

# Comment la synchronie détectée à partir de vidéos pourrait prédire la qualité de la relation dyadique

20 juin 2016

<http://bit.ly/syncpsy>

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# L'évaluation des psychothérapies est nécessaire mais difficile

Video collection  
(245 videos,  
252.44 GB)

(VLC)

Clinic, qualitative  
assessment

Psychometry  
collection  
(Excel)

## ■ Principes sous jacents :

- Ecole et courants épistémologiques différents
- Evaluation possible mais complexe (Canceil et al., 2004)
- Coût important mais peu d'évaluation

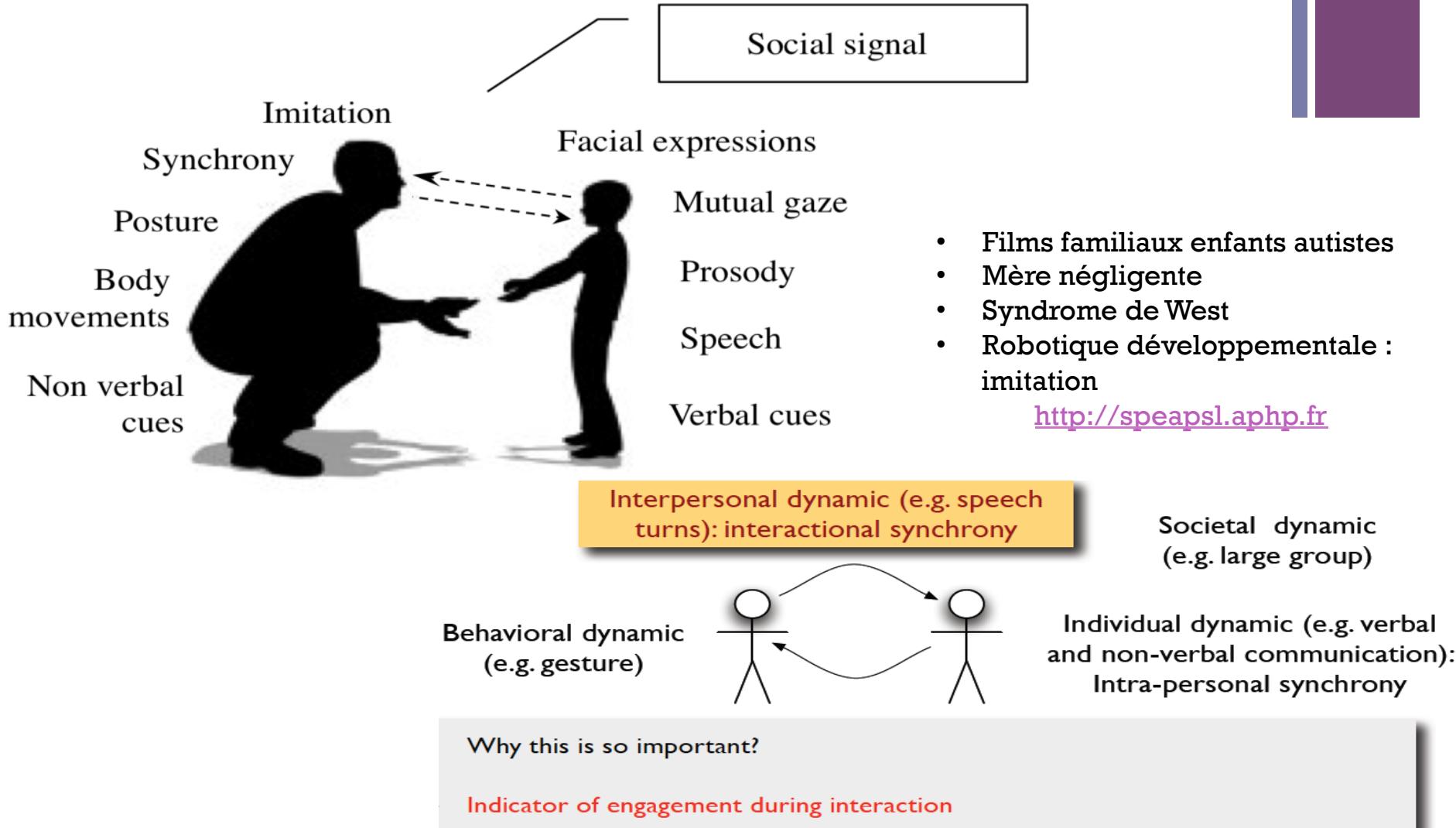
## ■ Méthode d'évaluation :

- Cotation d'entretiens systématique (fastidieuse)
- Mesure des processus de changement
- Psychométrie avant-après : EBM (a posteriori)

 **Mesure automatisée de la qualité de la relation ,  
prédicteur de l'efficacité de la psychothérapie ?**



# Mécanismes cognitifs sous-jacents



**Hypothèse : Meilleure synchronie = meilleure relation ?**



# Synchronie

- Imitation ( $\pm 5$  s)
- Ramseyer, 2011
  - Motion energy analysis
  - Dyade de même sexe
  - Uniquement motrice
- Sur différentes modalités  
(Delaherche, 2012)
- SyncPy (Varni, 2015)

