BRAIN-TO-BRAIN SYNCHRONY IN PARENT-CHILD DYADS FOLLOWING PRETRM BIRTH COMPARED TO TERM-BORN CHILDREN

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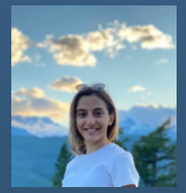
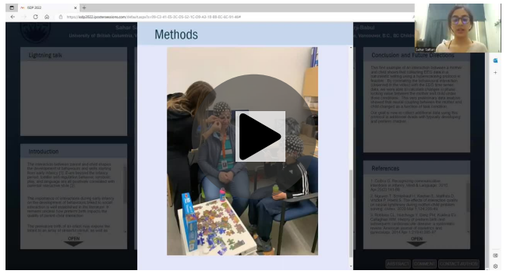


Lightning talk



Introduction

The interaction between parent and child shapes the development of behaviours and skills starting from early infancy [1]. Even beyond the infancy period, toddler self-regulation behaviour, symbolic play, and language are all positively correlated with parental interactive style [2].

The importance of interactions during early infancy on the development of behaviours linked to social interaction is well established in the literature. It remains unclear how preterm birth impacts the quality of parent-child interaction.

The premature birth of an infant may expose the infant to an array of stressful stimuli, as well as

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Methods

Participants: Ten dyads (Mother-Toddler) will be recruited, of which five will be typically developing children and five will be born preterm. All toddlers will be between the ages of 2 and 6 years old.
For the purpose of this poster, we recruited one dyad with a typically developing child of 5.5 years to show proof of principle of the hyperscanning method in a naturalistic setting.

Experimental procedure: All mother-toddler dyads will participate in three different conditions. In the baseline condition, both the mother and toddler will sit in front of a screen and watch a child friendly video independently. They will not interact or speak to each other during this session. There will be two different social interaction conditions in a naturalistic environment. In both these conditions, the mother and child will sit facing each other across a small table. The first social interaction condition will be to play a game using soap bubbles. The mother will blow bubbles and encourage her child to catch them with a bubble wand. During the second task the dyad will work on a puzzle together. Mothers and toddlers will be instructed to engage in free verbal conversation during each task. Each task will be 3 to 5 minutes.
The complete procedure will be video recorded.

Data acquisition and preparation: Simultaneous EEG data will be recorded from participants using 64-channel EGI system (EGI, Eugene Oregon). Two separate computers and amplifiers will be used which are connected to a clock box for synchronization. The start of each experiment will be marked on both data sets by the experimenter pushing a button which is connected to the same clock box.
Preprocessing steps include Re-referencing (to the average of all channels), filtering (0.5 - 35 Hz) and Independent Component Analysis.

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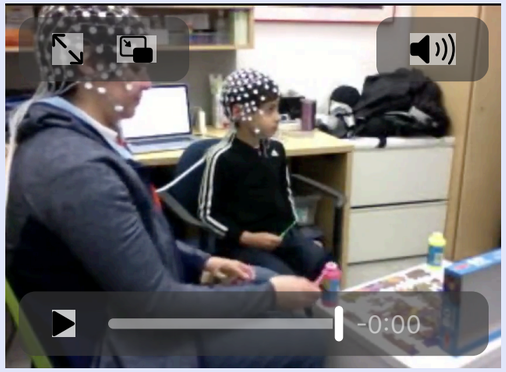
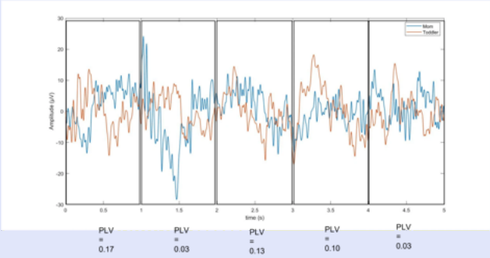
Results



Signal from channel F3 (as an example channel) corresponding to the video



Average Phase Locking Value (PLV) – complete 3.5 minutes of each task

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Conclusion and Future Directions

This first example of an interaction between a mother and child shows that collecting EEG data in a naturalistic setting using a hyperscanning protocol is feasible. By correlating the behavioural interaction (observed in the video) with the EEG time series data, we were able to calculate changes in phase locking value between the mother and child under three conditions. This very preliminary data analysis showed that neural coupling between the mother and child changed as a function of task condition.

Our goal is now to collect additional data using this protocol in additional dyads with typically developing and preterm children.

References

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2. Nguyen T, Schleihauf H, Kayhan E, Matthes D, Vrtička P, Hoehl S. The effects of interaction quality on neural synchrony during mother-child problem solving. cortex. 2020 Mar 1;124:235-49.

3. Robbins CL, Hutchings Y, Dietz PM, Kuklina EV, Callaghan WM. History of preterm birth and subsequent cardiovascular disease: a systematic review. American journal of obstetrics and gynecology. 2014 Apr 1;210(4):285-97.

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