

## INTRODUCTION

Habituation paradigms show that 6-month-olds reliably categorize audio-only and audiovisual infant-directed speech (IDS) utterances based on the *communicative intent* of the message (i.e. approving & comforting).<sup>1,2,3,4</sup>

- Communicative intent: intended function or meaning of the speaker's utterance. Displayed in both facial and vocal speech; distinguished by *prosody* – melodic speech properties.<sup>2,3,6,14</sup>

IDS Intent	Vocal Features	Facial Features
Approving	Higher F <sub>0</sub> Wider F <sub>0</sub> range	Wide eyes Smiling mouth
Comforting	Lower F <sub>0</sub> Narrow F <sub>0</sub> range	Sad eyes Frowning mouth

Audiovisual speech is naturally synchronous and sensory redundant - the signal is displayed both in the speaker's voice and on the speaker's face.<sup>7,11</sup>

- Synchrony between auditory and visual streams directs sensory exploration in the first postnatal months.<sup>7,8,12</sup>
- Sensory redundancy ensures infants attend to acoustic and visual information that belong together rather than unconnected streams of information – an essential component of adult perception.<sup>9,10,17</sup>

Previous research investigated how facial-vocal synchrony impacted infants' categorization of IDS intent. 6-month-olds categorized *synchronous* but **did not** categorize *desynchronous* IDS intents.<sup>1,4</sup>

- Synchronous IDS: Normal audiovisual speech.
- Desynchronous IDS: Visual and auditory streams communicate different utterances in the same intent category (approving or comforting). Speech onset and offset times misaligned by 1s.<sup>10,12</sup>

The absence of sensory redundancy may have impacted infants' failure to categorize desynchronous IDS in past studies.

- Auditory and visual streams may have been perceived as two separate unimodal events.

## RESEARCH OBJECTIVE

To examine 6-month-old infants' eye-tracking patterns for synchronous and desynchronous approving and comforting audiovisual infant-directed faces.

## HYPOTHESES

1. No differences in looking times to eyes and mouths for this age group for synchronous IDS, based on prior research.
2. Longer looking to mouths during desynchronous IDS vs. synchronous IDS, regardless of utterance intent.

## METHOD

- Infants viewed stimuli on Tobii T60XL eye-tracker, sitting on parent's lap
- Five-point calibration followed by stimulus presentation
- Two 10-second audiovisual videos of one of two female speakers delivering English IDS in an approving (N = 23) or comforting (N = 24) intent message
- Participants viewed one synch. and one desynch. video of the same talker presenting **either** approving **or** comforting IDS with presentation order counterbalanced across participants. Each stimulus type was viewed first by a subset/group of infants.

<b>Stimulus 1</b>	Synchronous Approval	Synchronous Comfort	Desynchronous Approval	Desynchronous Comfort
<b>Stimulus 2</b>	Desynchronous Approval	Desynchronous Comfort	Synchronous Approval	Synchronous Comfort