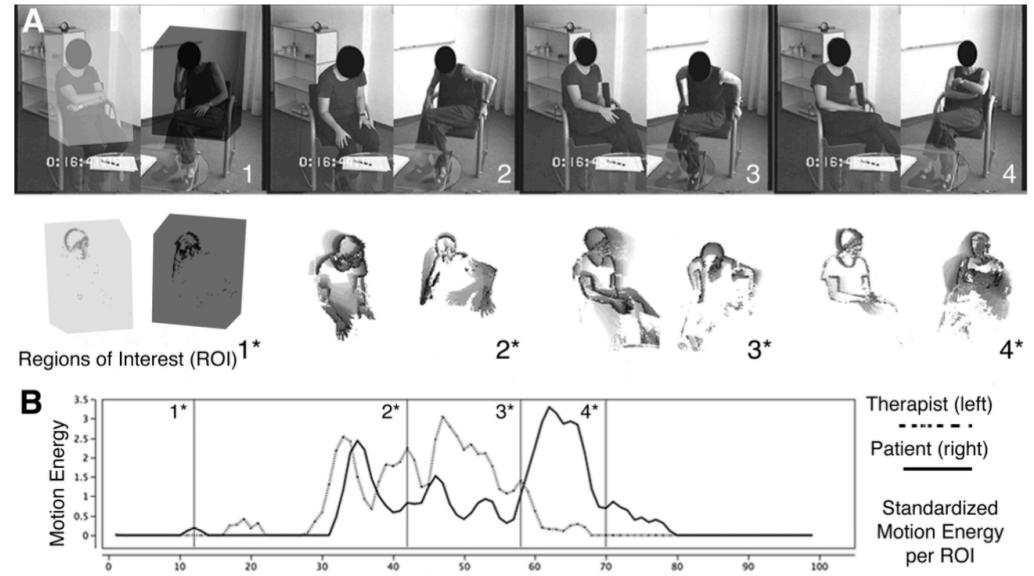
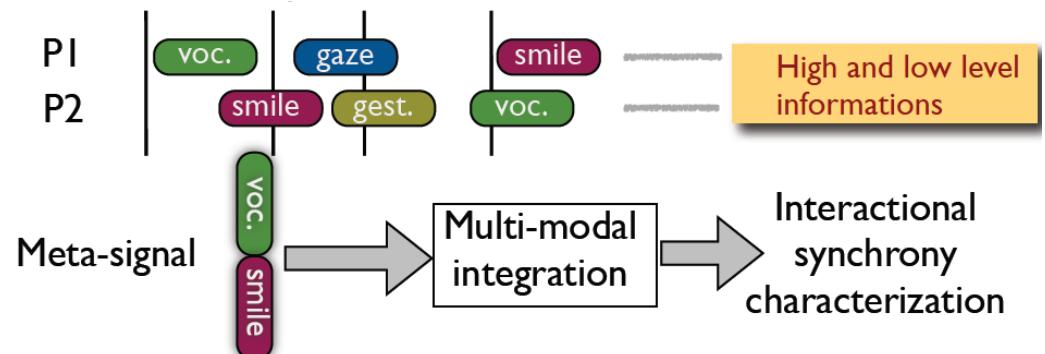


Fig. 1: Motion energy analysis (MEA).



# Etude INCANT



- Psychothérapie familiales :
  - Un groupe MDFT / Groupe contrôle non filmé
- Evolution de la consommation de cannabis
- Naturalistique

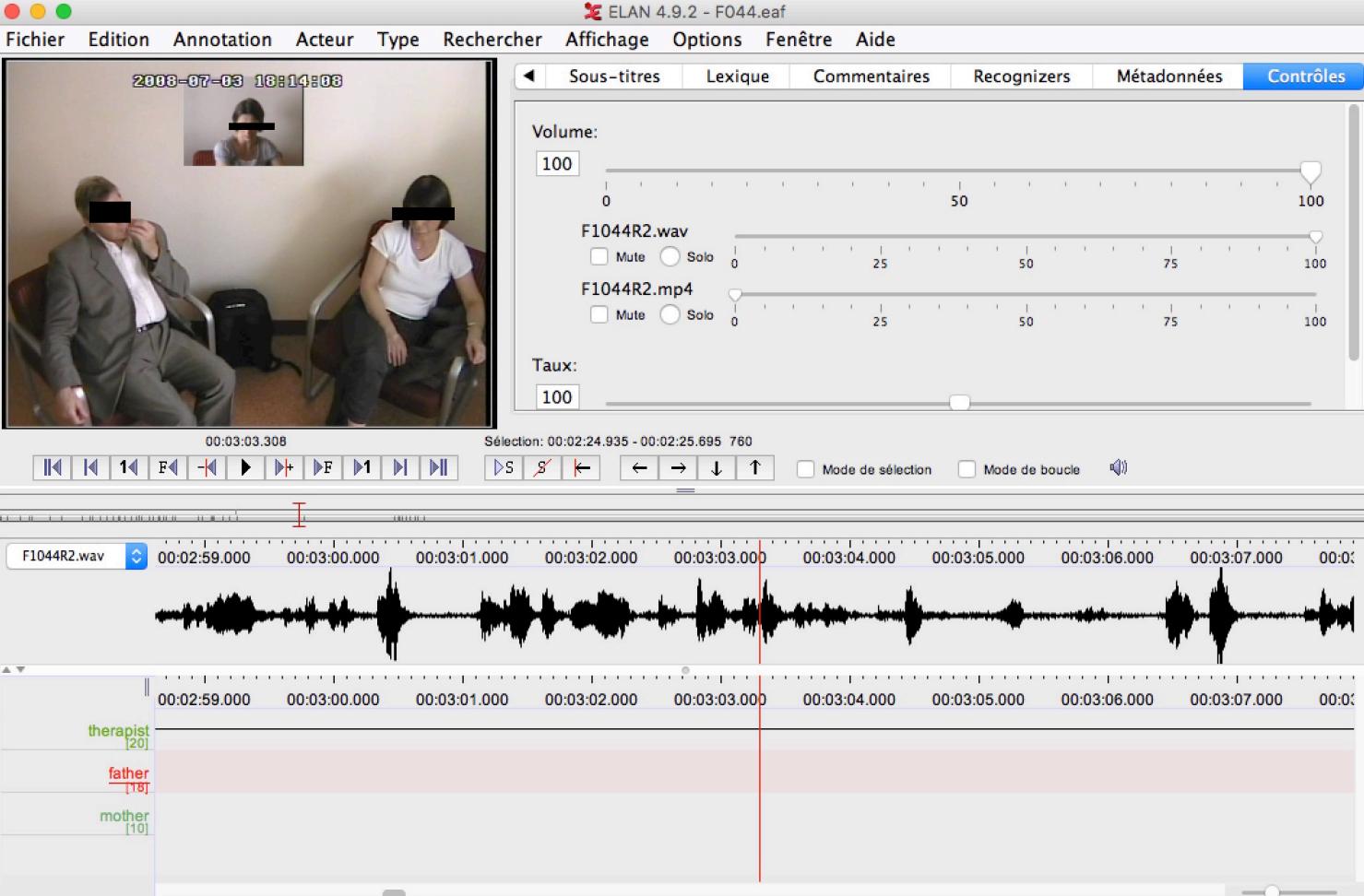
# Extraction des prises de parole

→ Video collection (245 videos, 252.44 GB) (VLC)

