



Infants' Categorization of Dynamic and Static Facial Expressions

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Abstract

This experiment compares 6-month-old infants' categorization of dynamic and static naturalistic emotional expressions. Most studies of facial expression categorization have presented infants with static photographs of exaggerated expressions, reporting that 6-7-month-olds categorize expression contrasts such as happy and fearful, fearful and angry, and happy and sad. However, it is important to study infants' processing of dynamic faces since motion provides unique information for face processing and more closely mimics the expressions infants experience in their daily interactions.

Infants' categorization of happy and disgust facial expressions was assessed. The stimuli are 3-s digital videos of female faces displaying dynamic happy or disgust expressions and static expression images edited from the videos. During familiarization, infants ($N=84$; M age=185 days; $SD=15$ days) were presented a sequence of three different female faces displaying either happy or disgust until fixation on 3 consecutive trials decreased 50% below the first three trials. Infants were then shown 2 novel faces displaying the familiarization expression (within-category test trials), followed by 2 novel faces displaying a novel expression (between-category test trials).

The results to date provide no indication that motion aids 6-month-olds' categorization of disgust and happy expressions. Post hoc comparisons reveal that infants increase fixation for the first novel face following habituation, indicating that they encode identity information for the three habituation faces. Additionally, infants increase looking to happy following habituation to disgust, but do not increase looking when disgust follows happy. These results have implications for understanding how infants process two types of information conveyed by faces, cues for identity and emotional expressions, both important for social-communicative development.

Introduction

Infants' categorization of emotion

- Infants 6-7 months of age categorize emotional expressions in STATIC faces (Nelson, 1993)
 - Fear vs. Anger; Happy vs. Anger (Serrano, Iglesias & Loeches, 1992, 1995)
 - Fear vs. Happy (Nelson & Dolgin, 1985)
 - Fear vs. Happy (Bornstein & Arterberry, 2003)
- But, categorization often based on salient features, NOT configurations or affect
 - Featural processing (Ludemann, 1991)
 - Toothy angry vs. toothy happy (Caron, Caron & Myers, 1985)
- Infants also discriminate emotional expressions given dynamic multimodal stimuli
 - (Kahana-Kalman & Walker-Andrews, 2001)
 - (Soken & Pick, 1999)

Role of motion in visual perception

- Motion aids infants' visual perception of object properties
 - Moving rod (Kellman & Spelke, 1983)
 - Illusory contours (Otsuka & Yamaguchi, 2003)

Motion affects adults' perception of faces

- Motion can be useful for recognizing familiar faces
 - (Lander & Bruce, 2000)
 - (Roark, Barrett, Spence, Abdi & O'Toole, 2003)
- Neuroimaging in adults indicates different mechanisms/pathways for processing of moving and static faces
 - Facial motion (Puce, Smith & Allison, 2000)
 - Facial affect (LaBar, Crupain, Voyvodic & McCarthy, 2003)

Purpose

The purpose of this study is to compare infants' categorization of dynamic and static faces portraying naturalistic expressions.

Based on previous research, motion may aid infants' categorization of facial expressions. However, few studies have considered the following:

- Use of naturalistic expressions, different from posed expressions (Eckman & Friesen, 1979)
- Categorization of dynamic expressions (Caron, Caron & MacLean, 1998)
- Direct comparison of dynamic and static expressions

Methods

Participants & Design

- 6 month-olds ($N=84$; M age= 185 days; $SD=15$ days)
- Familiarized with
 - Static or Dynamic Faces (Condition)
 - displaying
 - Happy or Disgust (Emotion)
 - Happy Static, $n=18$; Happy Dynamic, $n=25$
 - Disgust Static, $n=14$; Disgust Dynamic, $n=27$
- Faces presented contingent on fixation of visual stimulus

Facial Expression Stimuli

- 5 Happy & 5 Disgust female faces
 - 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 $\geq 95\%$
- Dynamic versions
 - 3 sec video clips
- Static versions
 - Edited image at peak of dynamic expression

Procedure

Habituation Paradigm

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

Experimental Setup



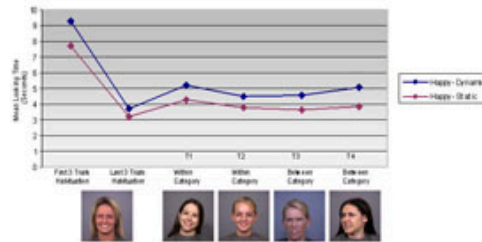
Figure 1. An infant sits in her mother's lap during presentation of the stimuli on the monitor. Two camera angles capture the experiment.

Results

Repeated Measures ANOVA: Condition (Dynamic vs. Static) X Emotion (Disgust vs. Happy) X Trial Blocks (Last 3 Habituation vs. Test Trial 1, 2, 3, 4)

Trials Main Effect: $F(4, 320) = 4.01, p < .003$

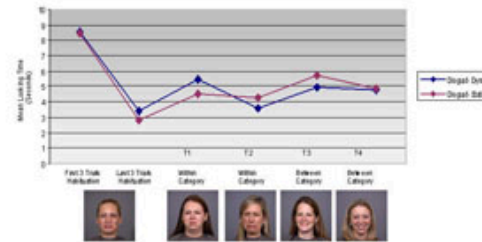
Happy Habituation: Comparison of Mean Looking Times for Dynamic and Static Faces



Post Hoc Analysis:

Dynamic group detected first happy test face (T1); static group did not. Neither group increased looking to disgust test faces (T3, T4).

Disgust Habituation: Comparison of Mean Looking Times for Dynamic and Static Faces



Post Hoc Analysis:

Both dynamic and static groups detected first disgust test face (T1). Both dynamic and static groups increased looking to happy test faces (T3, T4).

Discussion

- Dynamic presentation of facial affect did not facilitate categorization for either disgust or happy expressions, although static face data collection is still ongoing.
- Perhaps infants at this age are processing the information common to both dynamic and static expressions rather than focusing on the properties specific to dynamic faces. A second hypothesis is that motion is more helpful when faces are familiar. This is consistent with adult recognition literature (Roark et al., 2003) as well as Kahana-Kalman & Walker-Andrews' (2001) report that young infants discriminate facial emotions of mothers rather than those of unfamiliar faces.
- Infants who were habituated to disgust faces did increase looking time to the happy test faces.
- Infants who were habituated to happy faces did not increase looking time to the disgust test faces. This may be explained by the infants' disinterest to a facial expression that conveys negative affect following exposure to stimuli communicating positive affect.

Future Goals

- Are infants more likely to categorize emotions when shown larger numbers of faces in random order during habituation?
- Do older infants (10 month-olds) categorize happy and disgust emotions? Ludemann reported that 10 month-olds process affect rather than salient features of emotions (1991).

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