

Eyes, mouth, or elsewhere? Young infants exploration of talking faces

Marisa Filipe, Marisa Cruz, Cátia Severino, Joseph Butler, and Sónia Frota
Universidade de Lisboa, CLUL/FLUL

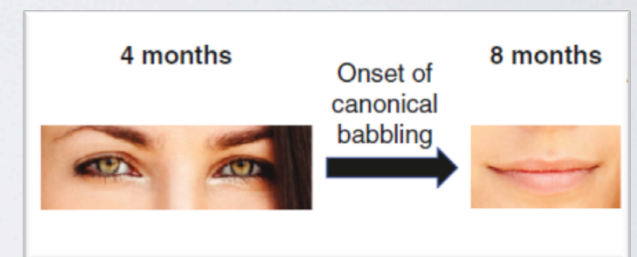
labfon@letras.ulisboa.pt
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Selective Audiovisual Attention

- ❖ Although there can be exceptional circumstances, audiovisual speech is the natural modality of language acquisition;
- ❖ Infants attend to speaking faces in order to extract visual information about speakers' vocal productions;
- ❖ For instance, infants stare in astonishment when a speaker's face movements is not in synchrony with the auditory vocal production (e.g., Dodd, 1979);
- ❖ Visual contributions to speech perception are well documented in literature, suggesting a **crucial role for visual information in typical speech development** (e.g., Chandrasekaran et al., 2009; Rosenblum et al., 1996; Summerfield, 1979).

Selective Audiovisual Attention

- ❖ It is known that selective audiovisual attention changes with language development;
- ❖ Research shows that the location of infant visual attention varies depending on age and mastery of a language;
- ❖ For instance, infants exposed to audiovisual materials in different languages shift their attention from the eyes to the mouth between 4 and 8 months, regardless of the native language (Lewkowicz & Hansen-Tift, 2012);
- ❖ Therefore, infants might use visual attention to assist language development.



Selective Audiovisual Attention

- ❖ Although the idea that infants attend to speaking faces to extract visual information about speakers' vocal production is not new, the question of how infants' attention to audiovisual stimuli changes across development is still unexplored in European Portuguese.
- ❖ Also, research has not explored the preferential looking at focal versus non-focal areas of a speaking face combined with social gestures.

Aim

- ❖ Our goal is to address infants' attention to audiovisual stimuli in European Portuguese (EP), characterizing infants' eye gaze while watching a video of a talking movie character (Noddy), nodding and waving.
- ❖ Using eye-tracking methodology, we examined the pattern of gaze to focal and non-focal regions of a speaking character in typical developing EP-learning infants with 5 – 6 months of age.
- ❖ We hypothesized an advantage of the eye region over the mouth. However, the extent to which this advantage is impacted by eye gaze to social gestures (waving) is hard to predict.

Method



Participants

- ❖ 24 typical developing monolingual EP-learning infants (16 males; mean age: 5 months 26 days; age range: 5-6 months).
- ❖ Typical development assessed with the Communication and Symbolic Behavior Scales Developmental Profile between age 12 and 24 months, and the MacArthur-Bates Communicative Development Inventories between age 8 and 30 months.

Material & Procedure

- ❖ Using remote eye-tracking (SMI RED500), infants' eye gaze was measured while watching a video with an animated toy with human properties (Noddy) talking and nodding and waving.
- ❖ The video was the last event of each experimental block in a speech perception experiment (Butler et al. submitted). It had a dual goal: to allow measurement of eye gaze to talking faces and social gestures, and to keep infants engaged in the speech perception task.

Method

Material & Procedure (cont.)

Four different exemplars of the video were created containing 4 different encouraging messages. Order of presentation was fixed within participants and randomized across participants.

The following areas of interest (AOIs) were considered:

- (a) **focal regions** (face, eyes, mouth)
- (b) **a non-focal region** (arm)