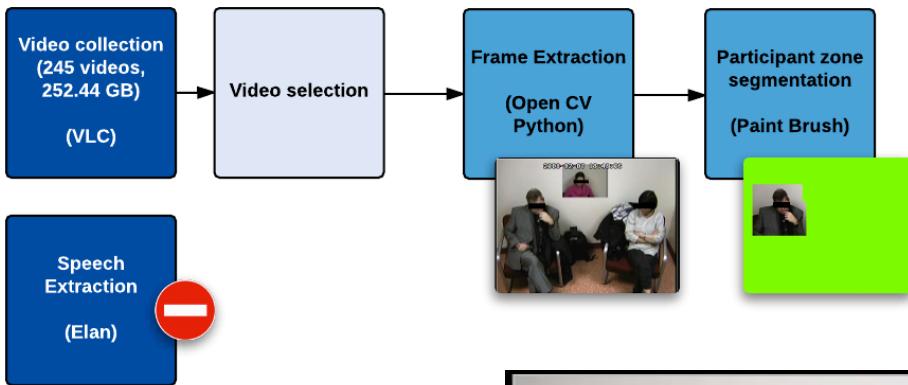
→ Speech Extraction (Elan) 

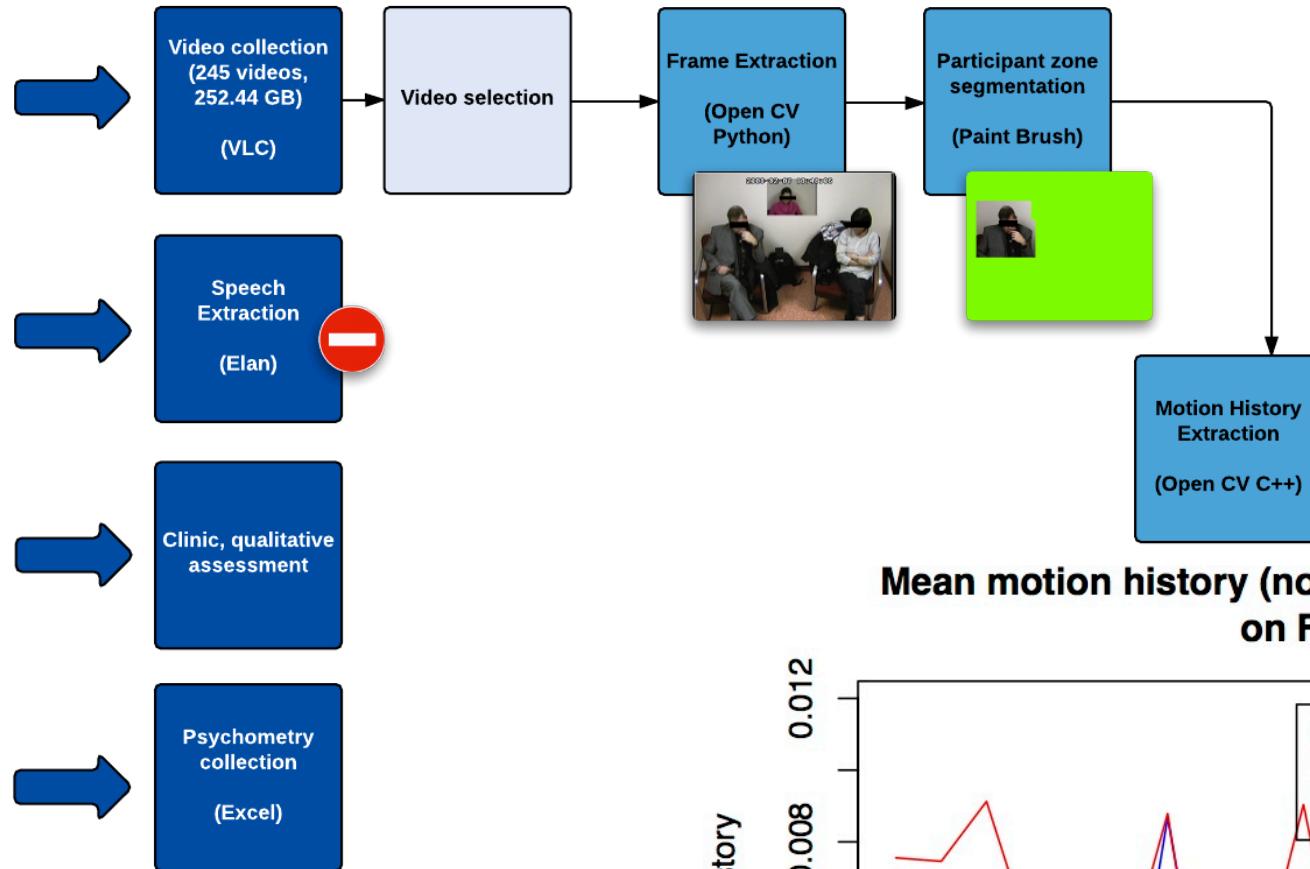
→ Clinic, qualitative assessment

→ Psychometry collection (Excel)

