Trials Main Effect:  $F(3, 144) = 3.518, p = .017$

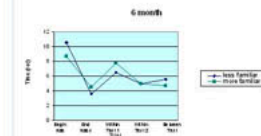
#### Pairwise comparisons:

##### Less familiar:

- Trial blocks EH&T1:  $M$  diff= -2.79,  $SE= 1.00, p= .011$
- Trial blocks EH&BT:  $M$  diff= -1.87,  $SE= .911, p= .053$

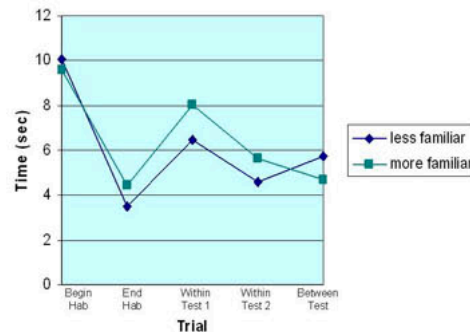
##### More familiar:

- Trial blocks EH&T1:  $M$  diff= -1.82,  $SE= 1.22, p= .146$
- Trial blocks EH&BT:  $M$  diff= .516,  $SE= .377, p= .183$



Repeated Measures ANOVA: **Condition** (Less familiar vs. more familiar) X **Trial Blocks** (Last 3 Habituation vs. Test Trial 1, 2, 3)

Trials Main Effect:  $F(2, 240) = 8.638, p < .000$



### 10-mo results

Repeated Measures ANOVA: **Condition** (Less familiar vs. more familiar) X **Trial Blocks** (End Hab vs. Test Trials 1, 2, 3)

Trials Main Effect:  $F(3, 90) = 5.398, p = .002$

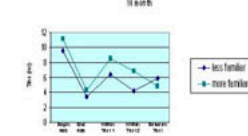
#### Pairwise comparisons:

##### Less familiar:

- Trial blocks EH&T1:  $M$  diff= -3.19,  $SE= 1.62, p= .069$
- Trial blocks EH&BT:  $M$  diff= -2.77,  $SE= 1.22, p= .039$

##### More familiar:

- Trial blocks EH&T1:  $M$  diff= -6.61,  $SE= 1.88, p= .003$
- Trial blocks T1&BT:  $M$  diff= -4.99,  $SE= 2.22, p= .039$
- Trial blocks EH&BT:  $M$  diff= -1.62,  $SE= 1.36, p= .252$



## Discussion

- Both Less and More Familiar groups detected identity changes
  - Effect of familiarization group... need analysis?
- Only Less Familiar group detected emotion change
  - More experience with 3 faces during habituation
  - biased attention to identity rather than emotion
- OR
- Individual differences in processing speed influenced processing of emotion

## Future Goals

- Are infants with more familiarization also shorter lookers?
- Are infants more likely to categorize emotional expressions when using more faces or fewer (fixed) trials during familiarization?
- Is there an effect of motion (vs. static) on identity when comparing less and more familiar experiences during habituation?

## Acknowledgements

This research was funded by:

- Timberlawn Psychiatric Research Foundation Award
- UTD Faculty Research Initiative Award

The stimuli were provided by DOD/DARPA Human ID project

- (O'Toole, Harms, Snow, Hurst, Pappas & Abdi, 2005)

Address correspondence and reprint requests to:

Emily W. Touchstone or Melanie J. Spence, School of Behavioral & Brain Sciences, University of Texas at Dallas, Box 830688, GR 4.1, Richardson, TX 75083-0688, exw010200@utdallas.edu, mspence@utdallas.edu

We would like to acknowledge all of the families who participated in this research, and express our sincere gratitude.