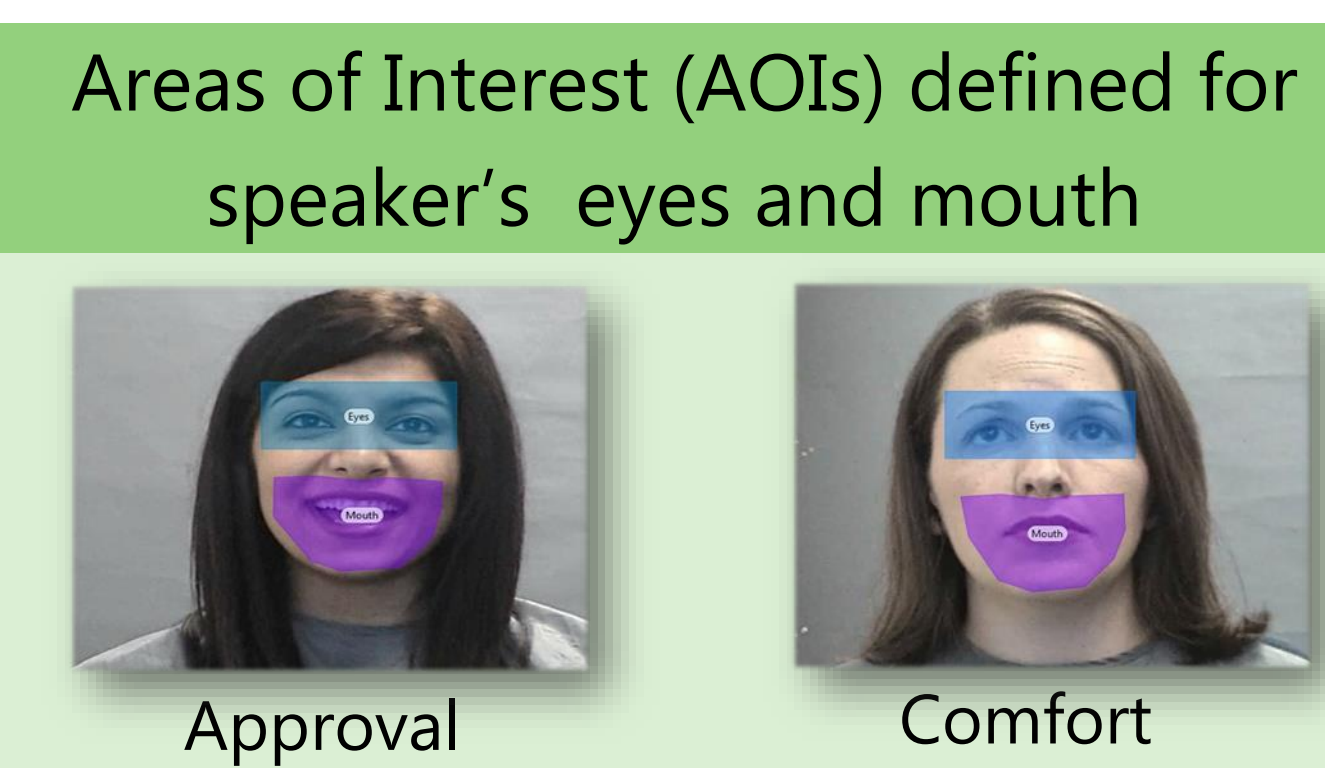
## PARTICIPANTS

- 6-month-old typically developing infants
- N = 47; 27 males, 20 females; M age = 178 days, SD = 11 days
- Only infants from monolingual English speaking families included in final sample