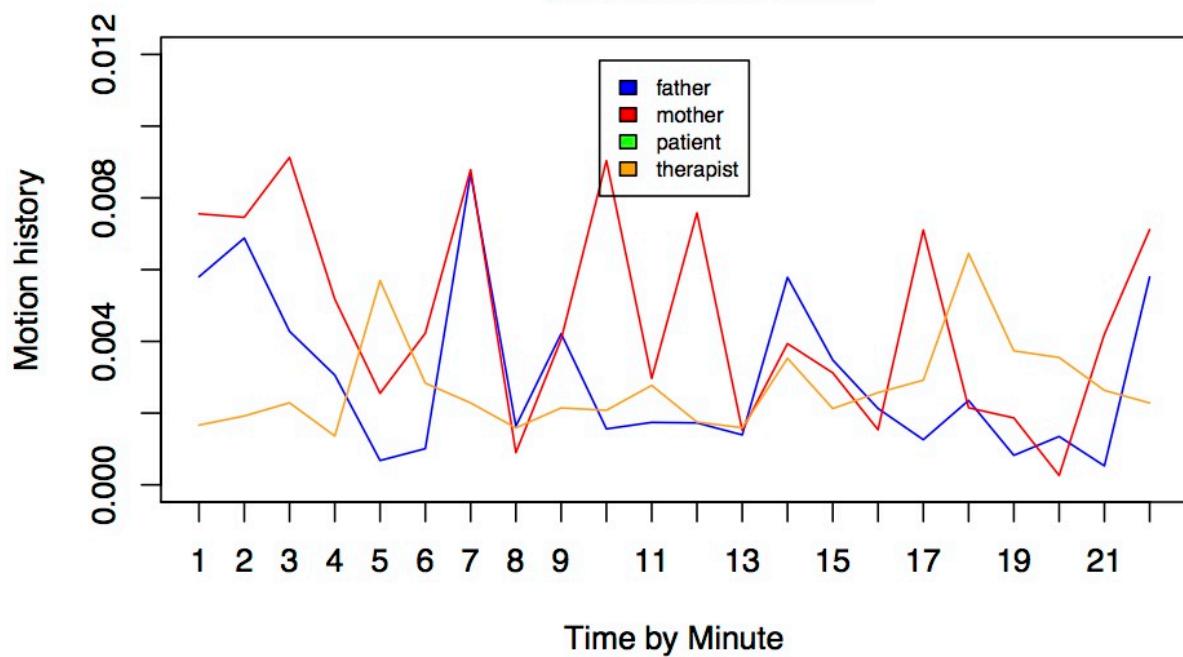


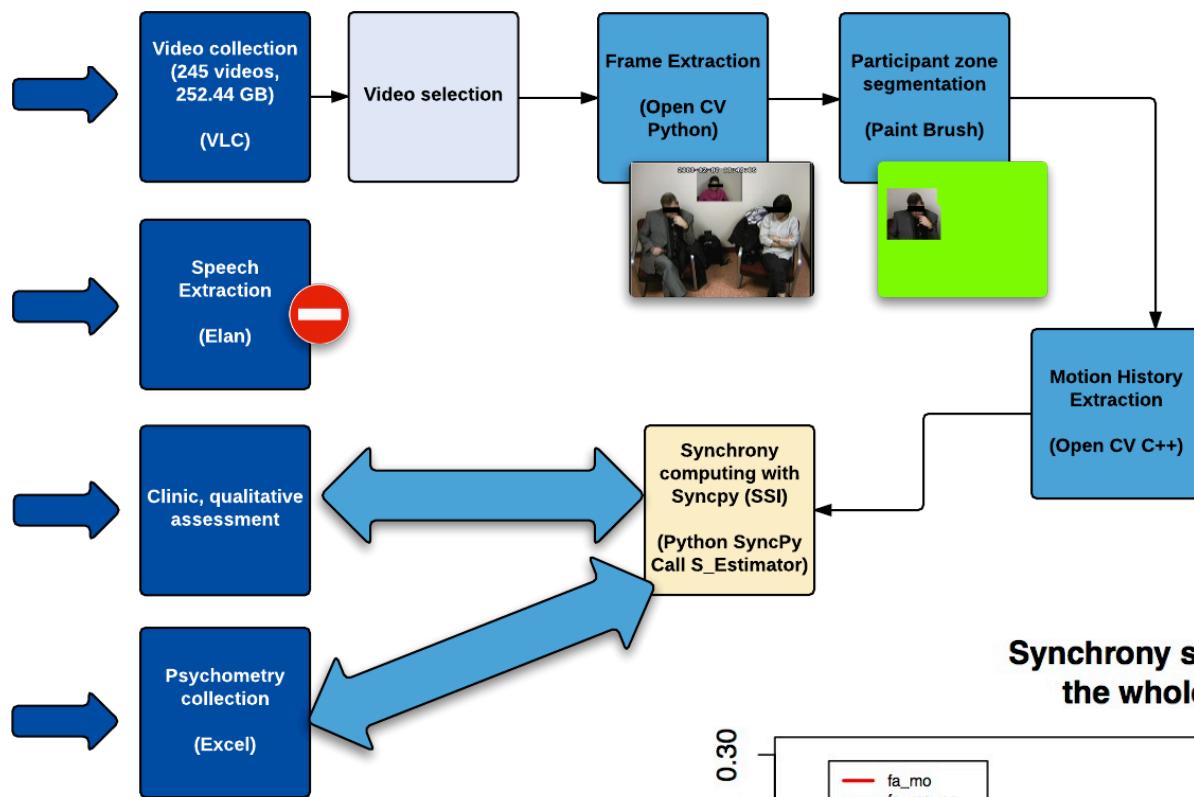
The screenshot shows the ELAN 4.9.2 software interface. At the top, the menu bar includes Fichier, Edition, Annotation, Acteur, Type, Rechercher, Affichage, Options, Fenêtre, and Aide. Below the menu is a toolbar with various icons for file operations. The main window displays a video frame from a recording dated 2008-07-03 at 18:14:08. Two people are seated in chairs. On the right, there are volume and balance controls for audio files F1044R2.wav and F1044R2.mp4. Below the video frame is a timeline with a red selection bar spanning from 00:02:24.935 to 00:02:25.695. The bottom part of the interface shows the raw audio waveform and a transcript area with three entries: "therapist [20]", "father [18]", and "mother [10]".



