Synchrony in social interactions

For questions or help email:
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Jin Hyun Cheong
COSAN Lab
PSYC 53

1. Examples of synchrony in social interactions.

2. Quick tutorial on how to extract and analyze non-verbal features from your videos.
   - Facial expressions: https://tinyurl.com/openfacecolab
   - Body poses: https://tinyurl.com/openposecolab

If you'd like to follow along later…

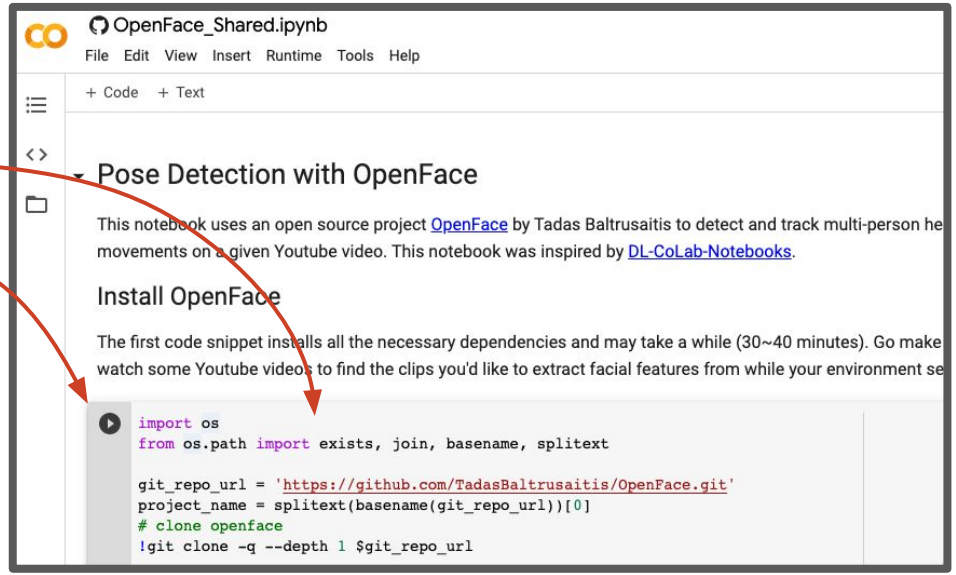
1. Enter following url in your browser: https://tinyurl.com/openfacecolab
2. Click the cell after "Install OpenFace", and then click the play button.
(You will need to log in to Google)

You'll see a screen like this.

1. Click in this cell

2. Click the play button to install necessary packages on your cloud computing notebook!

Installation takes ~40 min.



1. Examples of synchrony in social interactions.

2. Quick tutorial on how to extract and analyze non-verbal features from your videos.
   - Facial expressions
   - Body poses

For some reason, we take pleasure in synchronizing.

We like dancing together

We like singing together

We like laughing together

We even like to jump together

Why is synchrony important?

Chameleon effect (1999).

Therapist-patient synchrony predicts better clinical outcomes (2011).

Neural, emotion, and movement synchrony predict social connection (2018).

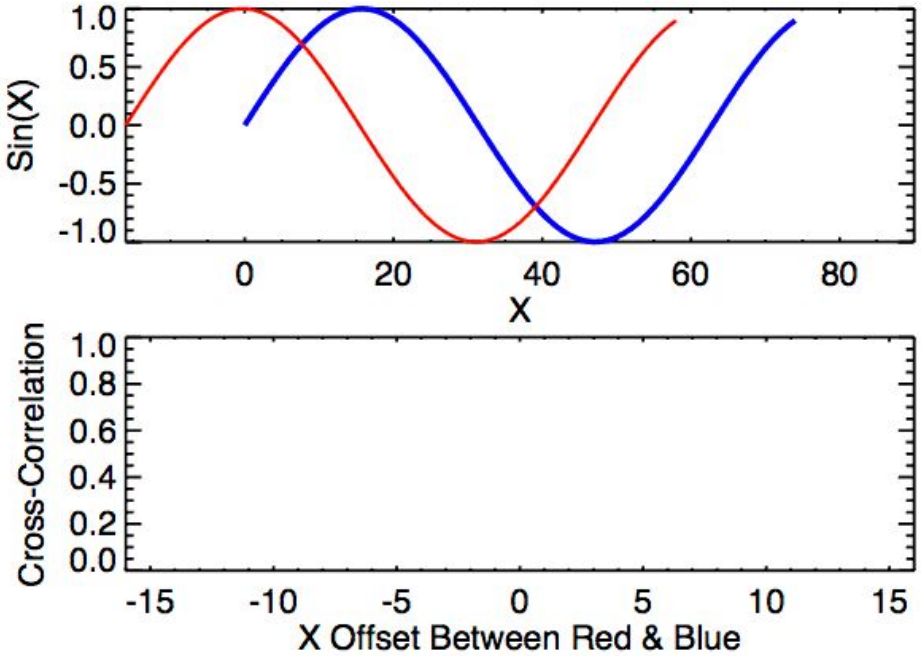
Time-lagged synchrony and social roles (leader-followers; 2015).

But what does synchrony mean?

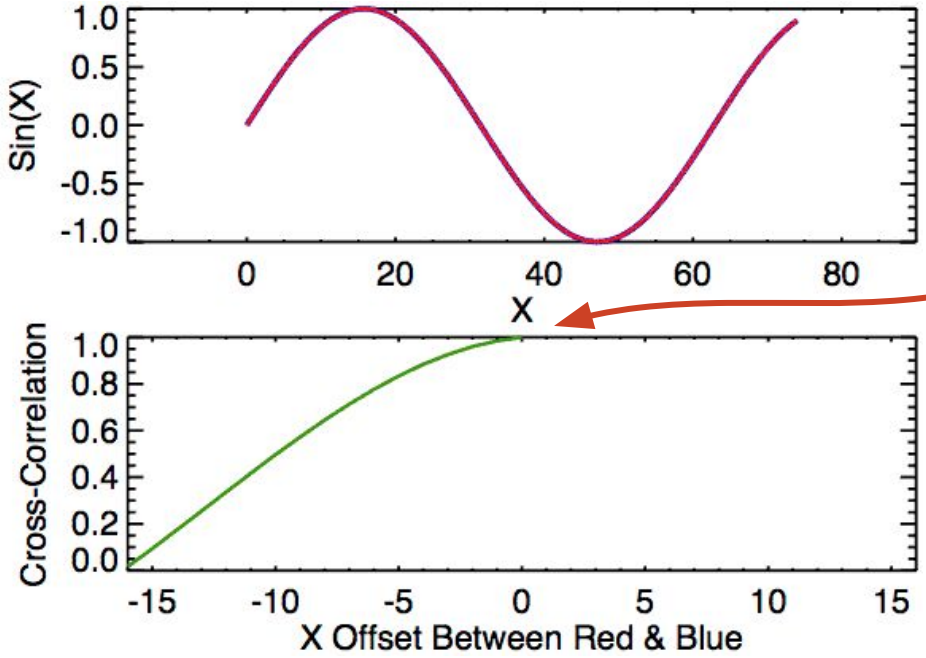
How do we define synchrony?

How do we define synchrony?

simultaneous action, development or occurrence

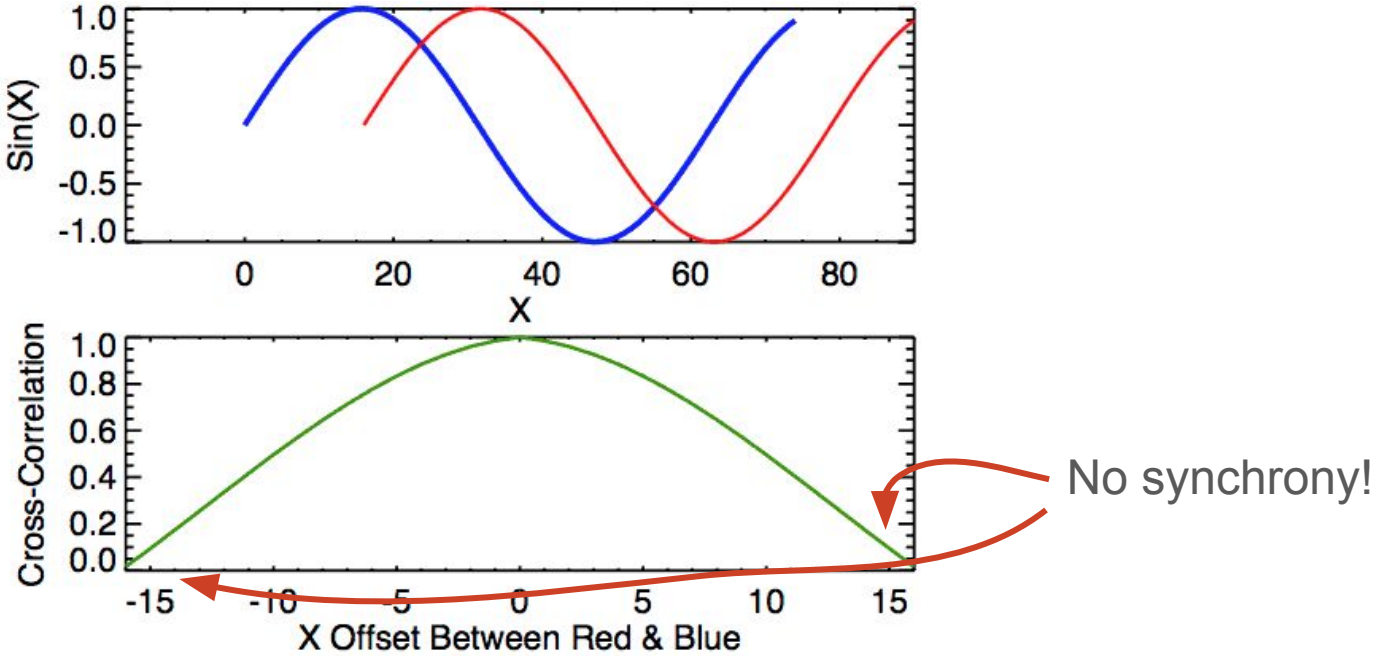


Perfect synchrony.

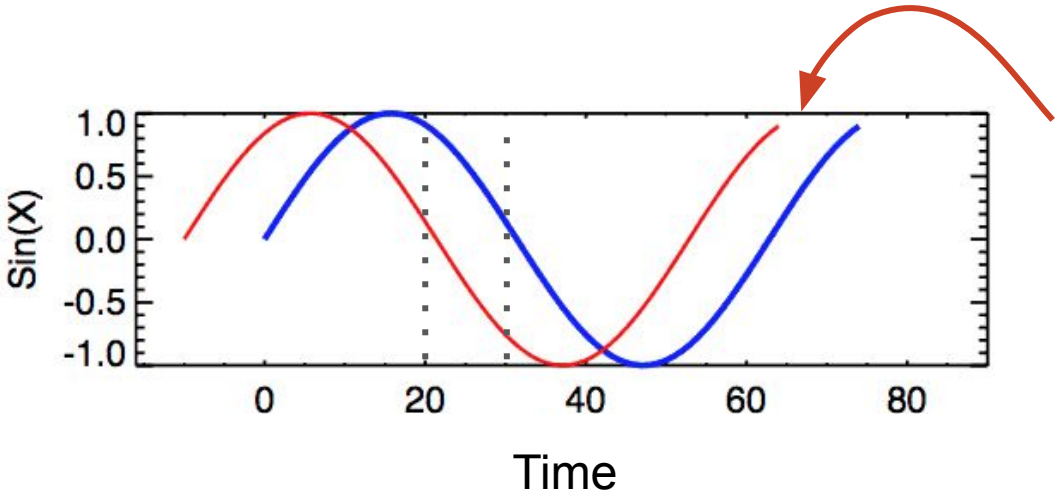


Most synchrony!

