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Concurrent associations between parent-infant engagement and cortical selectivity to social stimuli in five-month-old infants

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Introduction

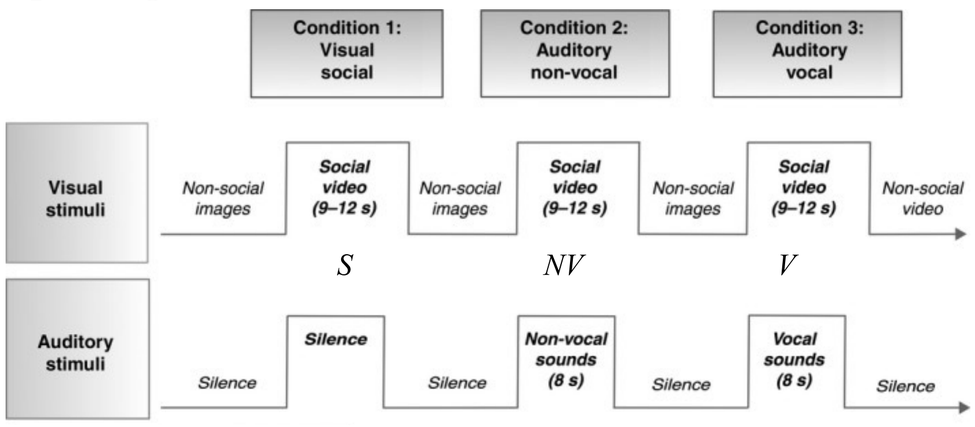
- Infants show selective processing of social vs non-social visual and auditory stimuli in the first year of life [1].
- Infant (e.g. ASD), caregiver (e.g. parenting) and familial (e.g. SES) factors have been linked to selective processing of social stimuli [2, 3].
- While most studies quantify these factors using global measures, observable behaviours in parent-infant interactions (PCI) were linked to various aspects of brain development [4].
- **Aims**: (1) to test whether infant-caregiver behaviours coded from PCI are related to cortical specialization to social stimuli (Study 1); (2) replicate and extend the findings toward a socially diverse sample (Study 2).

Methods

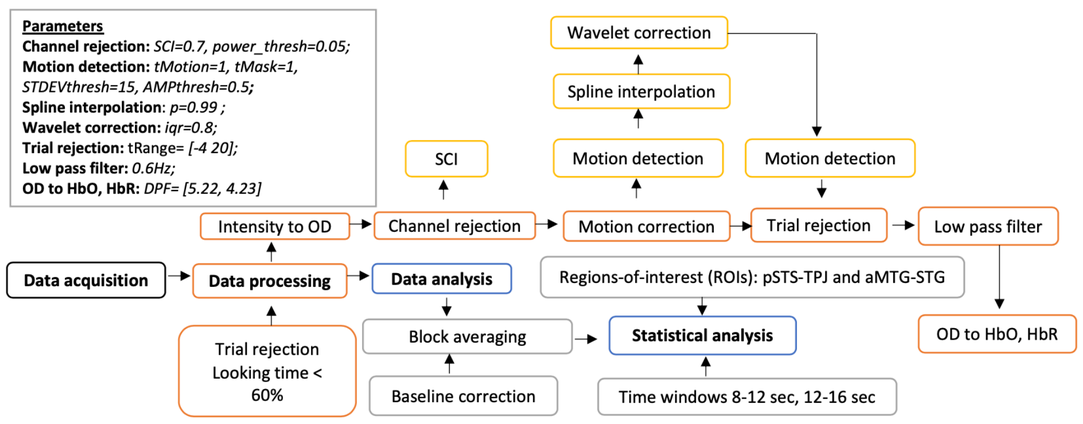
- British infants, 4-5 months old, **final sample** after pre-processing:

Study 1 - BRIGHT project (https://www.globalfnirs.org/): n= 28;
Study 2 – BASIS project (https://www.basisnetwork.org/): n=59.