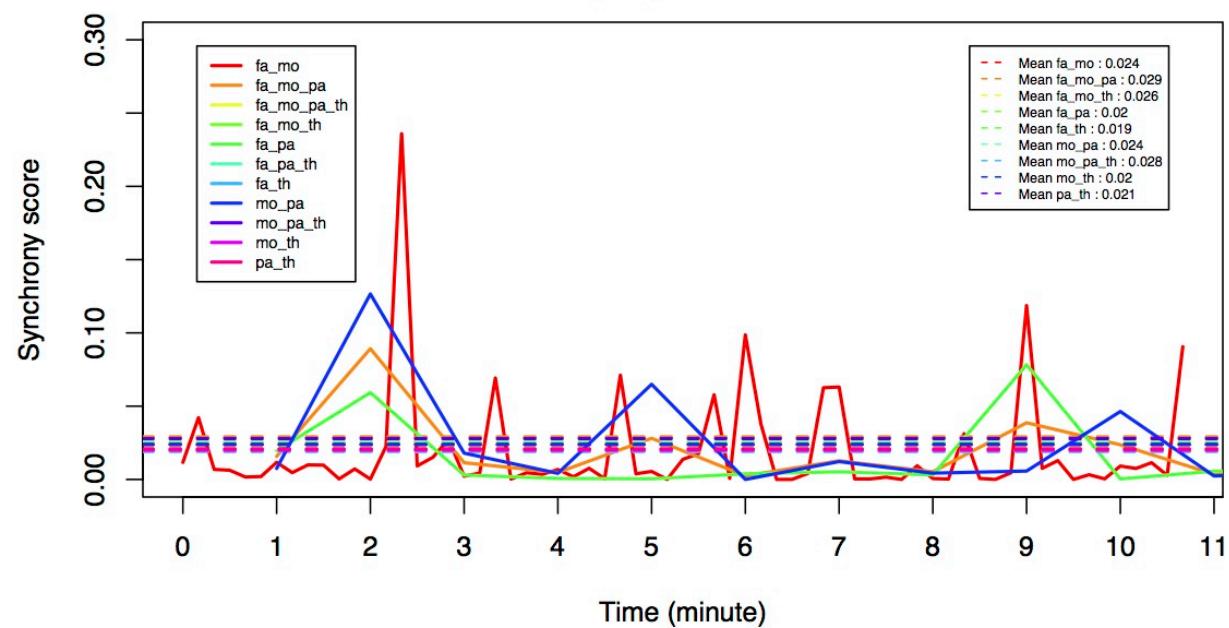


**Mean motion history (non overlapping minute intervals)  
on F1044M1 video**





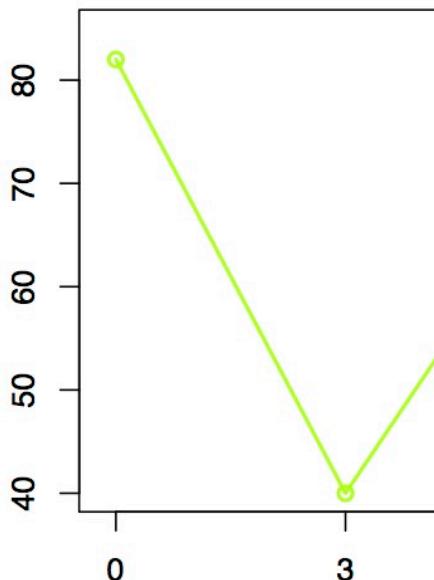
**Synchrony scores for each dyad and for the whole group in F1044D1 video**



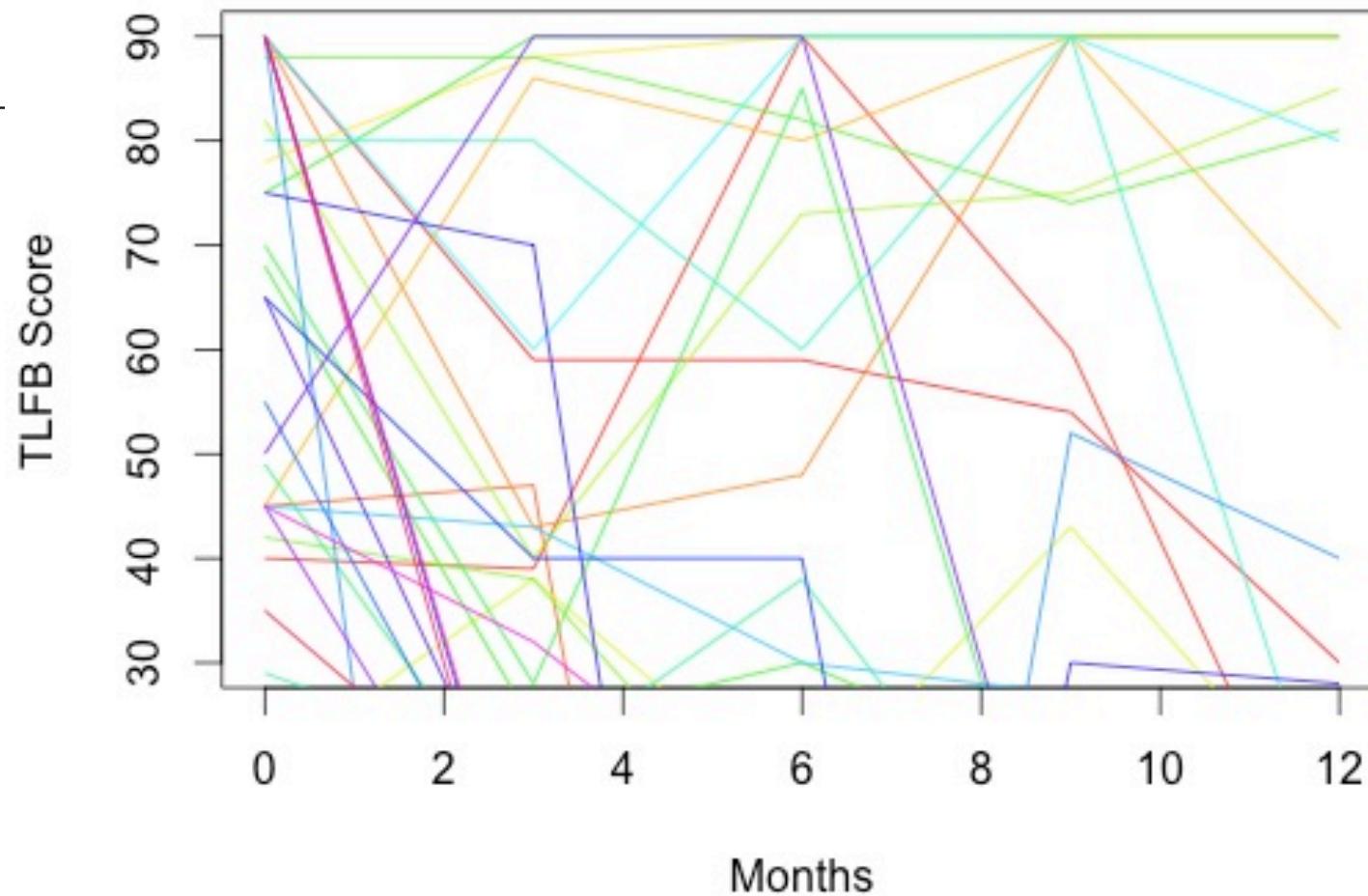
**S\_Estimator**  
**vs**  
**Cross-correlation**

