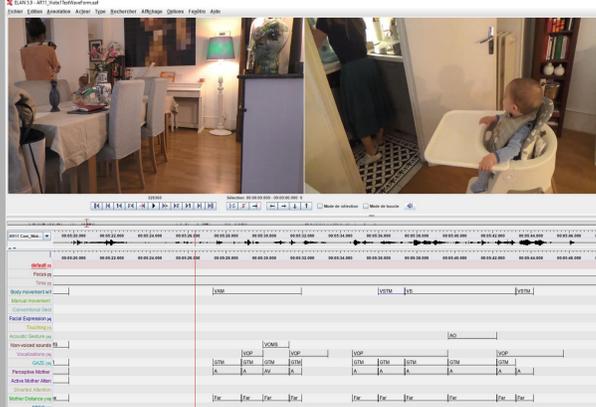


INTRODUCTION

Evo-devo hypotheses stipulate that vocal control may have appeared in the human lineage as a means to attract and maintain parental attention and investment (i.e., *Theories of the attentional conflict*). Interestingly, non-human primates also communicate using distinct sensory modalities (e.g. Hobaiter & Byrne, 2011) and many studies investigated the acquisition of specific communication signals in preverbal infants. Comparative studies run on both human infants and immature chimpanzees suggest using two descriptors of attention-sensitive communication: *unimodal* and *cross-modal* adjustments. That is why, our study seeks to expand these collective findings in realizing the first systematic investigation of the sensory modalities used by 7-to-20-month-old infants to communicate with their mother in naturalistic conditions.

METHOD

Participants 30 mother-infant dyads (11 female and 19 male infants) coming mainly from urban area (Toulouse, France). **Procedure and design** Dyads were observed in naturalistic conditions at home during the context of meals (lunch, dinner, afternoon snack time). Each dyad was observed twice for an average of one hour, one month apart. **Data collection** Quantitative behavioural data were collected on videos using an individual focal sampling approach on the infant (Altmann, 1974).



RESULTS

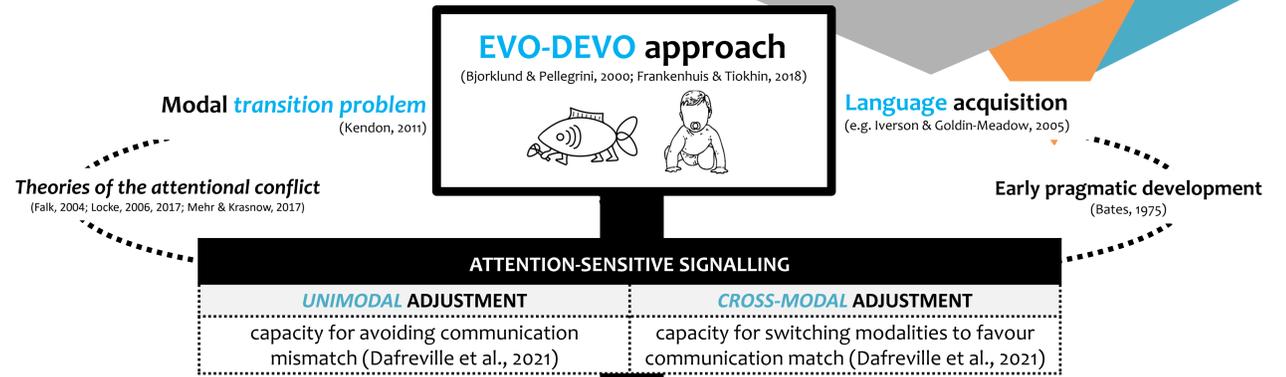
- Maternal visual attention and IDS were the most influencing factors on infants' selection of signal modality.
- Infants displayed *unimodal* adjustment from 8 months of age.
- Infants displayed *cross-modal* adjustment from 11 months of age.
- When mothers did not show visual attention, infants preferred audible over contact signals to address their mother.
- Within audible signals, they preferred oral signals over audible gestures only when the mother was talking to them.
- Infants produced most combinations in front of a visually attentive mother, whether she was talking or not.