## ANALYSES

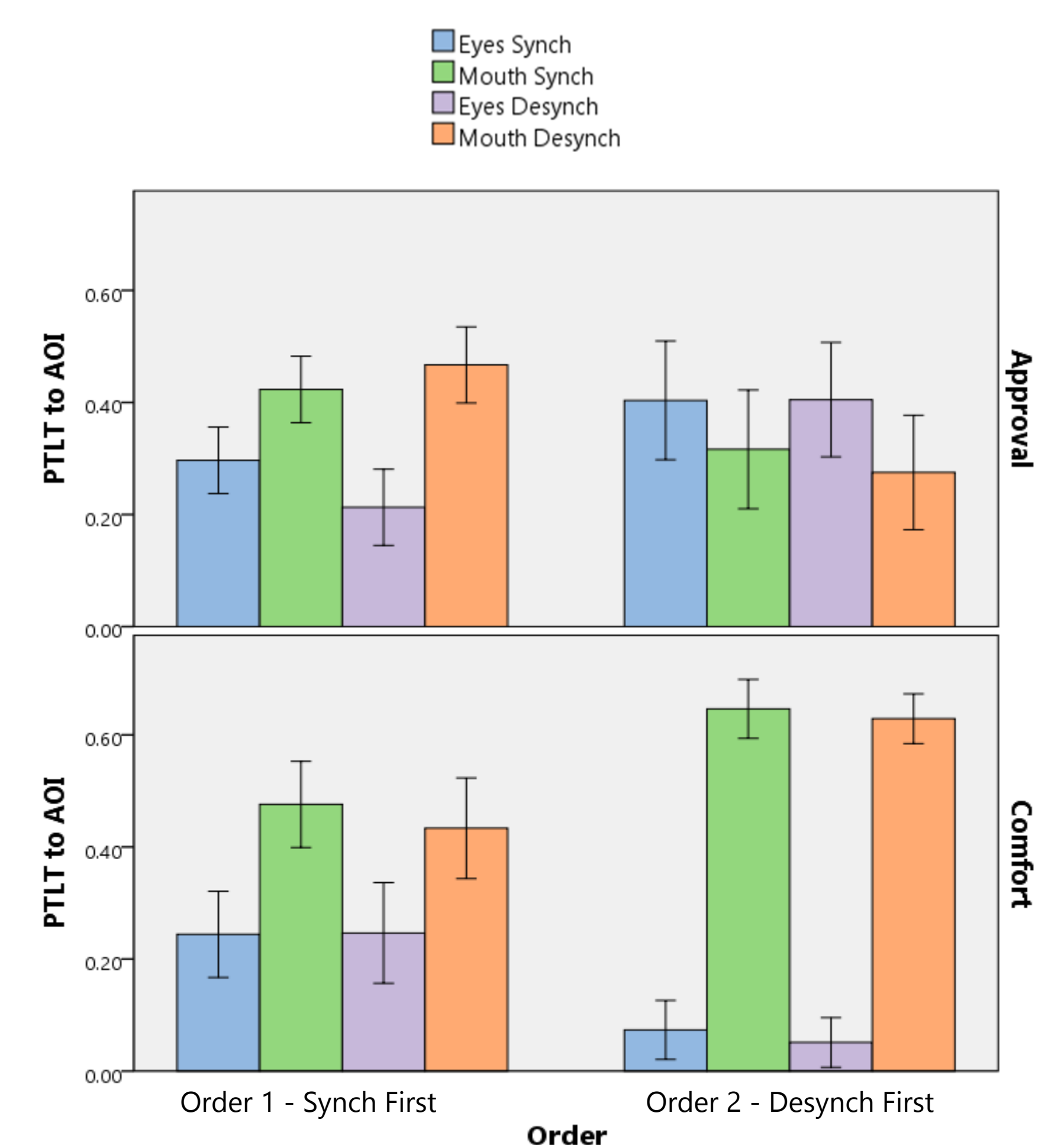
Mixed design ANOVA

DV: Proportion of Total Looking Time (PTLT) to each Area of Interest (AOI) for synchronous and desynchronous speech, out of looking time to the face during first 2.5 seconds of each trial



Speech Type	X	Intent	X	Order
Synch		Approval		Synch First
Desynch		Comfort		Desynch First

## RESULTS



**Main Effect of Speech Type (Desynch)**  
 $F(1,43) = 11.49, p = .002$

**AOI X Desynch X Intent Interaction**  
 $F(1, 43) = 7.56, p = .01$

**AOI X Desynch X Intent X Order Interaction**  
 $F(1, 43) = 6.76, p = .01$

Order	*Trial #	Intent	Eyes	Mouth	
1	Synch First	2	Approval	22 %	42 %
1	Synch First	2	Comfort	27 %	48 %
2	Desynch First	1	Approval	42 %	31 %
2	Desynch First	1	Comfort	6 %	63 %

\*Trial # = trial in which desynch. stimulus was presented

## DISCUSSION

When the synchronous stimulus was presented first, there were no significant order effects or differences in looking at eyes vs. mouth for either approving or comforting synchronous speech, consistent with previous findings.



Significantly longer looking to the mouth was found for synchronous comforting speech, *only* when the desynchronous stimulus was presented prior, a carry-over effect of stimulus.

- This pattern suggests that viewing a desynchronous stimulus first may lead to significant disruption to looking patterns, even for subsequent synchronous speech.

**Looking patterns were significantly different for desynchronous speech.** An interaction was found for area of interest, desynchronous speech, intent, and order.

- When the synchronous stimulus had been viewed first and the desynchronous stimulus viewed in the second test trial, infants looked significantly longer at the mouth than eyes for **both** desynchronous approving and desynchronous comforting speech (Order = Synch First).



- When the desynchronous stimulus had been viewed first, Infants looked significantly longer at the mouth than eyes for *desynchronous comforting* speech (Order = Desynch First).

- When the desynchronous stimulus had been viewed first, no significant differences were found in looking at eyes vs. mouth for *desynchronous approving* speech (Order = Desynch First).

Results suggest that infants were better able to perceive and recognize the presence of facial-vocal desynchrony in both approving and comforting IDS when they had viewed the synchronous audiovisual stimulus first (Order = Synch First).

Scanning and fixation patterns provide support for prior work suggesting infants actively process areas of faces that provide language-specific information and rely on audiovisual synchrony cues when processing fluent speech.

Results suggest that facial-vocal desynchrony disrupts typical facial scanning patterns for this age group and may have influenced infants' failure to categorize communicative intent of desynchronous infant-directed speech in prior studies.

### References:

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