### Evolution of cannabis consumption for F1044 subject

TLFB



Evolution of cannabis consumption  
of the 32 subjects of the INCANT Study



10

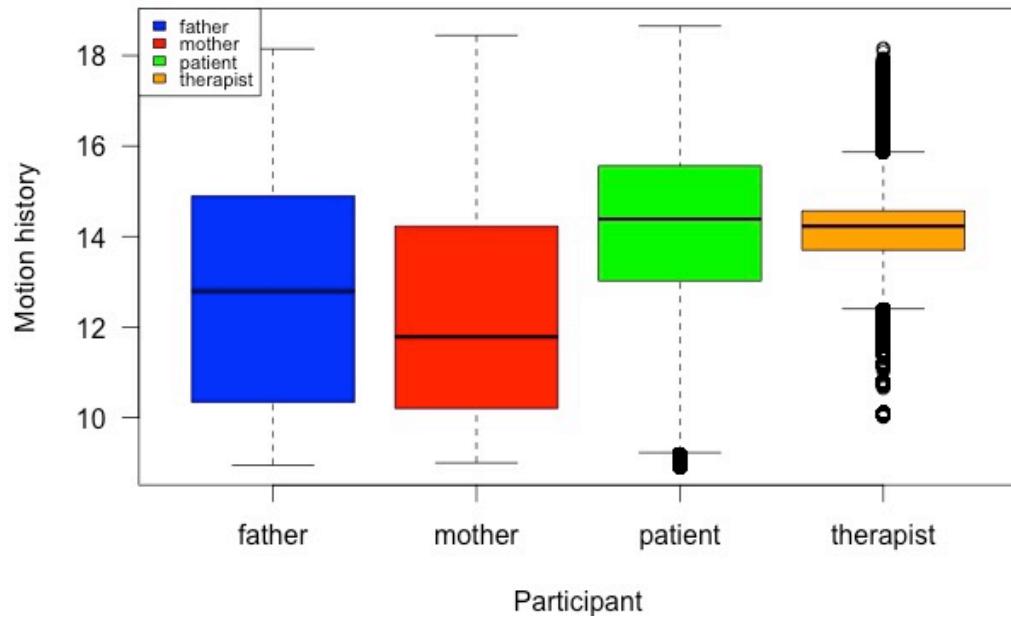
+

# Limits techniques



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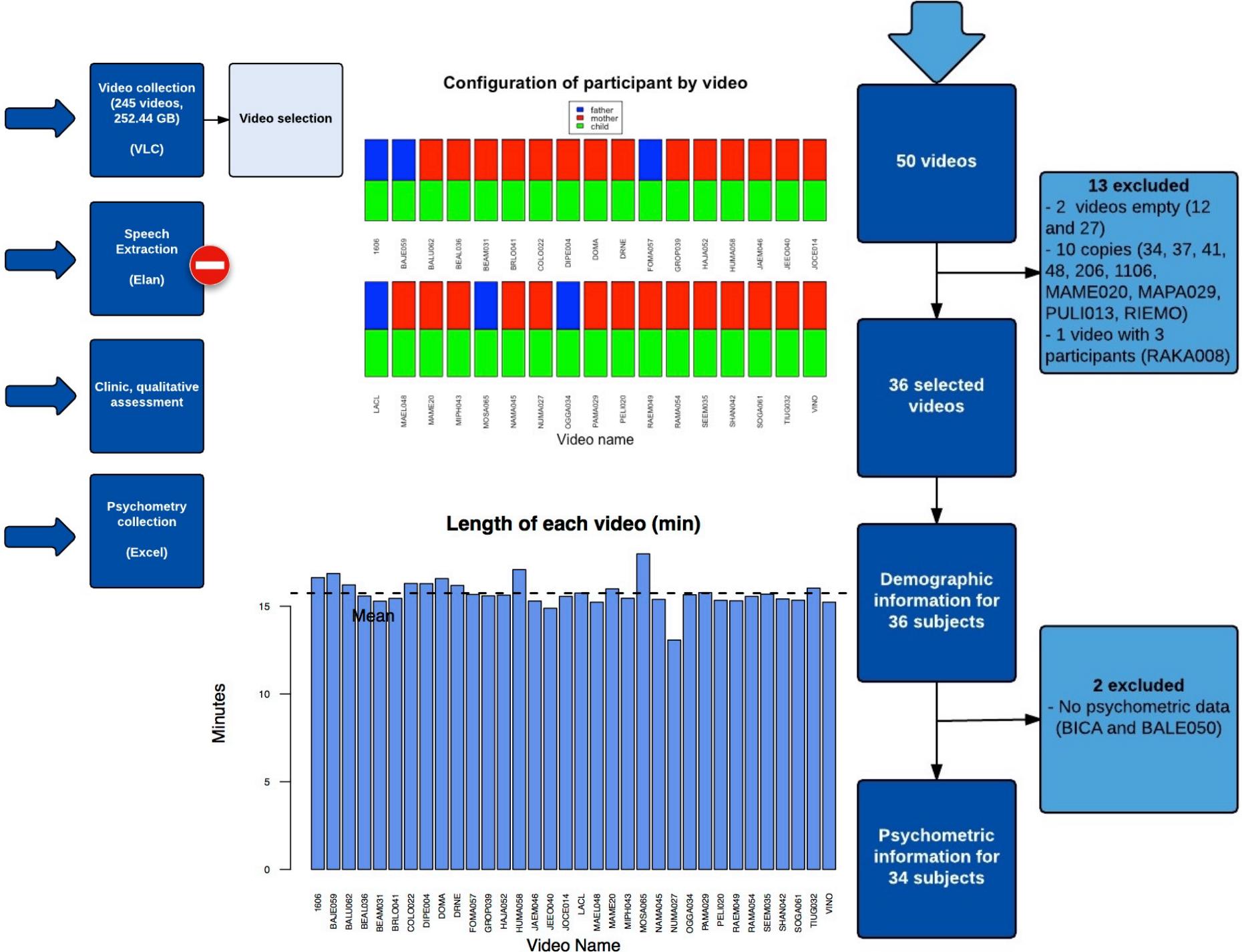
Box plots of the Motion history by frame (raw data), all videos