- **PCI measures (IVs):** 4 min of unstructured no-toy play coded for:
  - Individual social behaviours of infant and caregiver
  - Dyadic behaviours: mutual gaze (MG) and dyadic engagement (DE).
- **fNIRS paradigm**:



- Signal **pre-processing pipeline**:

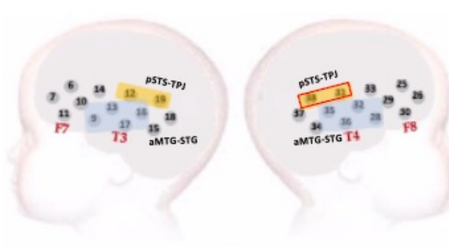


- **ROIs:** Channel groups were based on previous studies [1,3]
- **Measures of selectivity (DVs)**: Visual– visual social relative baseline; Auditory– auditory vocal relative to auditory non-vocal sounds.

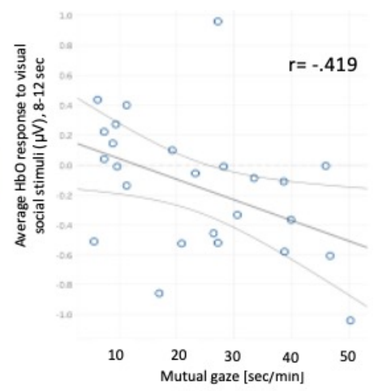
Results

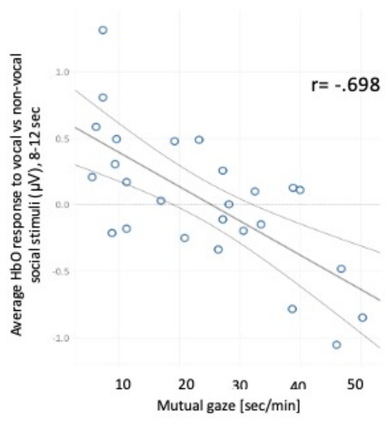
Study 1: Results from the BRIGHT project

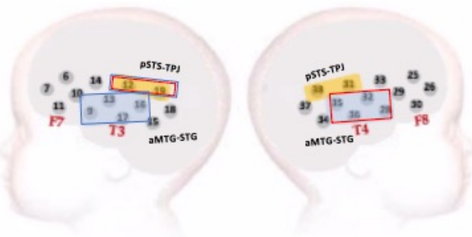
Only **HbO** findings are presented in these graphs.



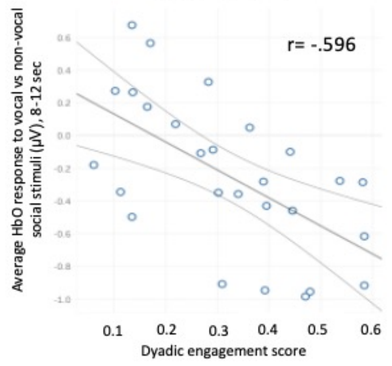
Social visual selectivity (S)





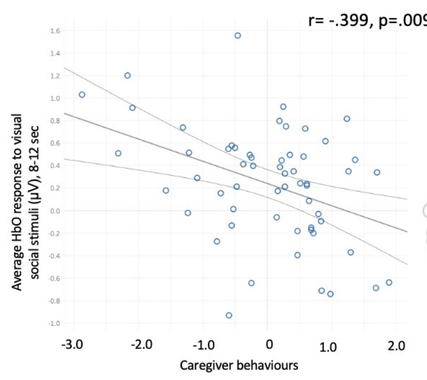


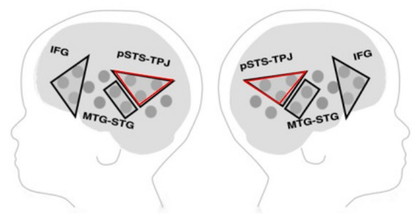
Social auditory selectivity (V vs NV)