DISCUSSION

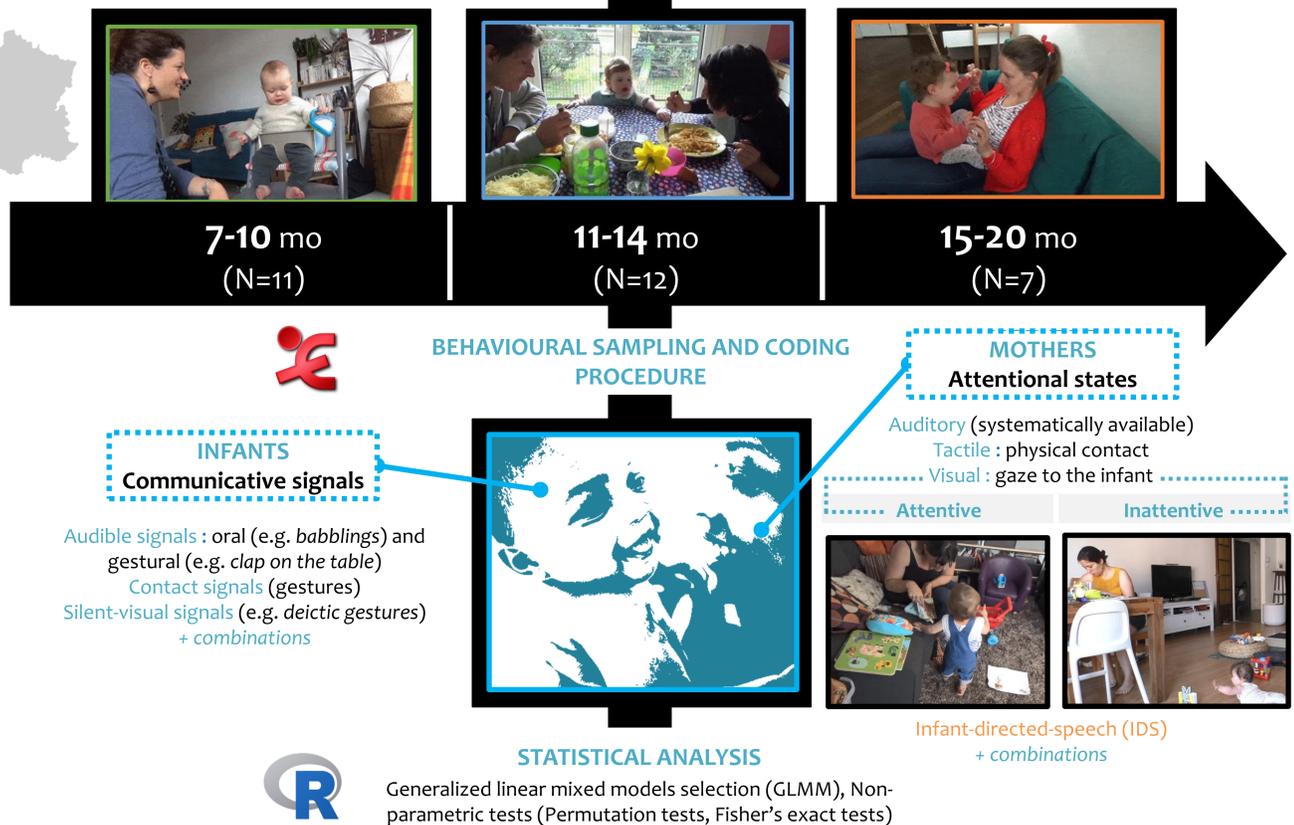
- Unimodal* adjustment emerges earlier than previously thought.
- Mediating effects of IDS went in concurrent directions according to whether *unimodal* or *cross-modal* adjustment was considered. The pattern of unimodal adjustment was steeper and appeared earlier in front of talking mothers while cross-modal adjustment was steeper when the mothers were silent.
- Infants displayed *unimodal* adjustment before *cross-modal* adjustment while young chimpanzees display an opposite order of appearance (Dafreville et al., 2021).