No synchrony



Mimicry or Time-lagged synchrony



Red: Leader
Blue: Follower

Red was 0 at t=20,
Blue hits 0 at t=30.

Where can we measure synchrony?

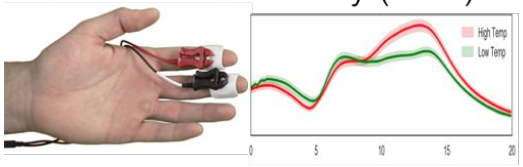
EEG

fMRI

fNIRS

facial expressions

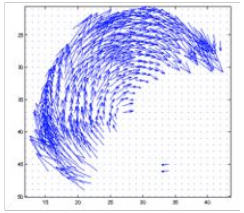
Electrodermal Activity (EDA)



Heart Rate (HR)

body movements

motion energy



Why is synchrony important?

Chameleon effect.

Therapist-patient synchrony predicts better clinical outcomes.

Neural and emotion synchrony predicts social connection.

Time-lagged synchrony can help predict social roles (leader-followers).

Chameleon effect

Journal of Personality and Social Psychology
1999, Vol. 76, No. 6, 893–910

0022-3514/99/$3.00

The Chameleon Effect: The Perception–Behavior Link and Social Interaction

Tanya L. Chartrand and John A. Bargh
New York University

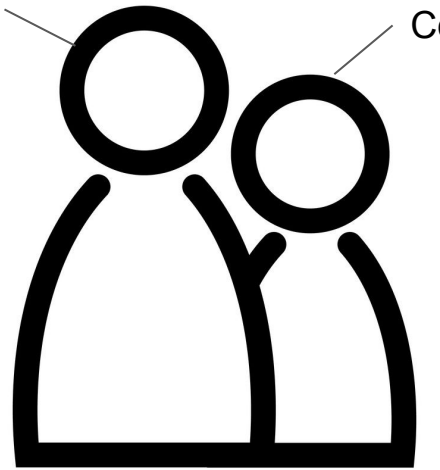
The *chameleon effect* refers to nonconscious mimicry of the postures, mannerisms, facial expressions, and other behaviors of one's interaction partners, such that one's behavior passively and unintentionally changes to match that of others in one's current social environment. The authors suggest that the mechanism involved is the *perception–behavior link*, the recently documented finding (e.g., J. A. Bargh, M. Chen, & L. Burrows, 1996) that the mere perception of another's behavior automatically increases the

Chameleon effect

Describe the photograph.

Participant

Confederate



Chameleon effect

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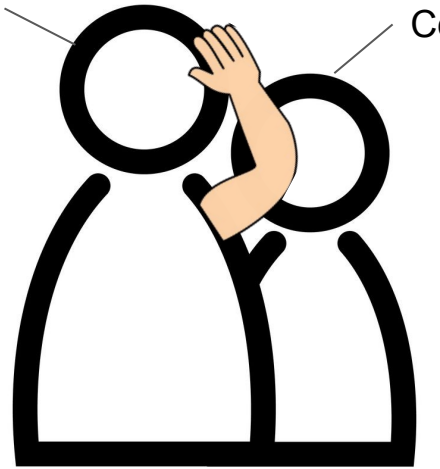


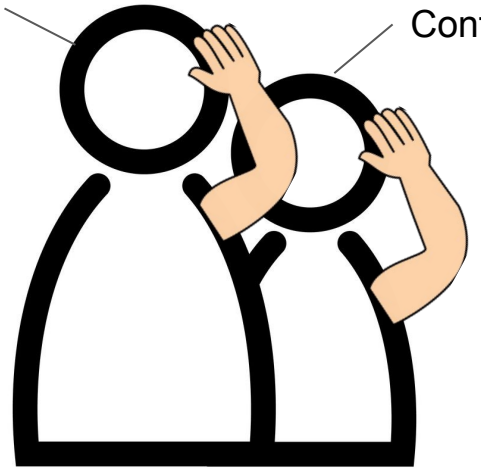
Control Condition

Chameleon effect

Describe the photograph.

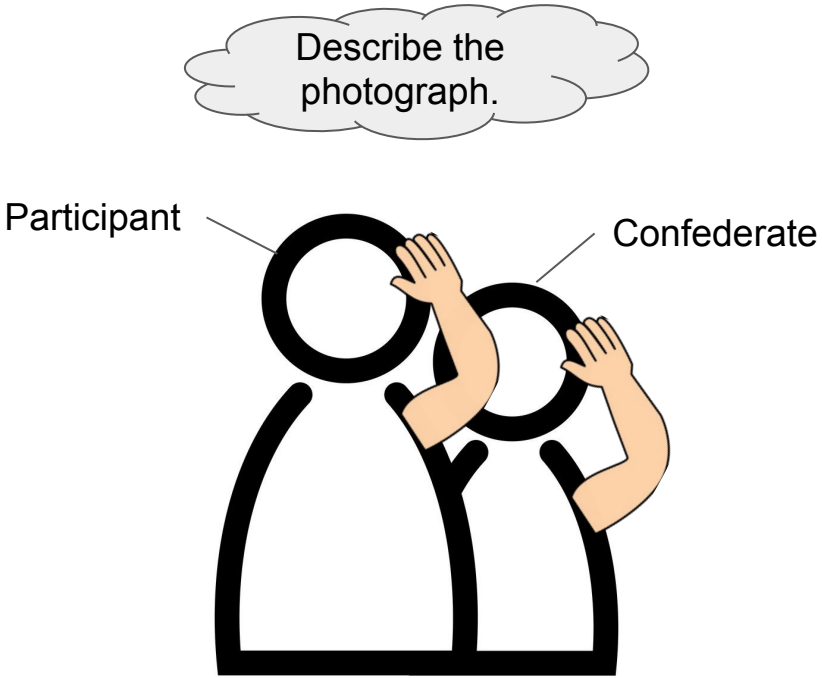
Participant

Confederate



Mimicry Condition

Chameleon effect

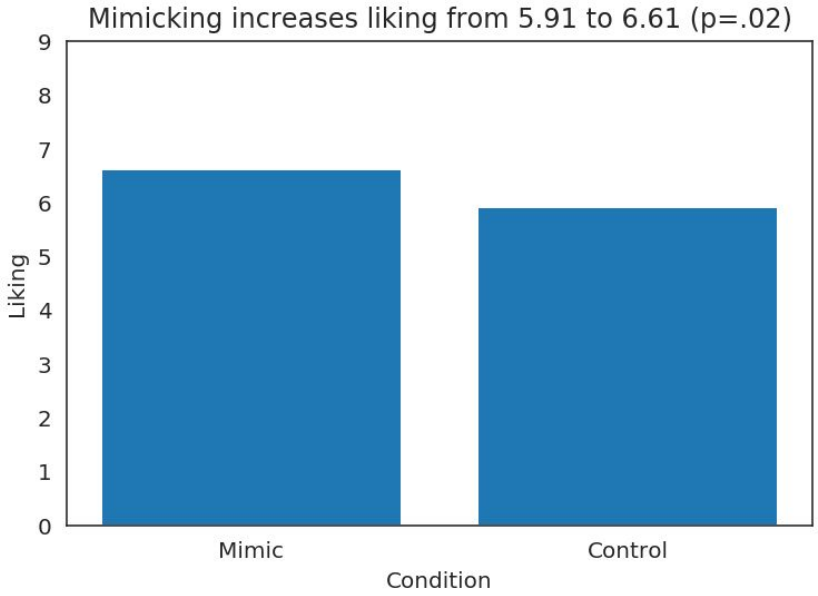


Will participants rate the mimicking confederate more “likable” than non-mimicking confederates (control)?

Will participants rate the interaction more “smooth” for mimicking than non-mimicking confederates (control)?

Chameleon effect

Participants rated the mimicking confederate more “likable” than non-mimicking confederates (control).



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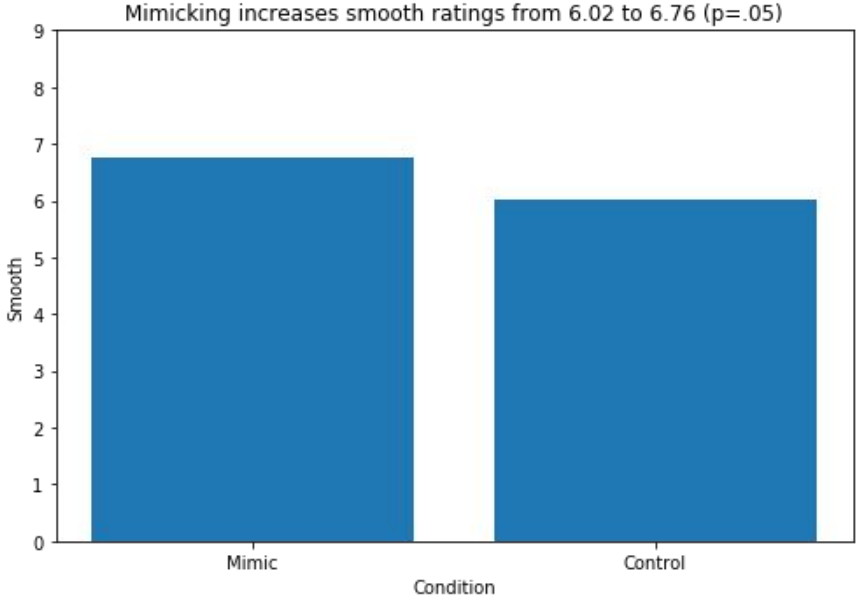
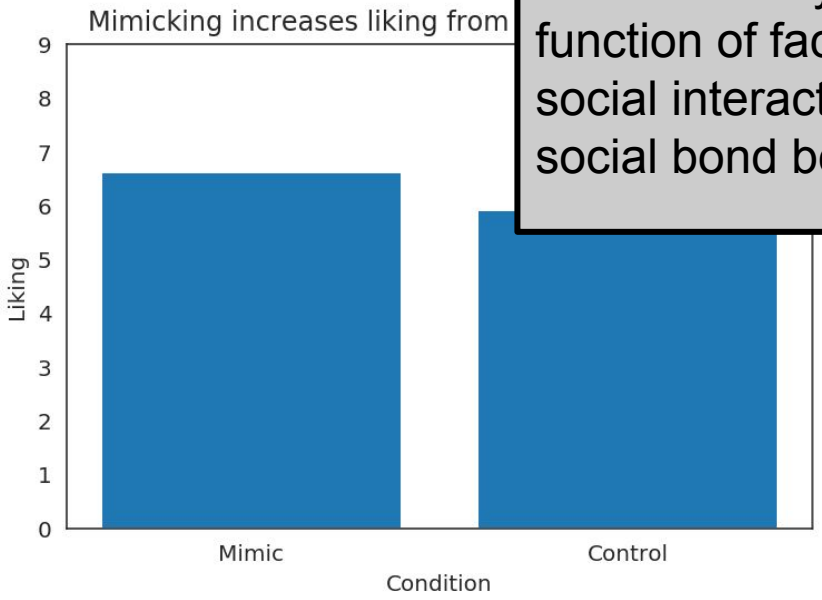


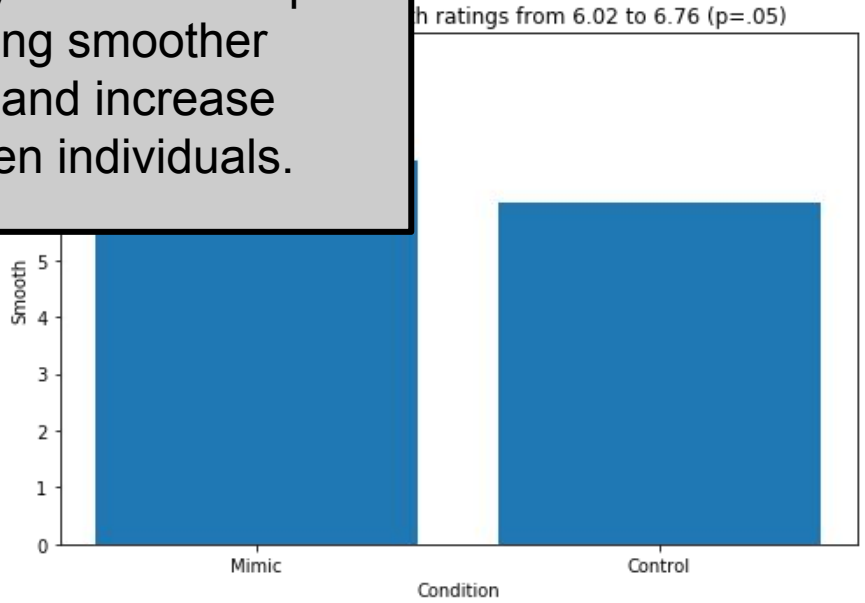
Chameleon effect

Participants rated the mimicking confederate more “likable” than non-mimicking confede

Participants rated the interaction more “smooth” for mimicking than federates (control).

