

Dear Members of the National Academy of Science,

Please find enclosed our manuscript entitled *Infants' Preference for Speech Decomposed: Meta-analytic Evidence*, which we wish to submit for publication in PNAS.

Vocal communication is crucial for a broad range of social species, and yet very few animal groups have complex vocalizations that are learned (humans, bats, cetaceans, songbirds, parrots and hummingbirds). The rarity of vocal learning among animals and its evolution in these distantly related species raises questions about the developmental mechanisms behind vocal learning. Current theories state that this capacity would be rooted in a processing advantage for communicative vocalizations. In humans, this processing advantage would manifest as a capacity to preferentially orient one's attention to speech sounds, a capacity that would gradually emerge during the first year of life. One theory argues that speech preference develops from familiarity with the sound patterns of the language to which infants are exposed. Another argues that the auditory system has evolved to process natural sounds the most efficiently, in which case speech would initially not be distinguished from other natural sounds. A third theory argues that infants initially process vocal sounds from various species as a broad category, and narrow it to speech during the first year of life.

In this paper, we gather all the available literature on the emergence of speech preference in human infants, and leverage meta-analysis to integrate results from experiments that used different stimuli at different ages. This allows us unprecedented power to examine current theories. Our analysis of data from 776 infants across 38 different experiments demonstrates that from birth, infants preferentially orient their attention toward speech. Infant's preference for speech does not depend on the language used, whether the competitor sound is vocal or non-vocal, natural or artificial; and is extremely stable across the first year of life. As such, our results provide evidence for yet another theoretical perspective, where from birth, human cognition is setup to discriminate speech from other natural or vocal sounds, in a way that is flexible enough to be independent of the language spoken. As these results strikingly parallel the development of face perception, we additionally argue that this capacity could be a gate to social cognition.

Uncovering the cognitive architecture enabling the development of vocal communication is one of the most intriguing questions nowadays, be it from an evolutionary, biological, or psychological perspective. We think that our approach to use meta-analysis to investigate this theoretical question at the scale of the literature, as well as the insights gained, would be of great interest for a large public from psychology to systems neuroscience, but also ethology and evolutionary biology.

We make our meta-analytic data and reproducible analysis scripts publicly accessible online; with links provided in manuscript.

This work has not been published previously, and is not under consideration for publication elsewhere.

Best regards,

Cécile Issard, Sho Tsuji, and Alejandrina Cristia

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**Authors' contribution:** Cécile Issard collected the meta-analytic data, with input from Alejandrina Cristia. Cécile Issard, Sho Tsuji, and Alejandrina Cristia analyzed data. Cécile Issard and Alejandrina Cristia wrote the manuscript. Cécile Issard, Sho Tsuji and Alejandrina Cristia reviewed the manuscript.