CONCLUSION

By using an ethological design and an extended behavioural repertoire, our study is the first to give a comprehensive overview of the development of attention-sensitive signalling. In a comparative perspective, human infants' developmental trajectory differs from the chimpanzees. This calls for further comparative analyses with other species as well as other human populations to unravel the modal transition problem in language evolution and acquisition (Kendon, 2011).

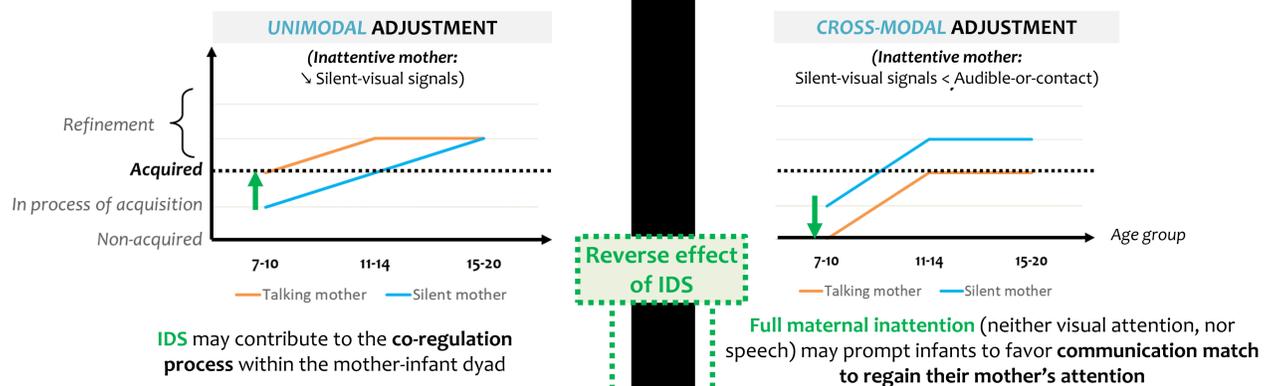


Do and how 7-to-20-month-old infants adjust their signals to the mother's visual attentional state?
Do and how Infant-directed-speech (IDS) and physical contact may affect the development of these adjustment capacities?



Age Range	ATTENTION-SENSITIVE SIGNALLING			
	UNIMODAL ADJUSTMENT		CROSS-MODAL ADJUSTMENT	
	deploy fewer silent-visual signals when the recipient did not show visual attention as compared to when she did (Permutation Test)		deploy more audible-or-contact signals that could be perceived when the recipient did not show visual attention as compared to when she did (Fisher's exact Test)	
	Talking mother (IDS)	Silent mother (No-IDS)	Talking mother (IDS)	Silent mother (No-IDS)
7-10 mo	p = 0.006, N=11	NS*	NS	NS
11-14 mo	p = 0.001, N=12	p = 0.003, N=12	OR = 0.543, p = 0.007, N=12	OR = 0.524, p < 0.001, N=12
15-20 mo	p = 0.047, N=7	p = 0.047, N=7	OR = 0.554, p = 0.036, N=7	OR = 0.168, p < 0.001, N = 7

*Infants showed unimodal adjustment only when older than 8 months (before 8: Permutation Test, p = 1, N = 4; from 8 to 10: Permutation Test, p = 0.031, N = 5).
Note: Unimodal adjustment was significantly more shaped in front of talking mothers than silent mothers in 7-10 and 11-14 months of age (7-10: Fisher Test, OR = 2.452, p < 0.001, N = 11; 11-14: Fisher Test, OR = 3.154, p < 0.001, N = 12; 15-20: Fisher Test, OR = 1.092, p = 1, N = 7). Cross-modal adjustment was significantly more shaped in front of silent mothers than talking ones' regardless age group (7-10: Fisher Test, OR = 0.454, p < 0.001, N = 11; 11-14: Fisher Test, OR = 0.285, p < 0.001, N = 12; 15-20: Fisher Test, OR = 0.084, p < 0.001, N = 7).



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