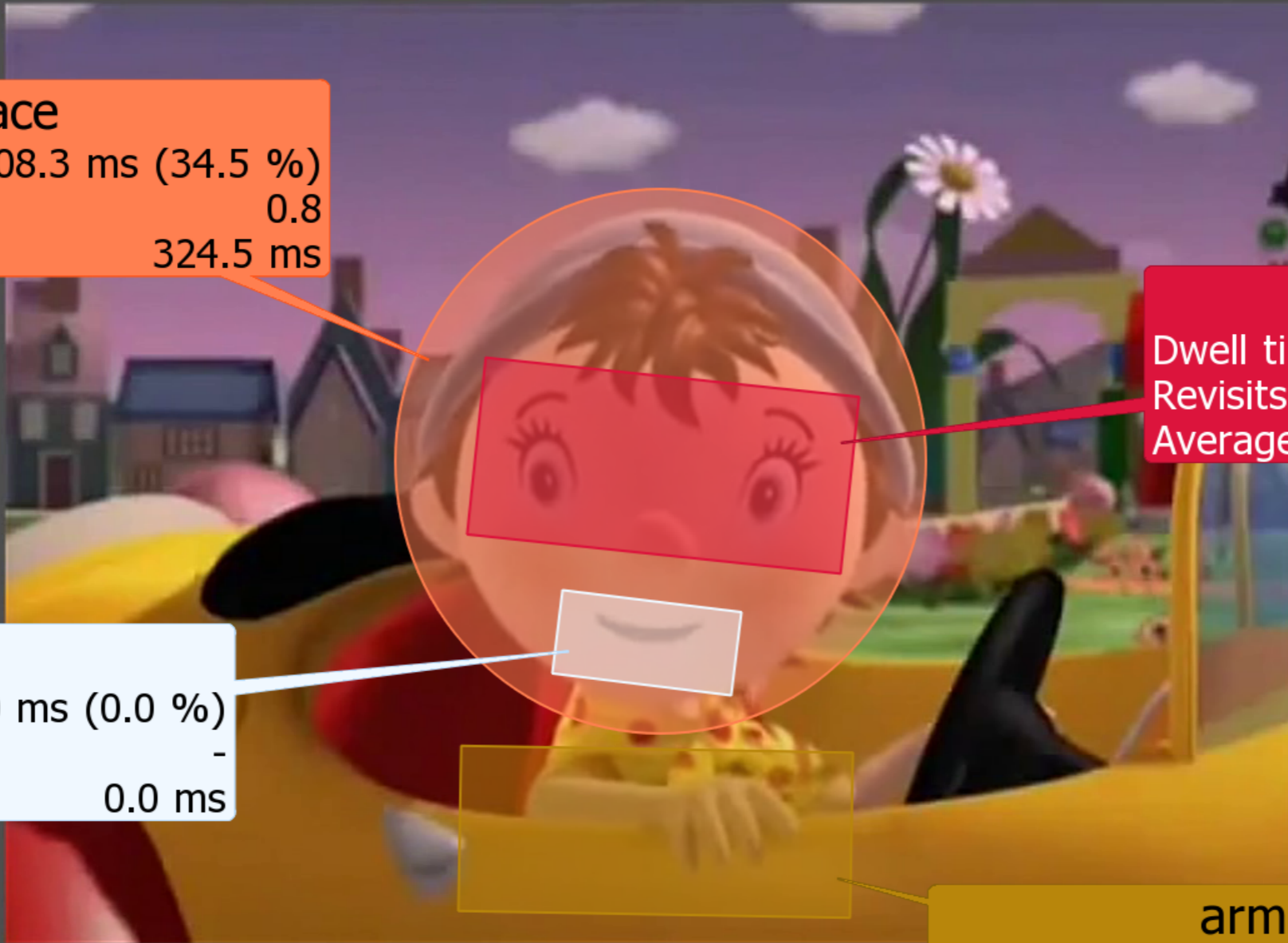
A total of 91 videos were analysed (mean 3,8 by infant).

Net dwell time (in ms) for each AOI was used as the eye gaze measure.



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face
Dwell time 1308.3 ms (34.5 %)
Revisits 0.8
Average fixation 324.5 ms

eyes
Dwell time 758.3 ms (20.0 %)
Revisits 1.0
Average fixation 289.1 ms

mouth
Dwell time 0.0 ms (0.0 %)
Revisits -
Average fixation 0.0 ms

arm
Dwell time 166.7 ms (4.4 %)
Revisits 0.0
Average fixation 163.9 ms

Results

- ❖ The different messages were shown not to impact on the results.
- ❖ We observed that gaze was concentrated more on the face than on the non-focal region ($t(23) = 6.564, p = \leq .0001$; mean face: 2097ms, mean arm: 298ms).
- ❖ For the focal regions, gaze was concentrated more on the eyes than on the mouth ($t(23) = 4.397, p = \leq .0001$; mean eyes: 1040ms, mean mouth: 211ms).



SensoMotoric Instruments

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Conclusions

- ❖ The gaze of typical developing European Portuguese-learning infants at 5-6 months follows a similar pattern as reported for other languages, by showing gaze fixations to the **eye region** before the **onset of canonical babbling**.

Future directions...

- ❖ Future research should include other ages, as well as clinical populations to observe how visual attention supports language development.
- ❖ Eye gaze of typical developing (TD) children has been compared to children with **Autism Spectrum Disorders** (ASD), because autism is a social-communicative disability characterized by atypical gaze to faces often accompanied by delays in language, and by deficits in audiovisual integration;
- ❖ Indeed, research showed that TD children look more to the mouth of the speaker than ASD children (Irwin & Brancazio, 2014; Johnels et al., 2014);
- ❖ In ongoing research we are examining how an atypical pattern of gaze to a speaking face can be an early marker of atypical development.

Take home message...

- ❖ These results set an important foundation for studies of language development, social interaction and clinical intervention.

Thank You!

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