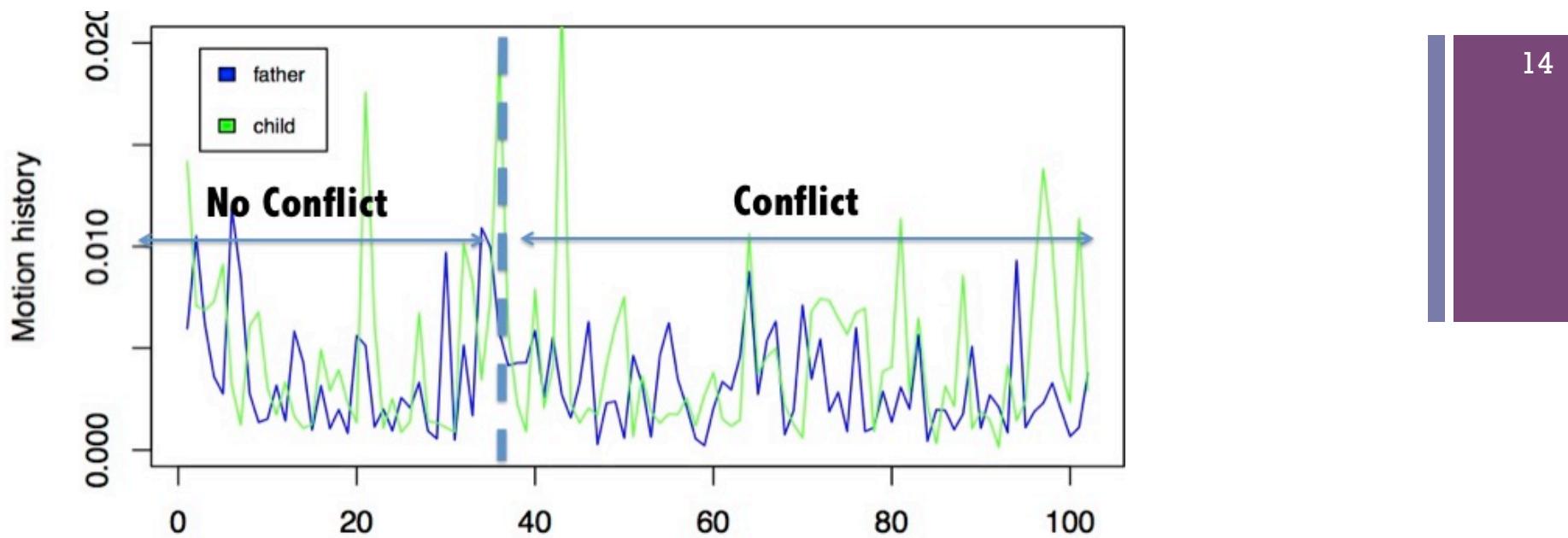


# Etude MONRADO

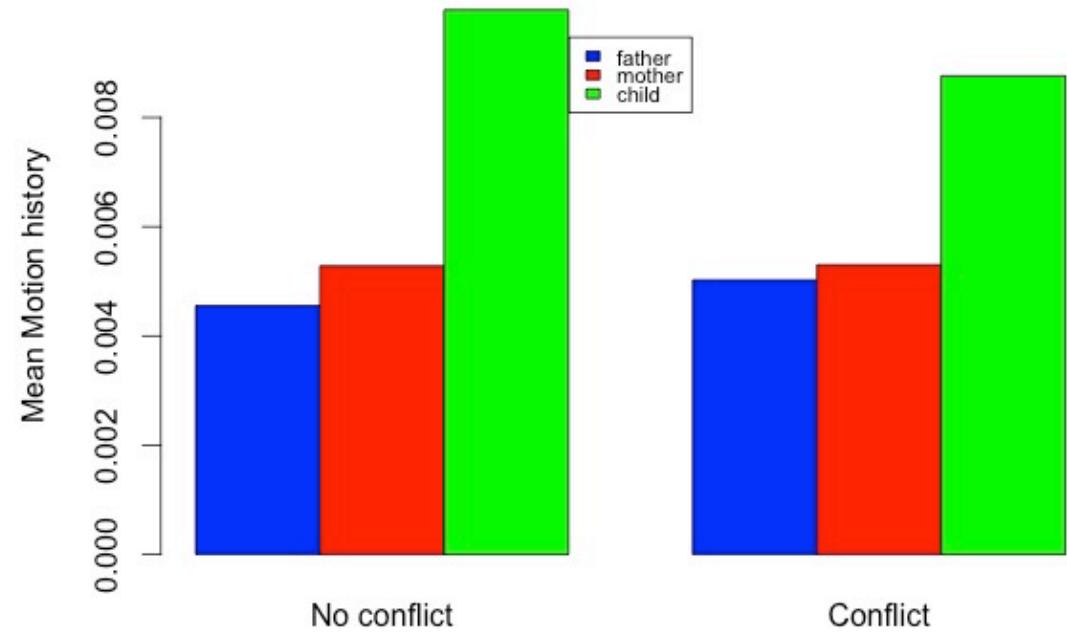
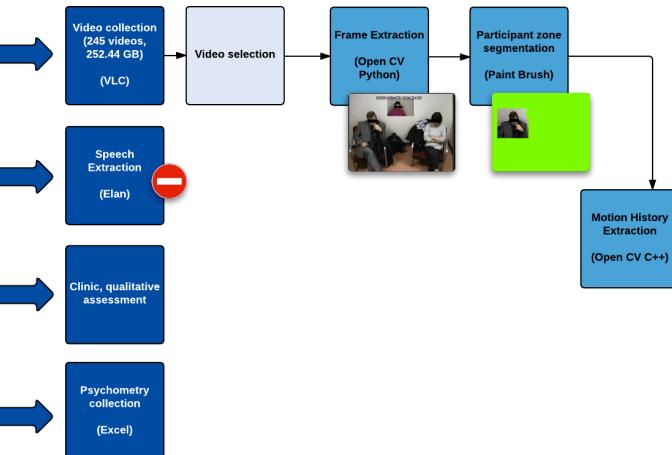
- 2 Sujets sains : parent /enfant
- Comportement en période non-conflit (5min) versus conflit (10 min)
- Profils d'attachement (qualité de la relation au parent)