Motor mimicry may have an adaptive function of facilitating smoother social interactions and increase social bond between individuals.





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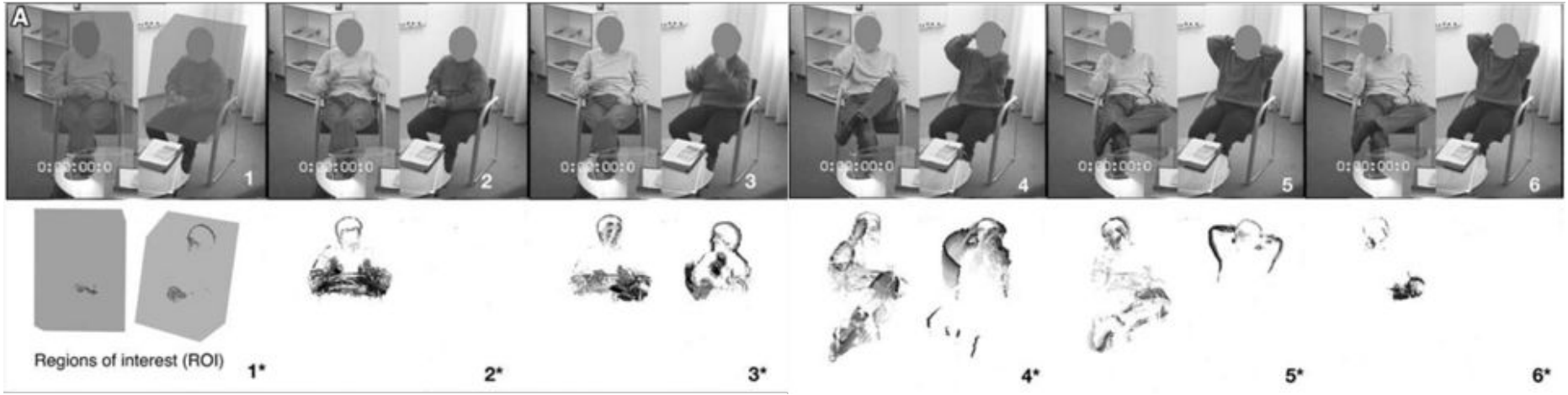
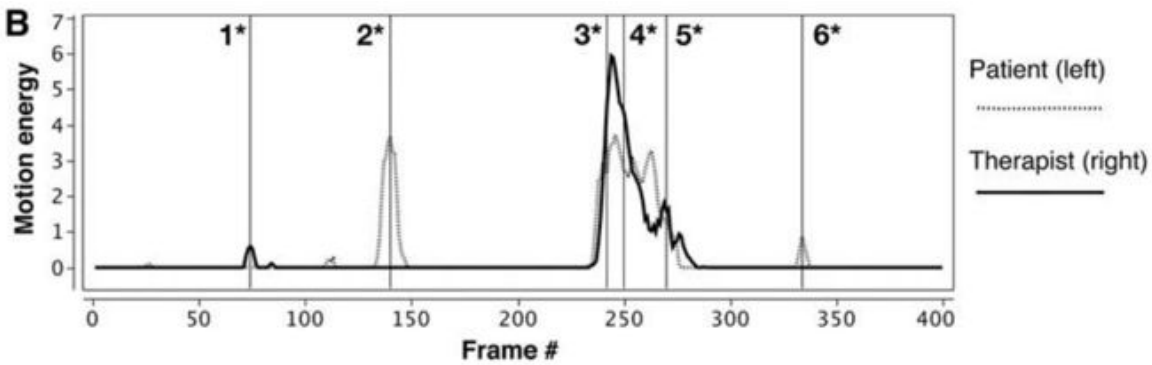
Wolfgang Tschacher

70 patients, on average 38 sessions
Synchrony of Motion energy

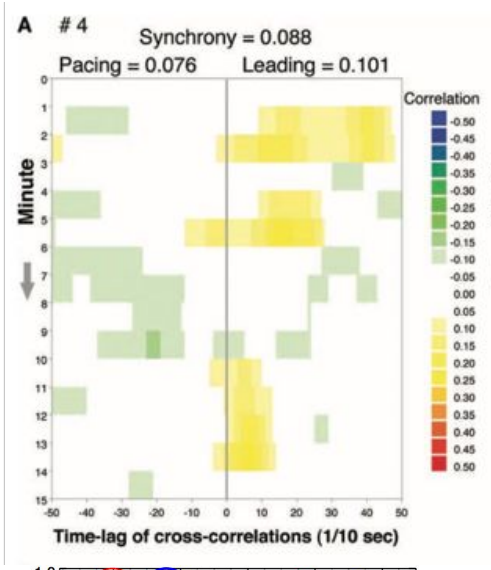


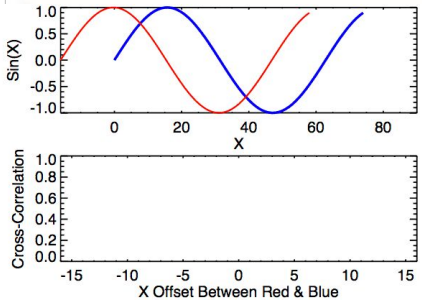


Wolfgang Tschacher

70 patients, on average 38 sessions
Synchrony of Motion energy

Low synchrony





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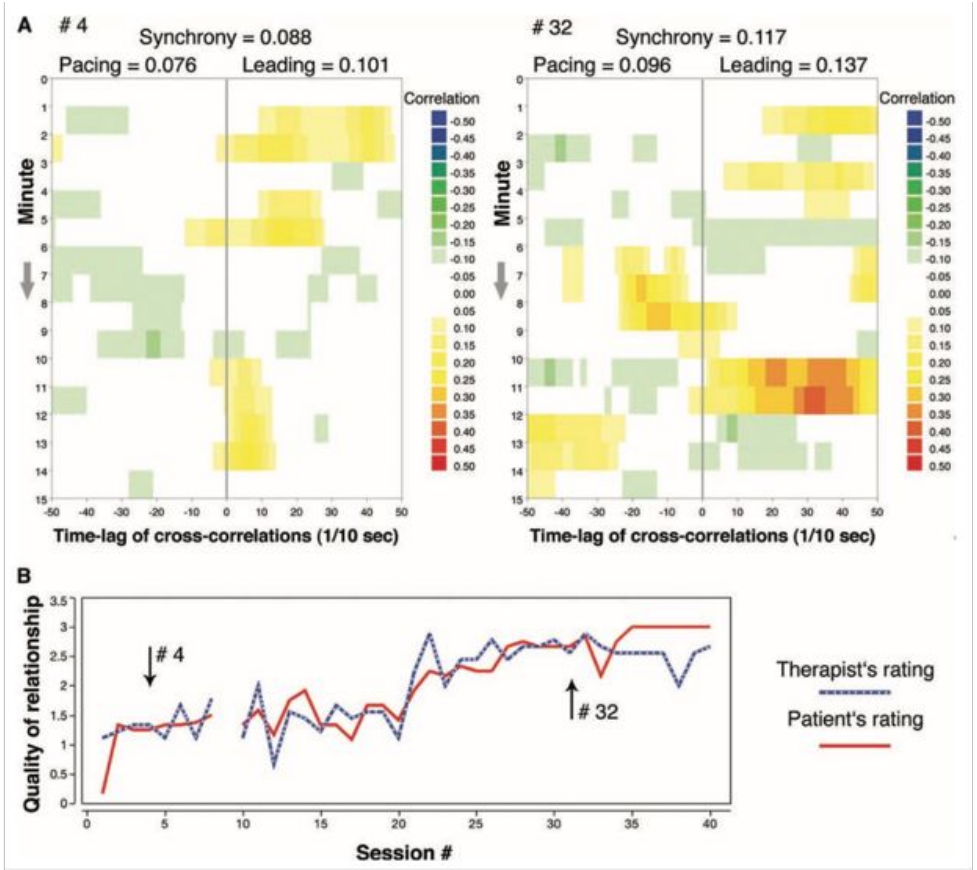
Low synchrony



High synchrony

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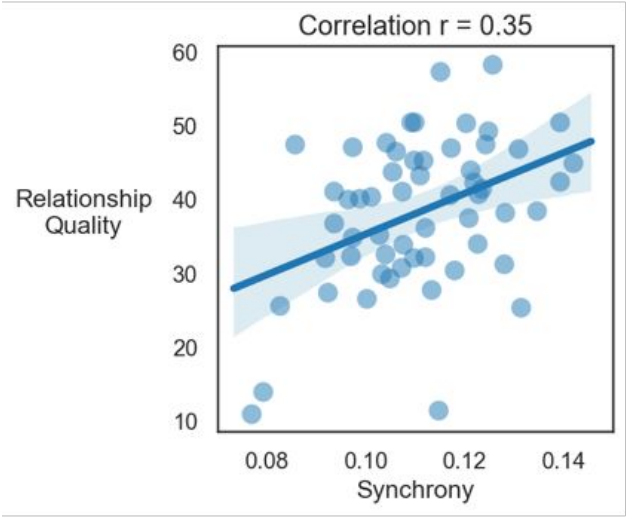

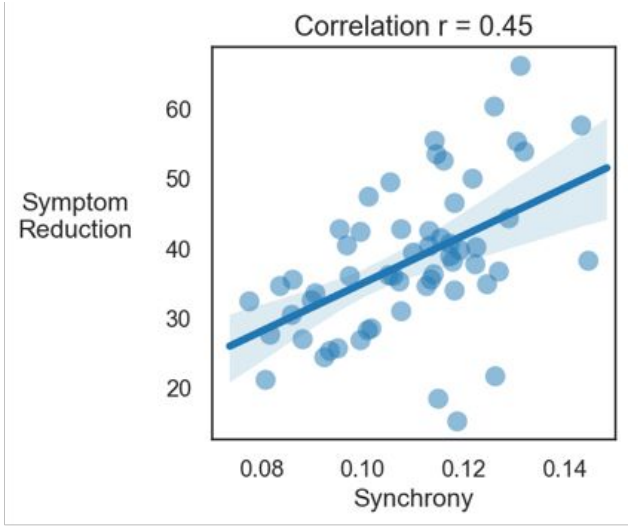

Higher doctor-patient synchrony predicts better relationships and therapy outcomes.

Why is synchrony important?

Chameleon effect.

Therapist-patient synchrony predicts better clinical outcomes.

Neural and emotion synchrony predicts social connection.

Time-lagged synchrony can help predict social roles (leader-followers).

