



Characterizing Social Interactions via Dyadic Hyperscanning Techniques



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Introduction

- Investigating social interaction through the lens of cognitive neuroscience is still in need
- Hyperscanning, the simultaneous recording of brain activity from multiple subjects, provides opportunities to investigate interactions in context
- As the most fundamental social unit, research on dyads informs group-based neuroscience research
- Electroencephalogram (EEG) provides high temporal clarity that allows for interactions to be adequately characterized

Research Question

How has dyadic hyperscanning been implemented?

- What types of social interactions can be investigated using this paradigm?
- What is the outcome measure?
- What's the advantages of mobile equipment?

Approach

- Summarize and synthesize studies using dyadic hyperscanning EEG paradigms
- Provide future study implications using this paradigm



Color Key

- Construct introduction
- Summarized results
- Implications for implementing paradigm

- Example: parent-child dyadic EEG hyperscanning

Basic Processes

Social gaze

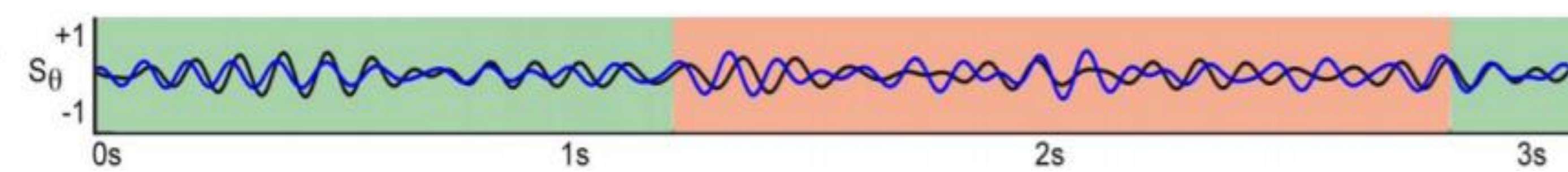
- Eye contact, a basic social behavior
- Social gaze facilitates higher quality communication between infants and adults and promotes higher brain synchrony

Speech Rhythm

- The duration and interval of speech between two voices
- Promotes higher brain synchrony in communication
- Allows investigation on the reciprocal processes (eye contact or speech rhythm) in communication

Joint movement

- A form of behavioral synchrony characterized by movement synchrony or imitation
- Positively correlated with alpha-band brain synchrony



(Dumas et al., 2010)

- Provides corresponding information on behavioral symmetry and brain synchrony

Complex Processes

Empathy

- Behaviors or brain activation led by emotional closeness
- Suggests physical contact may be associated with brain synchrony
- Allows reciprocal analysis of complex social-emotional interactions

Cooperation

- Behavioral and cognitive coordination toward one goal (including leader-follower interactions)
- Higher brain synchrony was found in preparation and coordination stages
- Suggests higher brain synchrony, but can be modified by social contexts

Competition

- Experiments evoke rivalry between participants
- Feedback modifies brain synchrony – positive feedback fosters competitive behaviors and decreases synchrony
- Allows for synchrony analyses on both symmetrical (mirrored) and asymmetrical (differentiated) behaviors
- Allows investigation of reciprocal interactions (cooperative or competitive) with contextual factors

Discussion

- Dyadic EEG paradigms have been implemented in basic and complex social interactions investigations
- Brain synchrony in different frequency bands was observed as the outcome measure

Future directions

- Due to relative immobility, most dyadic investigation happened within restricted laboratory settings
- With the development of mobile hyperscanning equipment, investigations of natural, in-context social interactions are becoming more and more viable
- Beyond dyads – explore potential individual-group interactions in classroom settings



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For references, please scan the QR code or refer to the handout. If you have any questions, please feel free to contact Ruohan Xia (ruohan.xia@outlook.com) or Tanya Evans (tanya@virginia.edu) at any time.