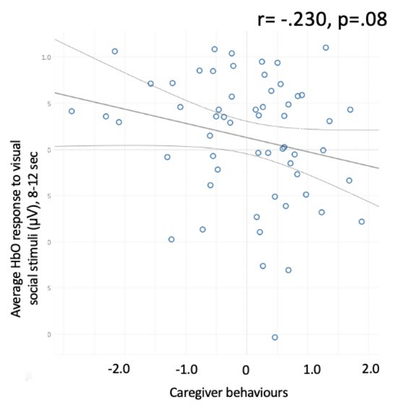
- **HbO:** Negative associations with MG and *social visual selectivity* in the right pSTS-TPJ (8-12 sec); infant behaviours/MG/DE and *social auditory selectivity* in the left pSTS-TPJ (8-12 sec,12-16 sec) and right aMTG-STG (8-12 sec);
- **HbR:** Positive associations with *social auditory selectivity* and MG/DE in the left ROIs (8-12 sec, 12-16 sec).

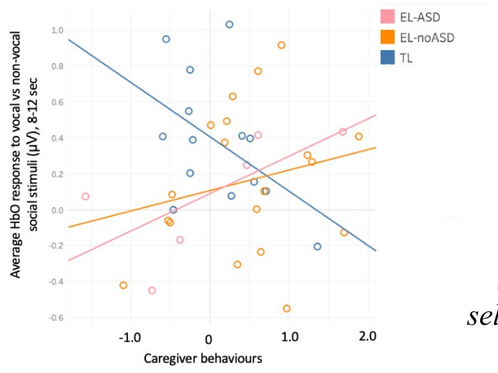
Study 2: Results from the BASIS project (17/59 TL infants)

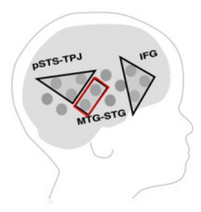




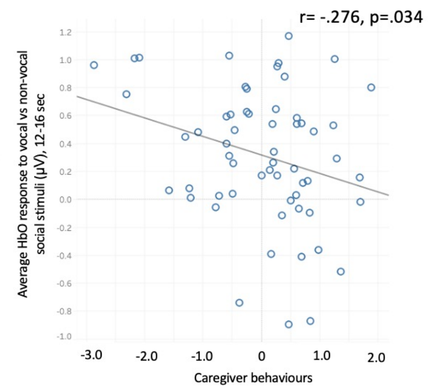
Social visual selectivity (S)







Social auditory selectivity (V vs NV)



- **HbO:** Negative associations with caregiver behaviours and *social visual selectivity* in the left pSTS-TPJ (8-12 sec, 12-16 sec), and *social auditory selectivity* in the right aMTG-STG, esp. for TL infants (8-12 sec; 12-16 sec).
- **HbR:** No associations

Discussion and Conclusions

- Contrary to initial predictions, parent-infant behaviours – measured individually and dyadically – were negatively associated with cortical selectivity to social stimuli (in HbO) in both studies, meaning that more engaged interactions were linked to reduced socially selective responses.
- One interpretation is that babies who experience engaging interactions need fewer resources to process social stimuli. Study 2 further demonstrated that these associations may differ for infants at EL for ASD, for whom engaging interactions could have mitigating effects on cortical responsivity, which was reported to be reduced in previous studies [3].

Abbreviations

ASD = Autism Spectrum Disorder; TL= typical likelihood ; EL = elevated likelihood
PCI = parent-infant interaction; MG = mutual gaze; DE = dyadic engagement
S= silence; V = vocal; NV = non-vocal;
ROI= region of interest; SES = socio-economic status
pSTS-TPJ = posterior superior temporal sulcus –temporo-parietal junction
aMTG-STG = anterior medial temporal gyrus – superior temporal gyrus

References

[1] Lloyd-Fox et al., (2018), Developmental Cognitive Neuroscience 45;
[2] Perdue et al (2018). Developmental science, 00:e12839.;
[3] Lloyd-Fox et al (2018). *The European journal of neuroscience*, *47*(6), 736–749.
[4] Ilyka, D et al., (2021). *Neuroscience and biobehavioural reviews*, *130*, 448–469.