Thalia Wheatley

279 Tuck student friendship network
42 scanned in fMRI watching various video clips
Synchrony of neural activity

Network measured in November

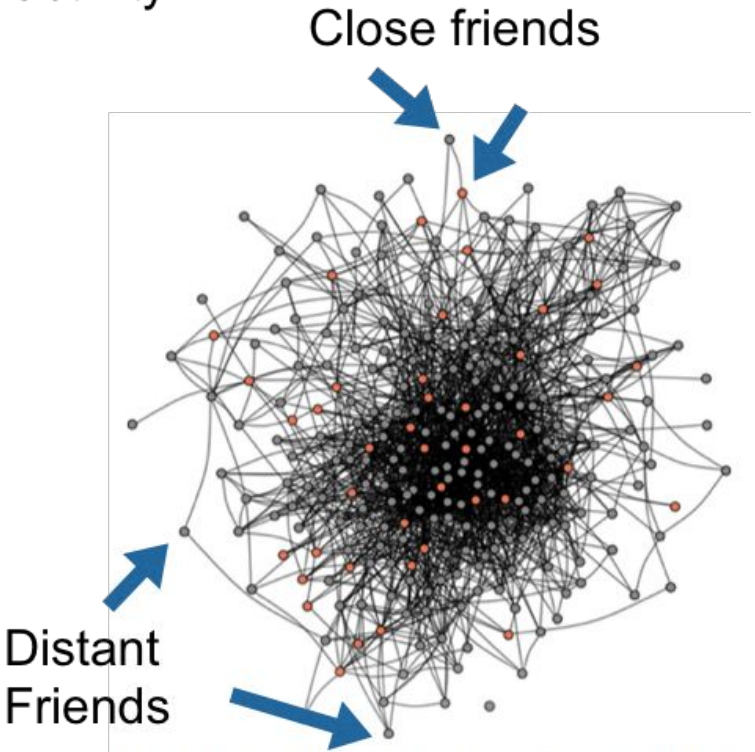

Fig. 1 Social network. The social network of an entire cohort of first-year graduate students was reconstructed based on a survey completed by all students in the cohort ($N = 279$; 100% response rate). Nodes indicate students; lines indicate mutually reported social ties between them. A subset of students (orange circles; $N = 42$) participated in the fMRI study

Thalia Wheatley

279 Tuck student friendship network
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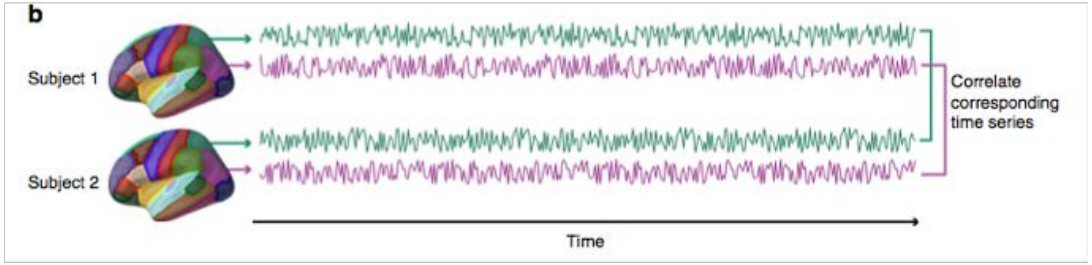
Synchrony of neural activity

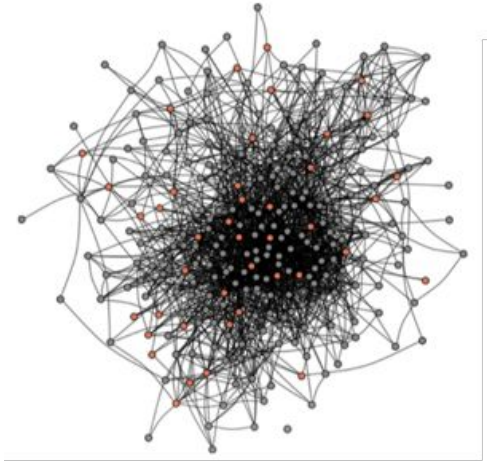


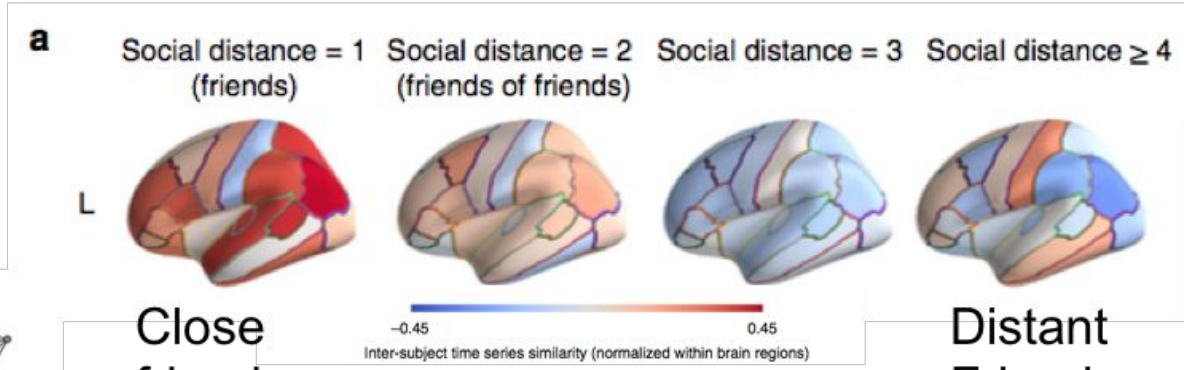
fMRI collected next February
(3 months after network response collected)

Example of videos used in study

Thalia Wheatley

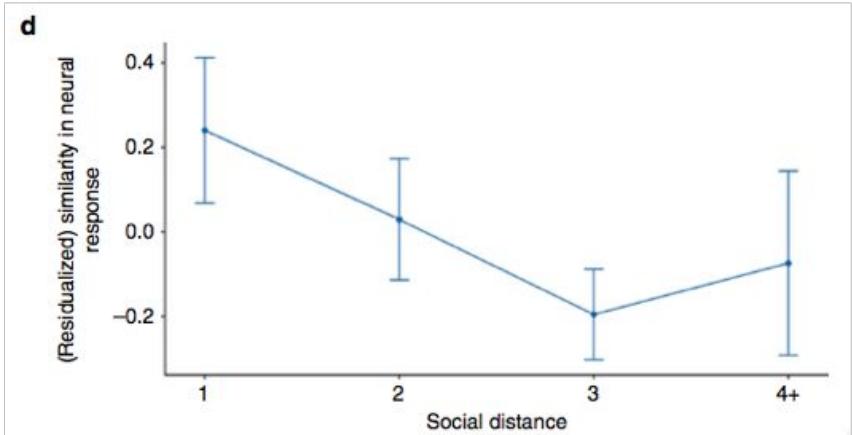
279 Tuck student friendship network
42 scanned in fMRI watching various video clips
Synchrony of neural activity





Close friends

Distant Friends



Thalia Wheatley

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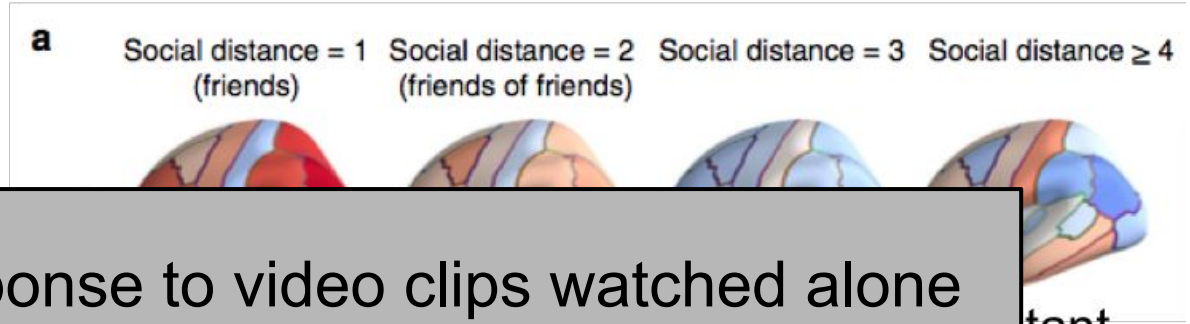
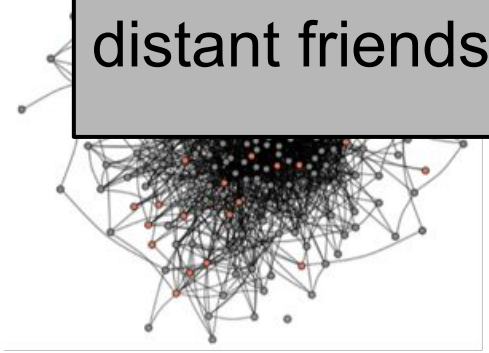
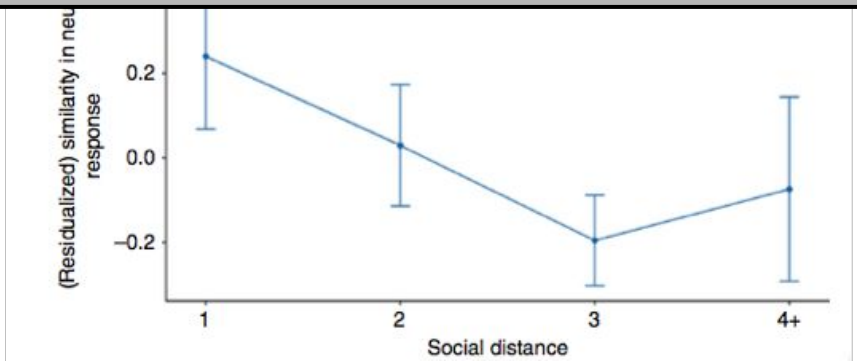


Neural response to video clips watched alone are more similar between close friends than distant friends.





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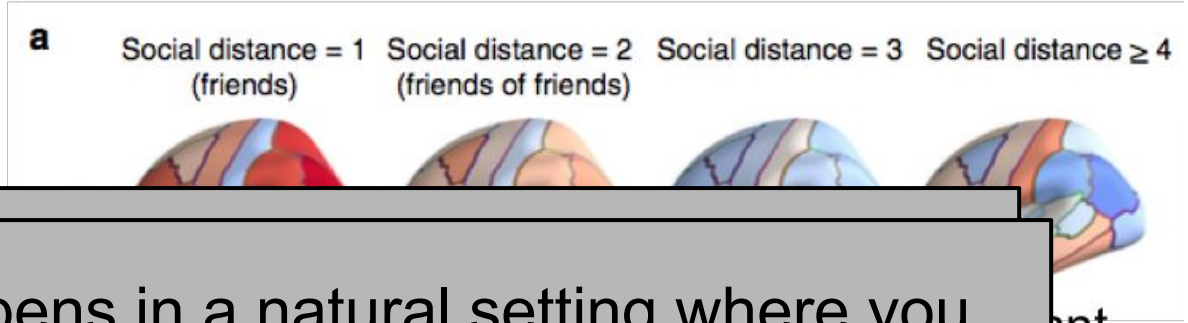
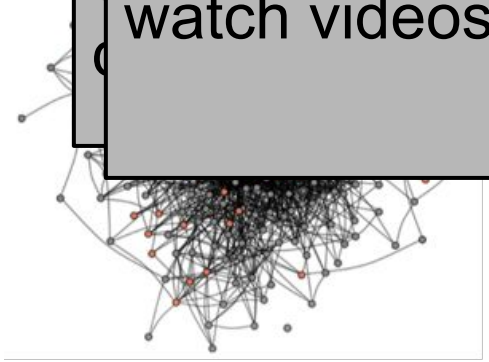
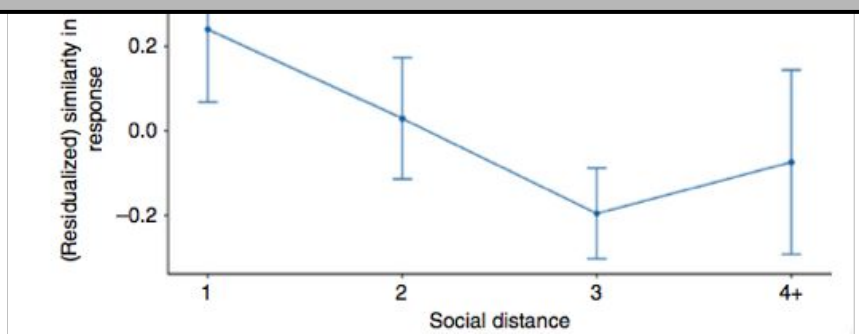


What happens in a natural setting where you watch videos with another person?





