

## **From the eye to the mouth: does a developmental shift in attention co-emerge with the emergence of babbling?**

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Speech is a biologically anchored behavior emerging very early in development. However, little is known about the articulatory mechanisms supporting infants' first linguistically-relevant speech exemplars as well as their processing of articulatory information from their environment, in particular in dyadic communicative situations. The present study aims to investigate the interaction of those two processes over developmental time. In the past decades, various studies have outlined the importance of audiovisual integration for speech perception (e.g., [1], [2]), and its production ([3], [4]) in the young age. More recently, a developmental shift in how facial information is processed by infants has been noted, from a focus on the gaze area to increasing attention on speakers' mouth between 8 and 12 months of age ([7]). A relation between both developments has been suggested based on the temporal co-occurrence of babbling and the gaze shift [7].

This study expands on previous findings by investigating German infants' attention to audiovisual (AV) versus unimodal speech (visual only, V) together with their vocal repertoire. We recorded eye movements in 60 monolingual German infants from 6 to 11 months of age in an AV versus V speech perception task. Only babies who did not present any hearing, vision or motor impairment were selected for the study. During the test, infants were sitting on their parents' lap, facing a computer screen on which an eye-tracker (SMI red-m) as well as a video camera were clipped. Infants were presented with audiovisual (AV) or visual (V) exemplars of the isolated vowels /i/ and /a/ pre-recorded by a German native female model speaker. Vowels were chosen because their perception is acquired early in development (i.e., around 6ms, [8]; [9]). The procedure consisted in 5 randomized repetitions of each vowel in each condition. Parents also filled in a detailed questionnaire that included infants' vocal habits. An additional questionnaire assessing infants' vocabulary will be sent at 18 months to test for a developmental relation between attention and lexical growth.

To test for a developmental shift in attention, we determined looks with respect to three regions of interest (ROIs, Figure 1): the eye area, the mouth area, other looks on the face. Using LMERS, we then tested for an effect of experimental condition (AV, V), age (6-7, 8-9, 10-11), vowel (/a/, /i/) and ROI (gaze, mouth, face) on infants' total looking time (in ms) as the dependent variable. Looking times per ROIs were determined in relation to the total amount of looking time on the face of the model speaker and calculated as a ratio per condition, per vowel, and per child, following the 'eye-mouth index' method used by [10].

Because data analysis is in progress, we only outline our specific predictions. Overall, we anticipate all infants (regardless of age) to look longer at the model speaker's face (one of the 3 ROIs) in AV condition as compared to V only because this condition approximates natural speech conditions from which infants have been exposed. We expect greater attention to the mouth area in 8-10 months German infants as compared to younger infants (6-7 months of age) and a correlation with their vocal habit as reported in parental questionnaires.

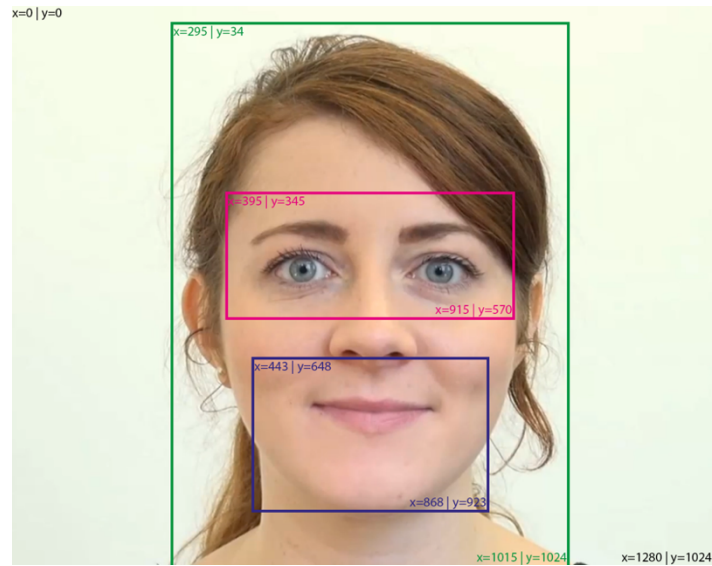


Figure 1. Regions of interests (ROIs) selected in the eye-tracking study design. Eye area (red), Mouth area (Blue) and additional face area (green).

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