# The effect of face orientation on audiovisual speech perception in infancy: an eye-tracking study

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## Introduction

•Across the first year of life infants become increasingly attuned to native speech and they loose the ability to discriminate between non-native phonemes[1]
•Around 9 months of age infants gradually shift from featural to configural face processing, as marked by the emergence of the face inversion effect[2]
•Infants shift from looking to the eyes towards looking to the mouth around 9 months of age, and back to the eyes around 12 months of age[3]

•Hypothesis: Face inversion will affect the patterns of face scanning and the processing of audiovisual speech information

**Aims**
•Investigate visual scanning of upright and inverted talking faces in infancy
•Compare scanning of audiovisually congruent and incongruent syllables
•Assess the impact of face orientation on AV speech perception

## Methods

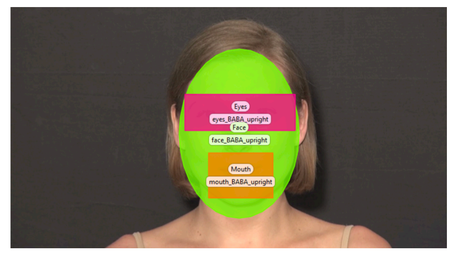
**Participants**
Overall 173 infants between 5 and 14 months were tested; included in analyses:
•40 infants between 5 and 7 months (17 girls, mean age 5.8 months)
•42 infants between 9 and 11 months (19 girls, mean age 9.9 months)
•30 infants between 12 and 14 months (11 girls, mean age 13 months)

**Stimuli**

Videos of syllable articulation (10s long, 10 articulations of each syllable), upright and inverted faces. Eyetracker Tobii T60XL, 60 Hz

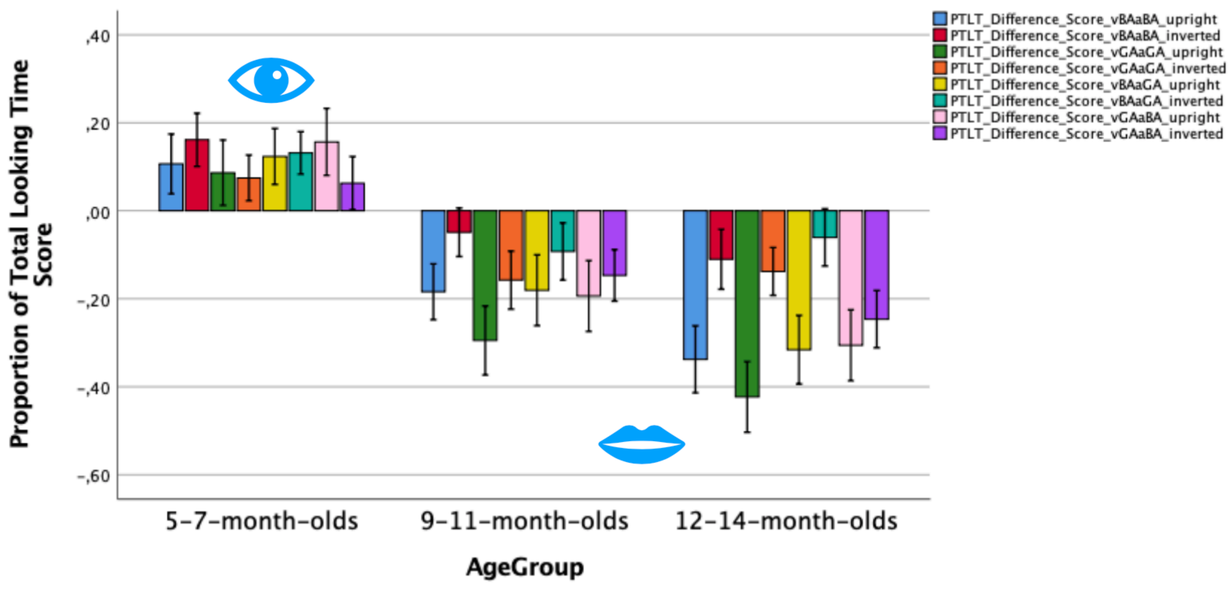
| Congruent: | Incongruent: |
|---|---|
| vBAaBA upright | vBAaGA upright: mismatch |
| vBAaBA inverted | vBAaGA inverted: mismatch |
| vGAaGA upright | vGAaBA upright: fusion |
| vGAaGA inverted | vGAaBA inverted: fusion |