Sushmita Sadhukha

Zainab Molani

Luke Chang

Synchrony of emotions through facial expressions

How connected do you feel to the other participant?

How much did you enjoy the episode?

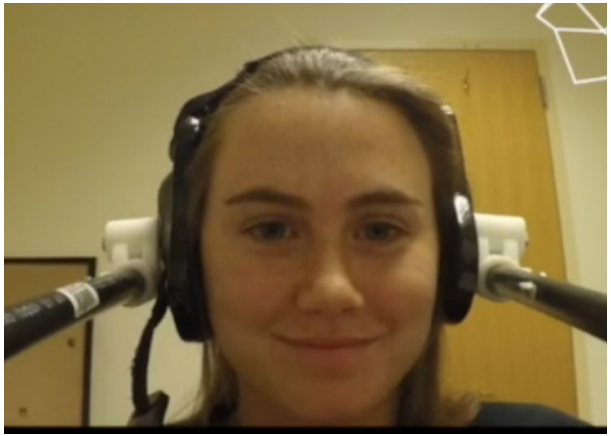
Session 1 (~3 hrs) **Session 2 (~3 hrs)**

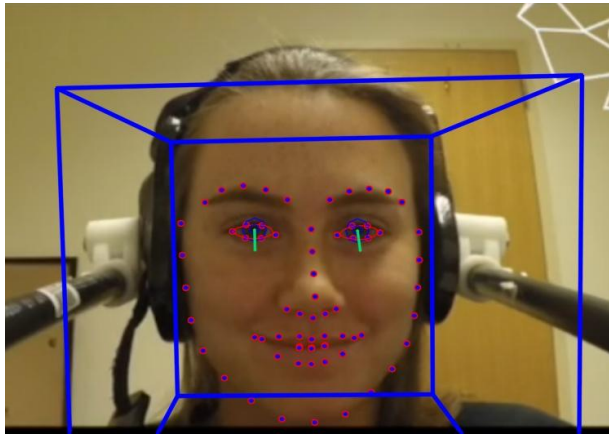
ep01 ep02 ep03 ep04

Group 1
(Dyad)
n = 64

Can we predict their connection from their emotional reactions?


cosan

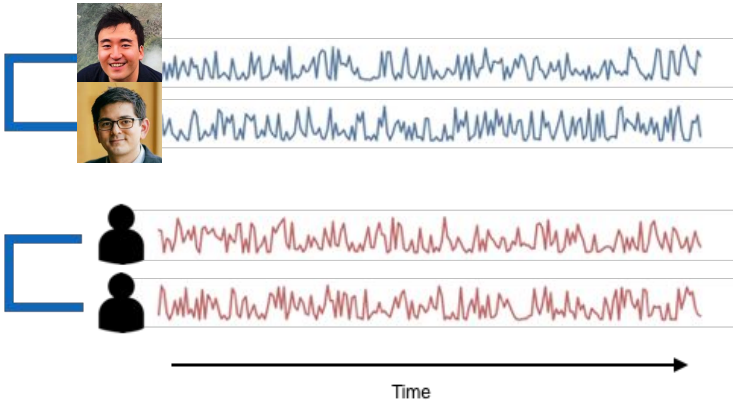


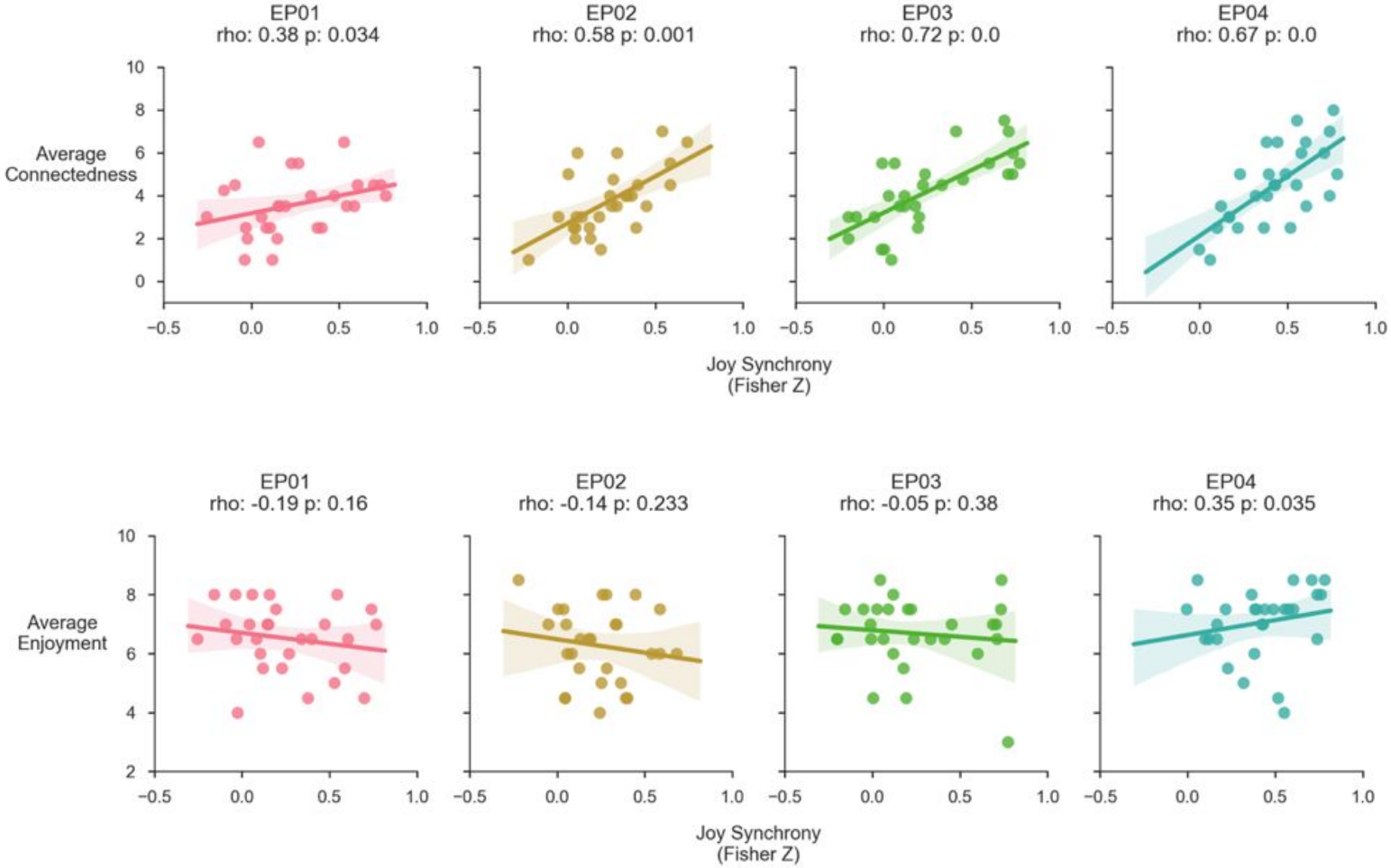


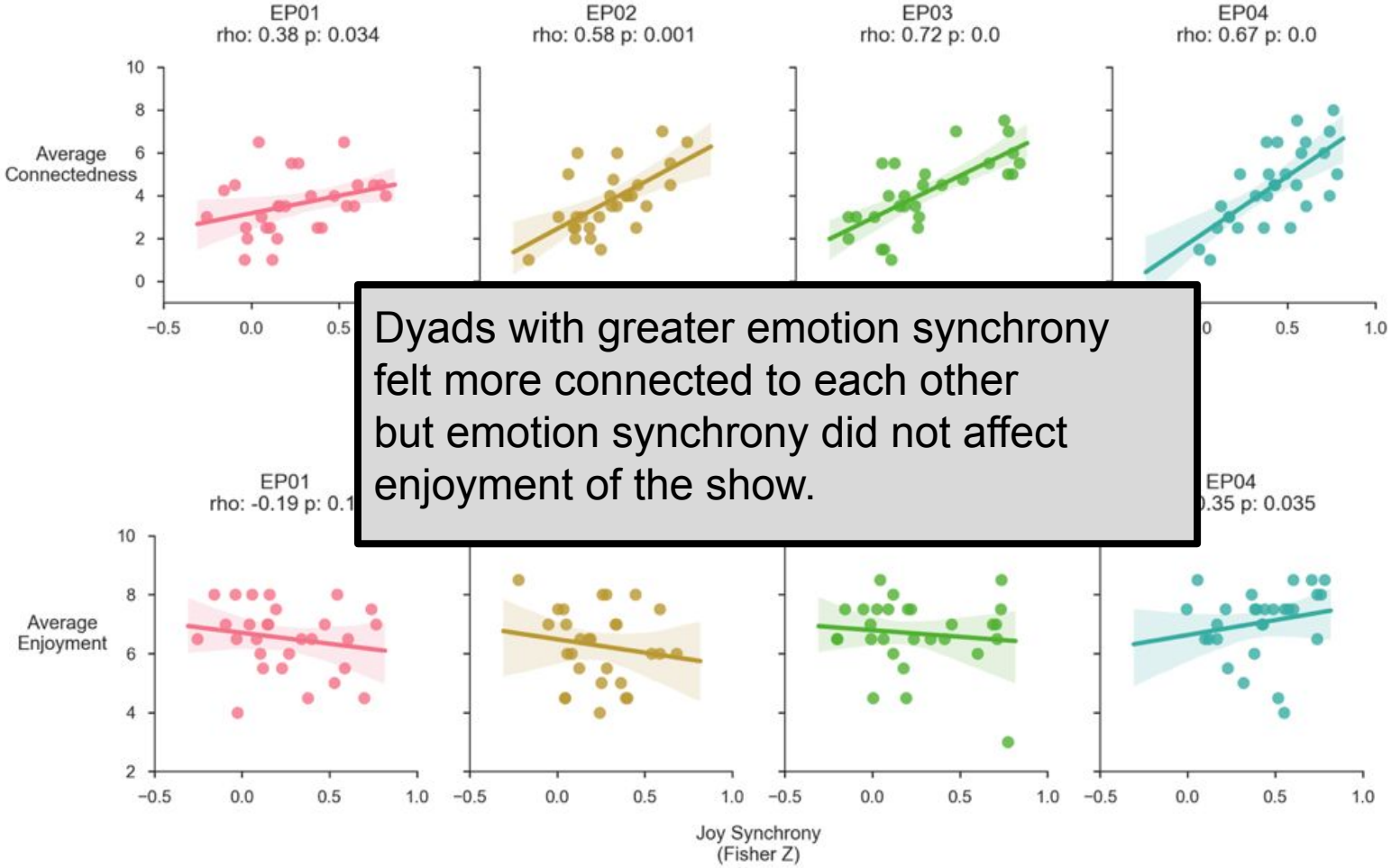
Time:	34:12
Joy:	.99
Sadness:	.01
Fear:	.05
Disgust:	.07
Surprise:	.00
Anger:	.02

Synchrony of Dyad Pairs

Joy Facial Expressions




EP01
rho: 0.38 p: 0.034
EP02
rho: 0.58 p: 0.001
EP03
rho: 0.72 p: 0.0
EP04
rho: 0.67 p: 0.0
Average Connectedness
Joy Synchrony (Fisher Z)
EP01
rho: -0.19 p: 0.16
EP02
rho: -0.14 p: 0.233
EP03
rho: -0.05 p: 0.38
EP04
rho: 0.35 p: 0.035
Average Enjoyment
Joy Synchrony (Fisher Z)



Dyads with greater emotion synchrony felt more connected to each other but emotion synchrony did not affect enjoyment of the show.

Please decide how to divide your support between these two fundraising campaigns.

Donate to Option 1

50

Stephanie's College Tuition

Who am I?

Hi, my name is Stephanie Mercado and I'm a first-generation college student enrolled to attend CSU Monterey Bay this Fall. I have worked very hard over the last four years to pursue my passion of becoming a veterinarian. I am also excited to discover all of the new opportunities my experience at CSU Monterey Bay will offer.

Donate to Option 2

50

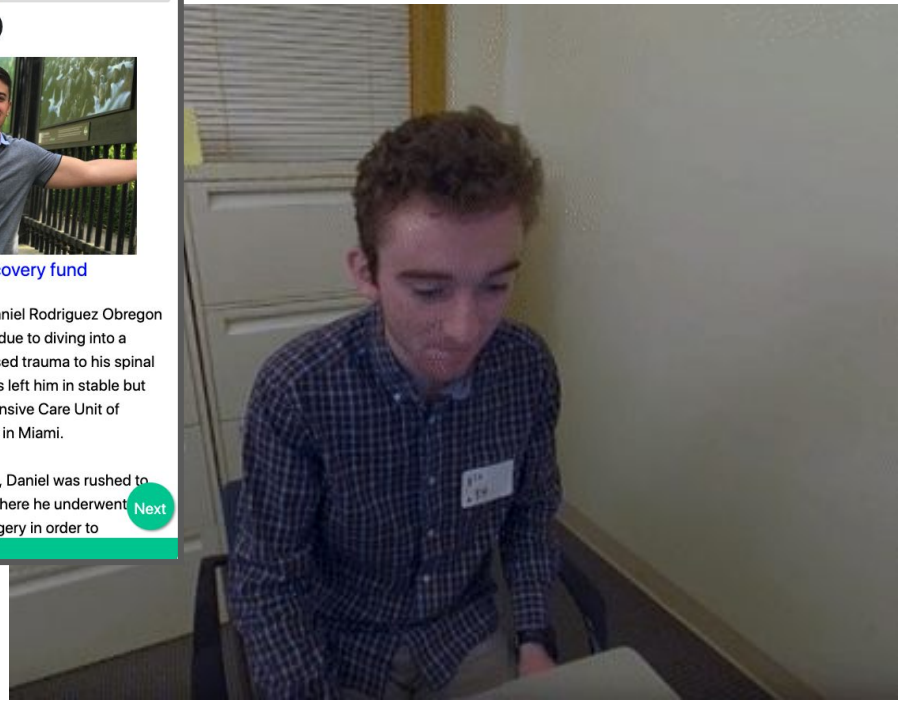
Daniel Rodriguez - Recovery fund

On October 20th, 2018, Daniel Rodriguez Obregon suffered a severe accident due to diving into a pool; the accident has caused trauma to his spinal cord at the C6 level and has left him in stable but critical condition at the Intensive Care Unit of Jackson Memorial Hospital in Miami.

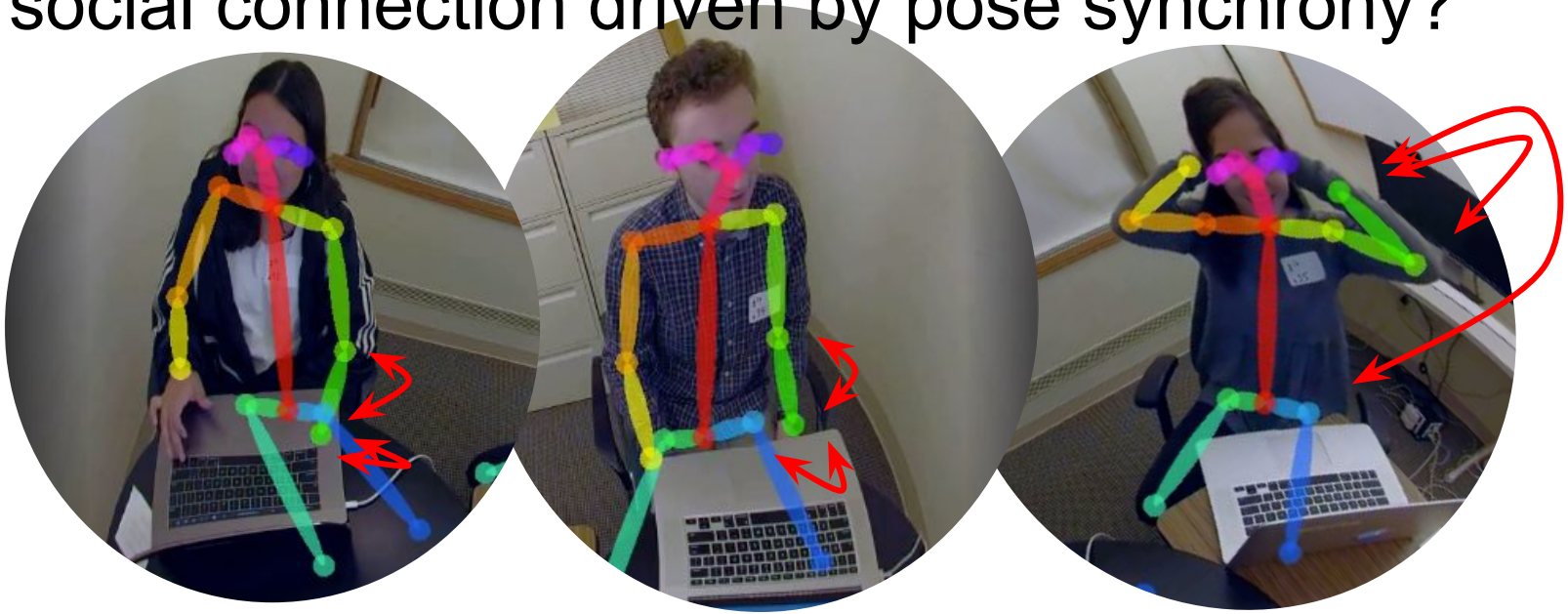
On the day on the accident, Daniel was rushed to the Ryder Trauma Center where he underwent immediate corpectomy surgery in order to

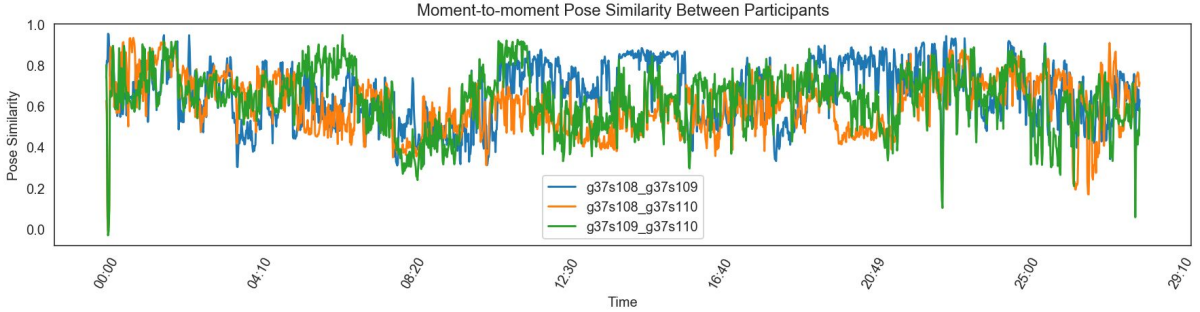
Next

Remaining time: 02 : 36



Is social connection driven by pose synchrony?





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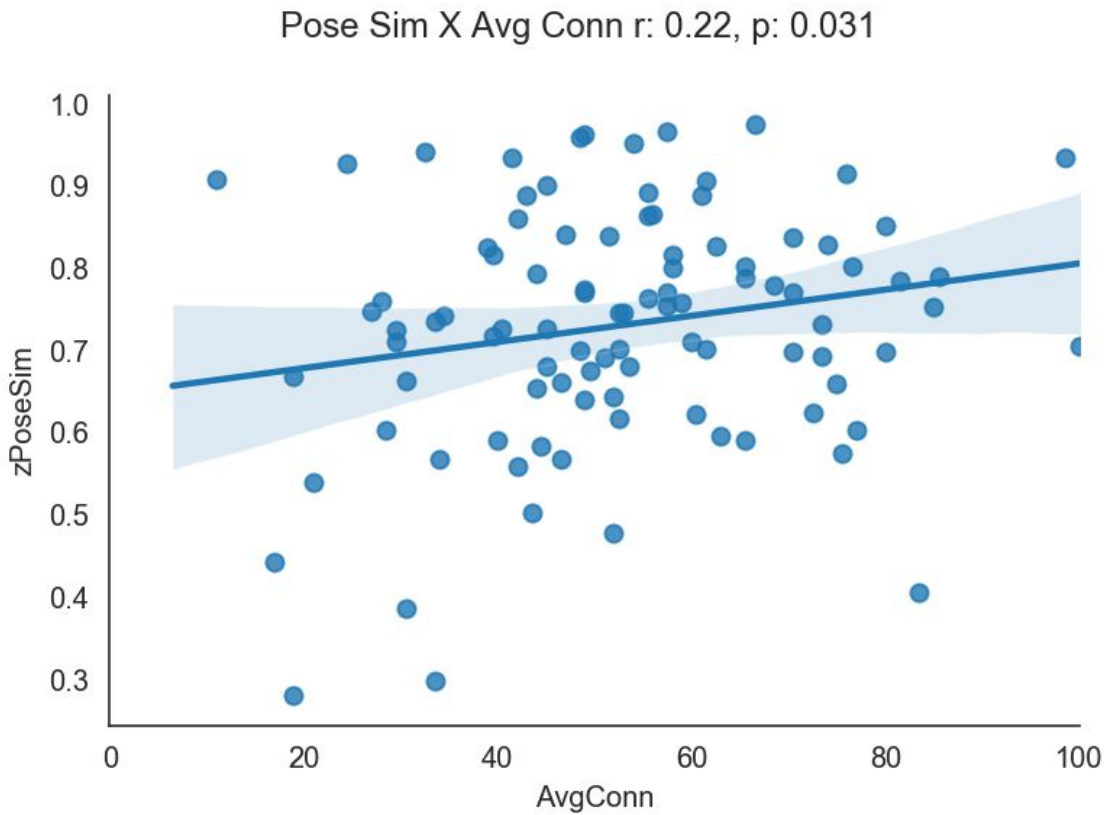

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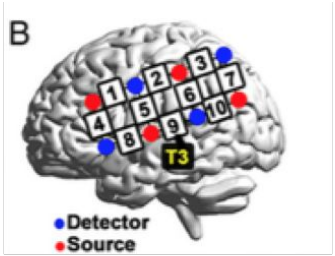
Chunming Lu

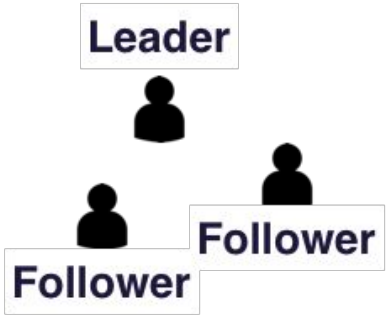
Neural synchrony in discussions

Leaderless
Group Discussion
5 minutes



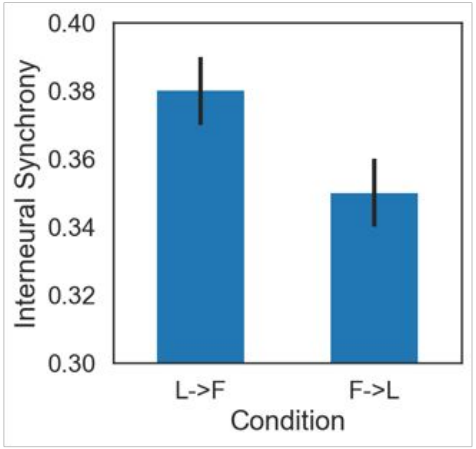
fNIRS (functional Near Infrared Spectroscopy)
Measurement of local hemodynamic effect