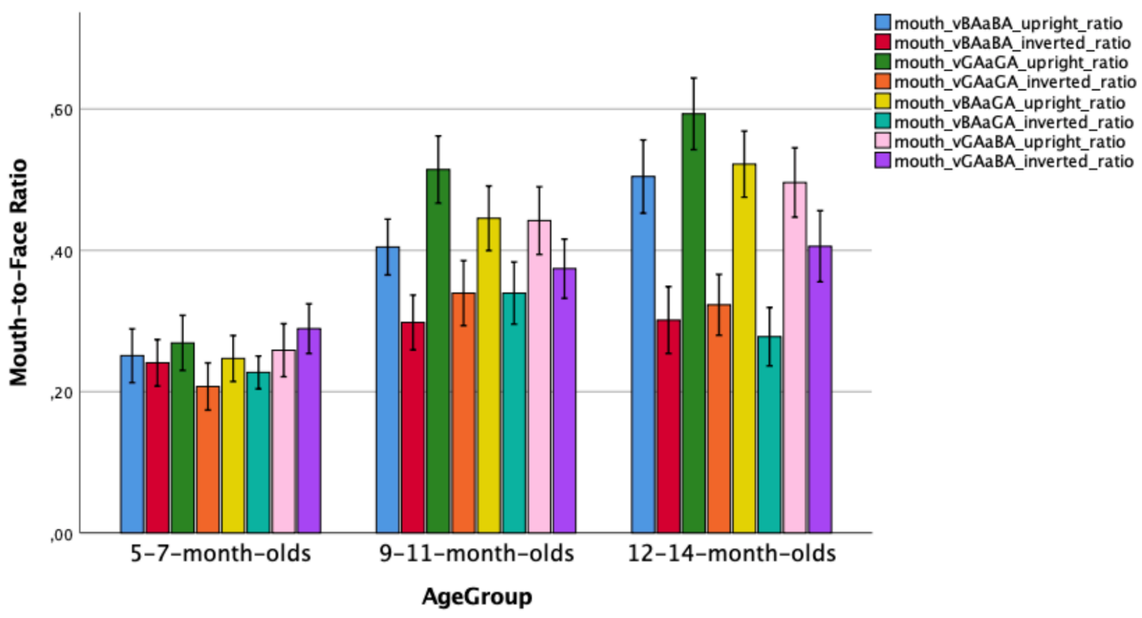
**Areas of Interest**




Total looking duration extracted in 3 AOIs

## Results




**Proportion of Total Looking Time Difference Score**
•A positive PTLT Difference Score indicates a preference for the eyes, whereas a negative Difference Score indicates a preference for the mouth
•Error bars indicate standard error
•Main effects of Speech Condition, Face Orientation and Age Group
•Interaction between Speech Condition and Face Orientation
•5-month-olds: preference for the eyes
•9-month-olds & 12-month-olds: preference for the mouth, especially in upright conditions

**Looking to the mouth**
•Main effects of Speech Condition, Face Orientation and Age Group
•Interactions: Age Group x Face Orientation; Speech Condition x Face Orientation
•5-month-olds looked less at the mouth of the upright faces than both older groups
•Both older groups looked longer at the mouth of upright than inverted faces
•Infants looked longer at the mouth of the upright than inverted faces in three speech conditions (vBAaBA, vGAaGA, vBAaGA) but not in vGAaBA

## Conclusions

•This study showed that 5-7-months-old infants look relatively longer to the eyes than to the mouth of the upright faces articulating syllables, whereas older infants, 9- and 12-month-olds, look relatively longer to the mouth than to the eyes
•Face inversion effect is present in infants from 9 months of age - around the time when infants start to produce canonical babbling, they also prefer looking at the upright than inverted face
•Face inversion effect was present only in speech conditions in which infants looked longer at the mouth than at the eyes region of the articulating faces: both congruent ones and vBAaGA but not the fusible incongruent one (vGAaBA)

- **Face inversion affects audiovisual speech perception in infancy**

## References

1)Werker, J. F., & Tees, R. C. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant Behavior and Development*, *7*(1), 49–63.
2)Cashon, C. H., & Holt, N. A. (2015). Developmental Origins of the Face Inversion Effect. *Advances in Child Development and Behavior*, 117–150.
3)Lewkowicz, D. J., & Hansen-Tift, A. M. (2012). Infants deploy selective attention to the mouth of a talking face when learning speech. *Proceedings of the National Academy of Sciences*, *109*(5), 1431–1436.

## Acknowledgements

This study was funded by the Polish National Science Center, 2016/23/B/HS6/O3860. The authors would like to thank all the parents and infants who contributed to this study, A. Dopierała, A. Malinowska-Korczak, D. Ilyka and M. Szmytke for their help with data collection, and P. Tomalski for his supervision and guidance.