Independent raters
rate who the leader was

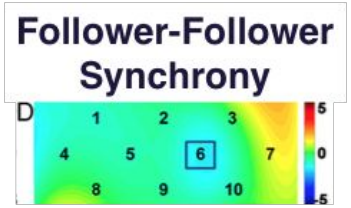


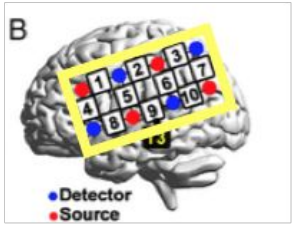
Chunming Lu

Neural synchrony in discussions



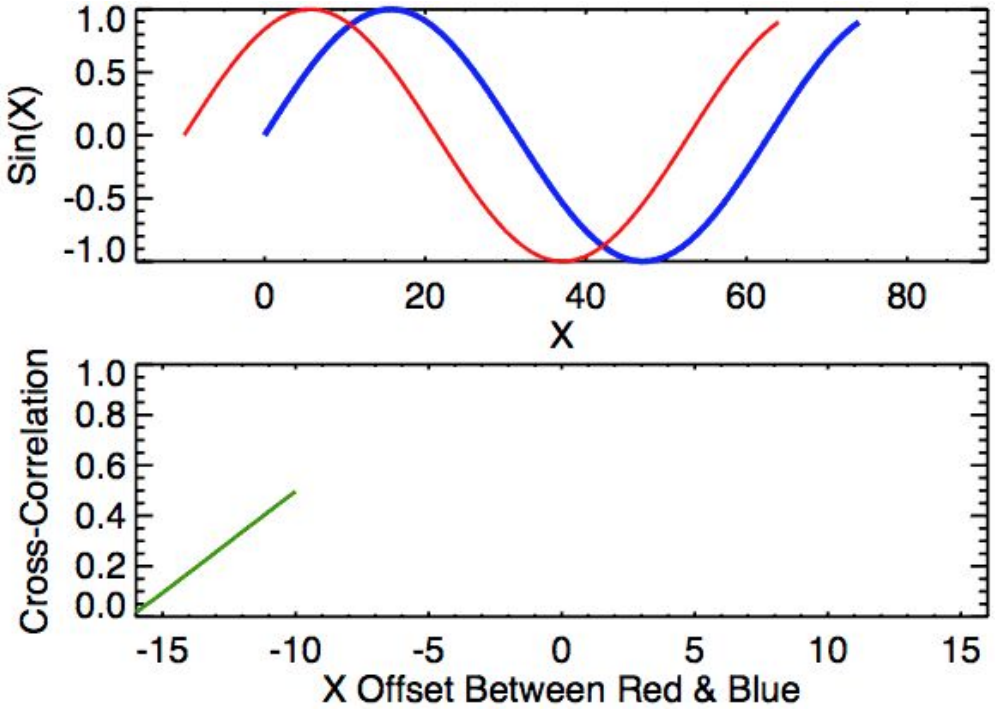
Greater neural synchrony in Leader-initiated communication (L->F) than in Follower-initiated communication (F->L)





Greater neural synchrony (more red) along TPJ between Leader-Follower than between Follower-Follower

Mimicry or Time-lagged synchrony



Blue: Leader

Red: Follower

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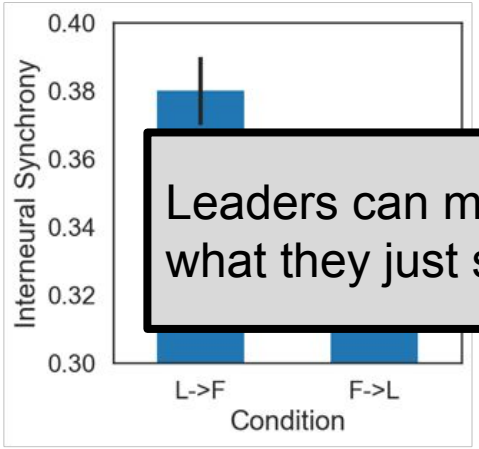
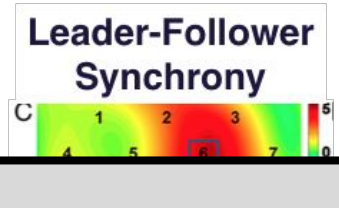
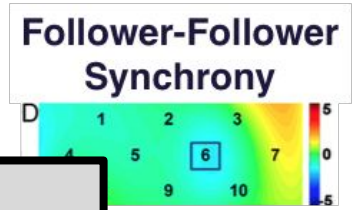
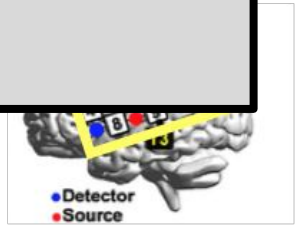


Leaders can make followers think about what they just said.







Greater neural synchrony in Leader-initiated communication (L->F) than in Follower-initiated communication (F->L)

Greater neural synchrony (more red) along TPJ between Leader-Follower than between Follower-Follower

Why is synchrony important?

Chameleon effect.

Therapist-patient synchrony predicts better clinical outcomes.

Neural and emotion synchrony predicts social connection.

Time-lagged synchrony can help predict social roles (leader-followers).

1. Examples of synchrony in social interactions.

2. Quick tutorial on how to extract and analyze non-verbal features from your videos.
   - Facial expressions: https://tinyurl.com/openfacecolab
   - Body poses: https://tinyurl.com/openposecolab

If you'd like to follow along later...

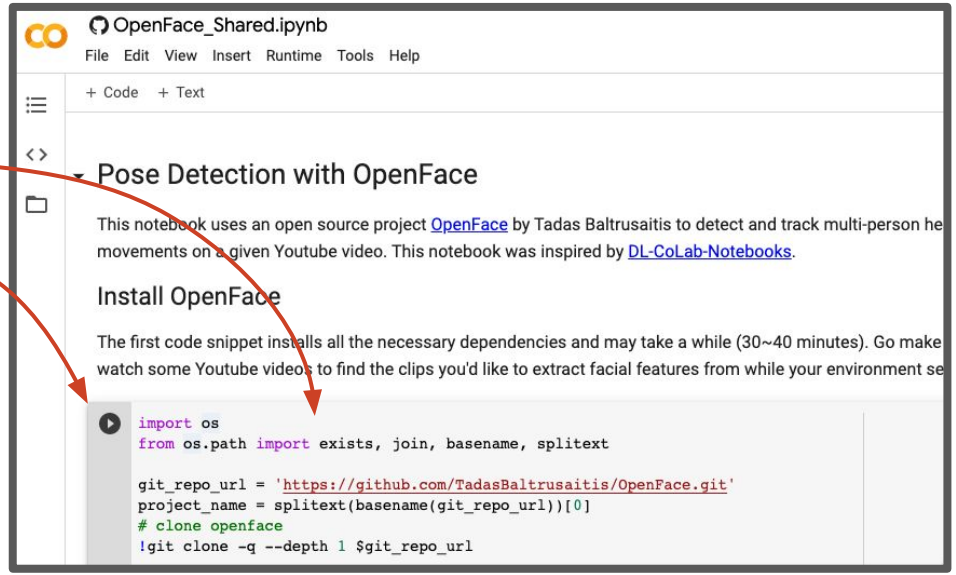
1. Enter following url in your browser: https://tinyurl.com/openfacecolab
2. Click the cell after "Install OpenFace", and then click the play button.
(You will need to be logged in with a Google account)

You'll see a screen like this.

1. Click in this cell

2. Click the play button which will install the necessary programs on a virtual notebook!

Installation takes ~40 min.



Google Colab

Free computing cluster - Think Google Docs for coding!

- Free 12 GB of RAM memory!
- Free GPU (for 12 hours)!
- Download and install software without filling up your laptop.
- Share code with friends.
- Organize your results with the code that produced it.

Why use automated feature extraction?

Pros

- ~~No~~Less elbow grease required.
- Reliable & Reproducible.
- Analyze every frame of video.

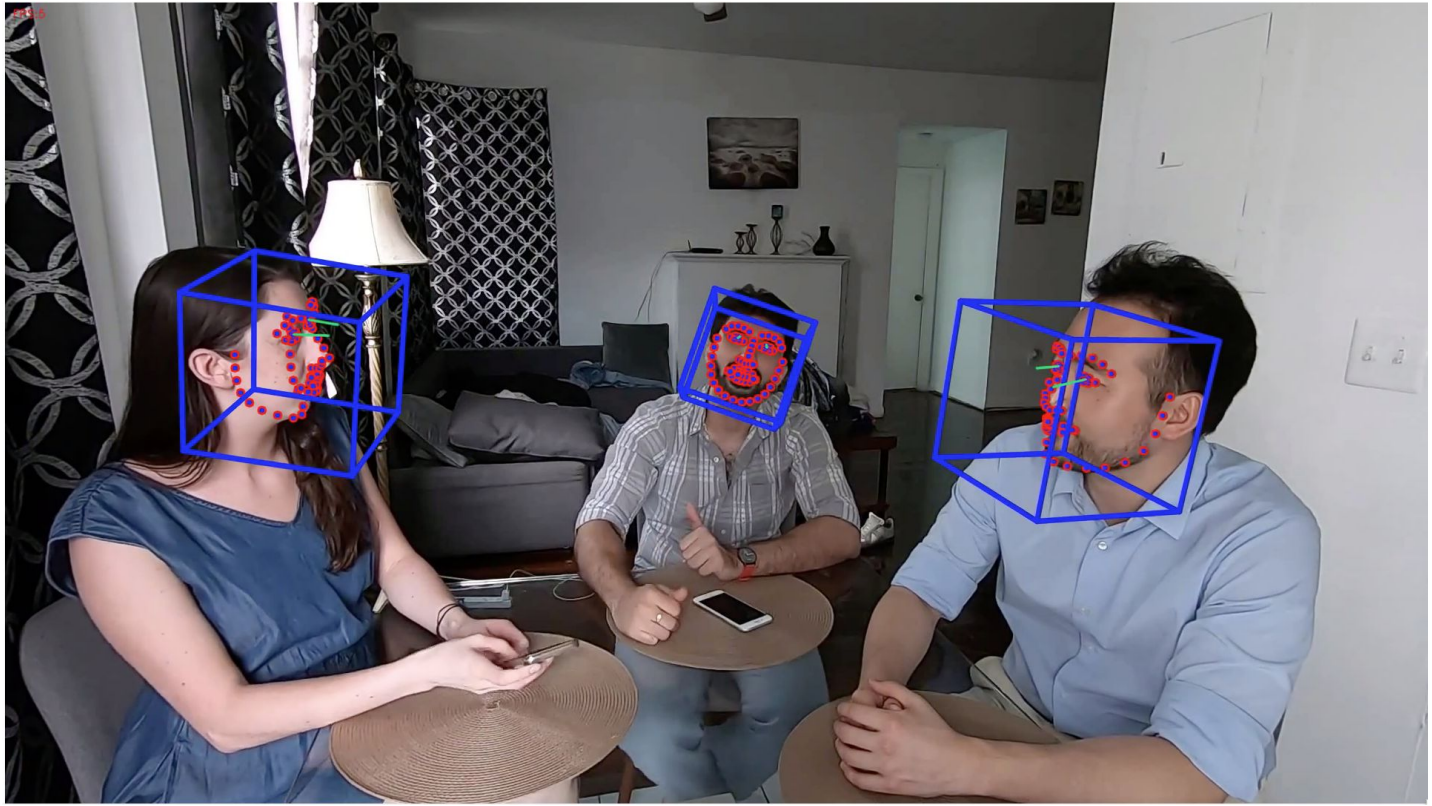
Cons

- Requires computing power.
- Limited by the model.

Detect poses on a test video

We are going to detect facial features on the following Youtube video:

```
[ ]  from IPython.display import YouTubeVideo

     # Change the Youtube_ID with the link to your group's video.
     YOUTUBE_ID = 'XtA6FQz8BHQ'

     YouTubeVideo(YOUTUBE_ID)
```



OpenFace_Shared.ipynb

File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

Table of contents | Code snippets | Files

Upload Refresh Mount Drive

..
OpenFace
processed
sample_data
cmake-3.13.0-Linux-x86_64.tar.gz
output.mp4
video.mp4
youtube.mp4

Download
Delete file
Rename file
Copy path
Refresh

Finally, visualize the result:

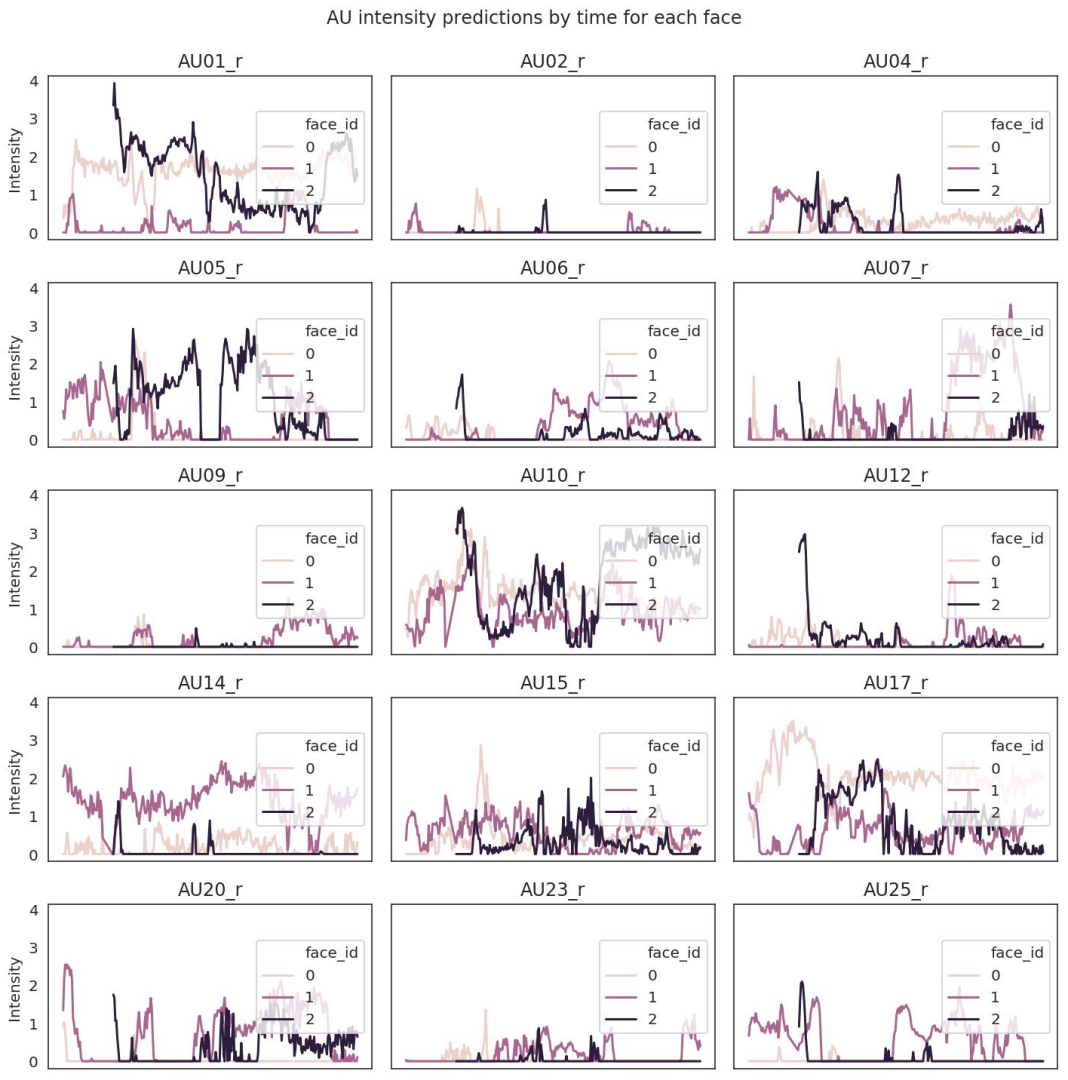
```
[102] def show_local_mp4_video(file_name, width=640, hei
        import io
        import base64
        from IPython.display import HTML
        video_encoded = base64.b64encode(io.open(file_nar
        return HTML(data='''<video width="{0}" height="{
                                <source src="data:video/mp
                            </video>'''.format(width, he

show_local_mp4_video('output.mp4', width=960, heigl
```

Upper Face Action Units

AU 1	AU 2	AU 4	AU 5	AU 6
				
Inner Brow Raiser	Outer Brow Raiser	Brow Lowerer	Upper Lid Raiser	Cheek Raiser
*AU 41	*AU 42	*AU 43	AU 44	AU 45
				
Lid Droop	Slit	Eyes Closed	Squint	Blink

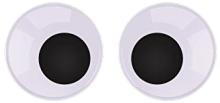
Lower Face Action Units

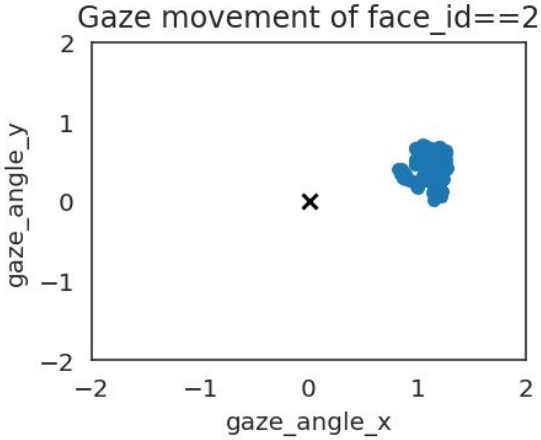
AU 9	AU 10	AU 11	AU 12	AU 13
				
Nose Wrinkler	Upper Lip Raiser	Nasolabial Deepener	Lip Corner Puller	Cheek Puffer
AU 15	AU 16	AU 17	AU 18	AU 20
				
Lip Corner Depressor	Lower Lip Depressor	Chin Raiser	Lip Puckerer	Lip Stretcher
AU 23	AU 24	*AU 25	*AU 26	*AU 27
				
Lip Tightener	Lip Pressor	Lips Part	Jaw Drop	Mouth Stretch

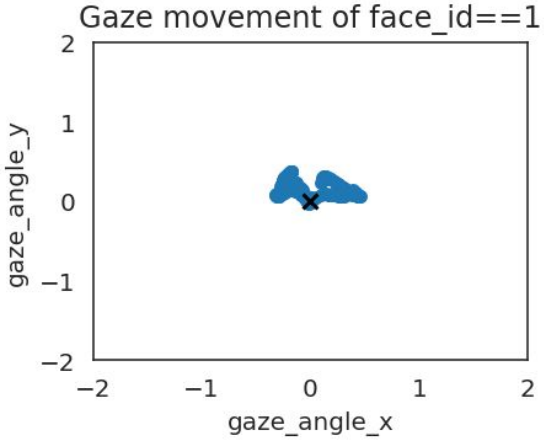


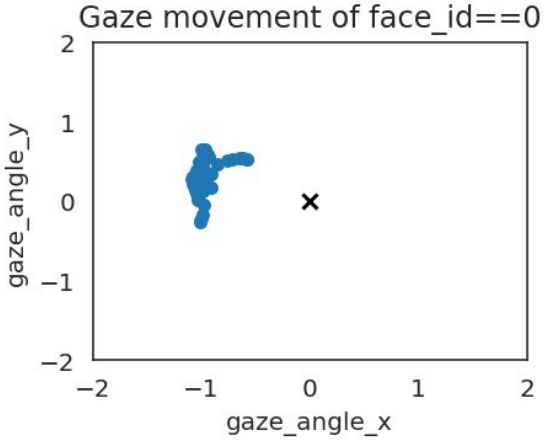
```
# Let's compare how much AU12 (smiling) activity occurs at similar times across people.
df_clean.pivot(index='frame', columns='face_id', values='AU12_r').corr()
```

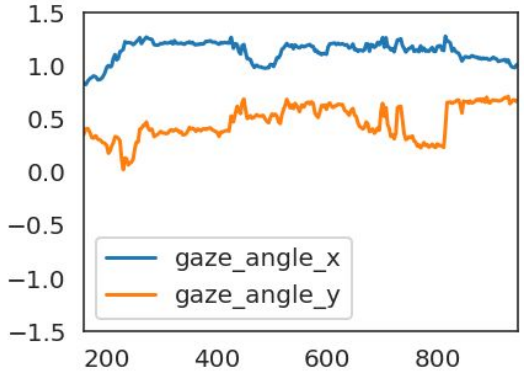
face_id	0	1	2
face_id			
0	1.000000	-0.145006	0.451838
1	-0.145006	1.000000	-0.124261
2	0.451838	-0.124261	1.000000

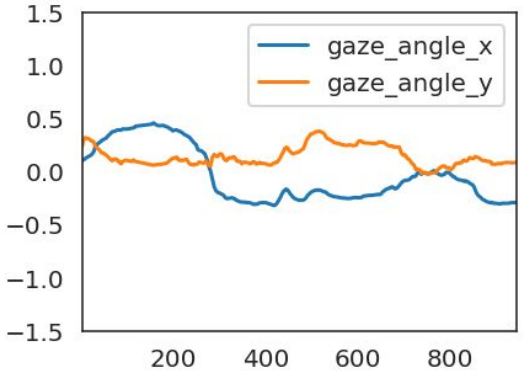


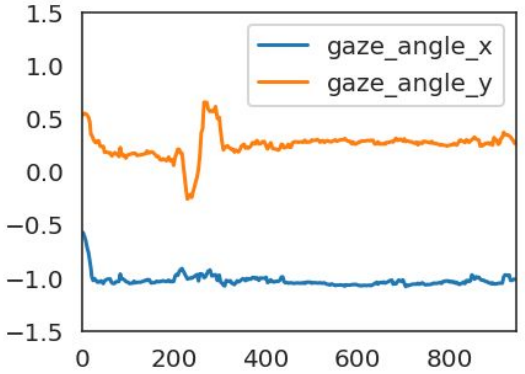

Gaze movement of face_id==2
gaze_angle_y
gaze_angle_x
2
1
0
−1
−2
−2
−1
0
1
2


Gaze movement of face_id==1
gaze_angle_y
gaze_angle_x
2
1
0
−1
−2
−2
−1
0
1
2


Gaze movement of face_id==0
gaze_angle_y
gaze_angle_x
2
1
0
−1
−2
−2
−1
0
1
2


gaze_angle_x
gaze_angle_y
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
200
400
600
800


gaze_angle_x
gaze_angle_y
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
200
400
600
800


gaze_angle_x
gaze_angle_y
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
0
200
400
600
800

Resources

[Learn about the package OpenFace]

[Colab notebook for extracting faces.]

[Learn about the package OpenPose]

[Colab notebook for extracting pose data.]

[Tutorial on four different ways of analyze synchrony.]