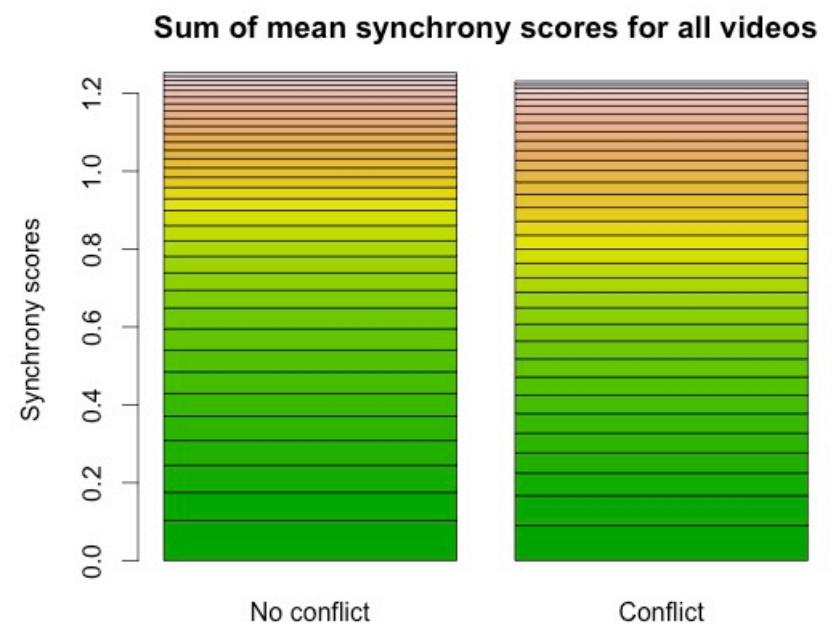
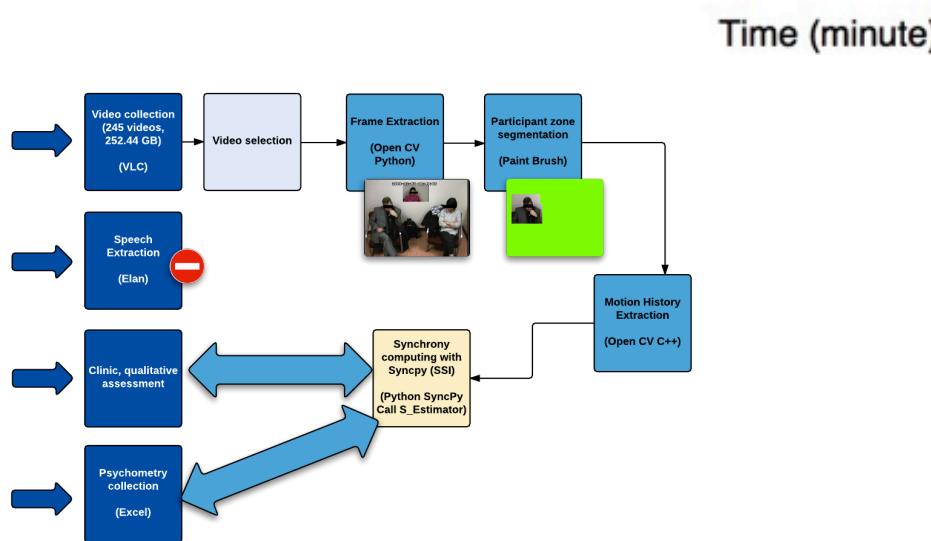
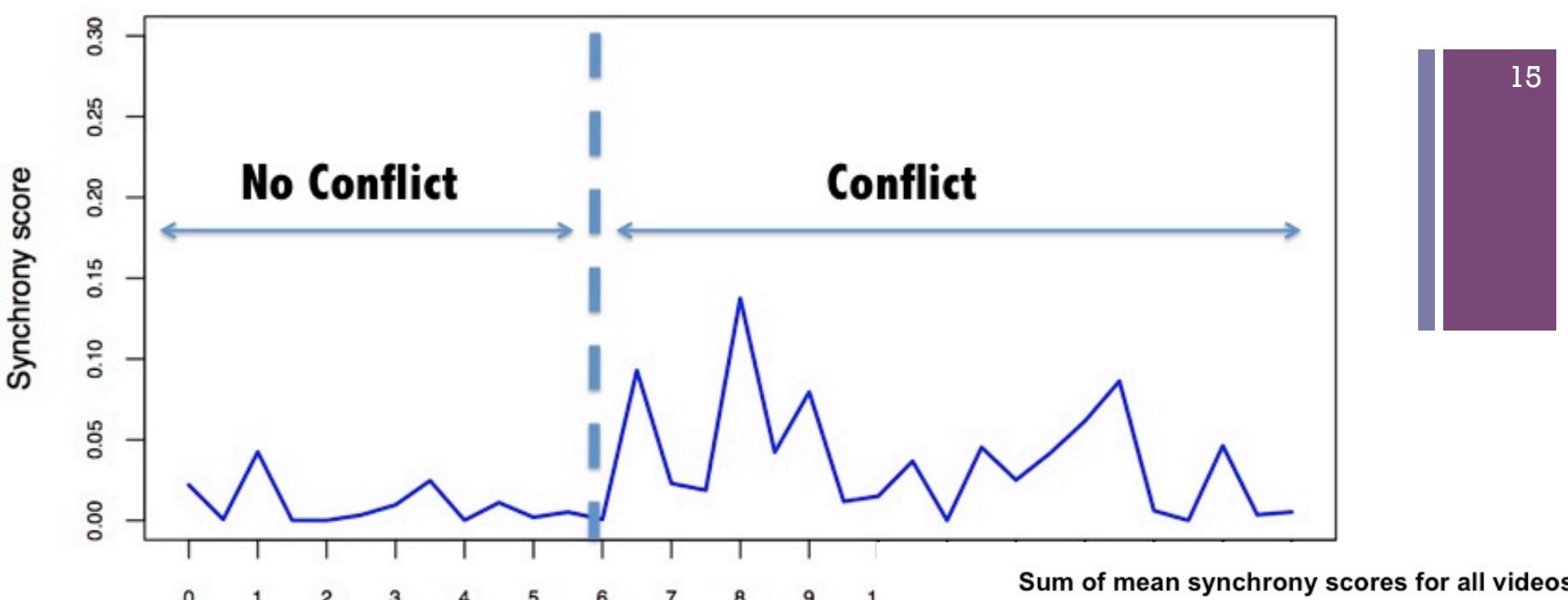






**Mean Motion history for each participant without and with conflict**





Score de synchronie de la vidéo faible

Score de synchronie de la vidéo élevé

+



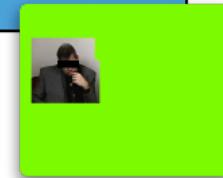
**Video collection**  
(245 videos,  
252.44 GB)  
(VLC)

**Video selection**

**Frame Extraction**  
(Open CV  
Python)



**Participant zone  
segmentation**  
(Paint Brush)



**Speech  
Extraction**  
(Elan)



**Clinic, qualitative  
assessment**

**Synchrony  
computing with  
Syncpy (SSI)**  
(Python SyncPy  
Call S\_Estimator)

**Motion History  
Extraction**  
(Open CV C++)



**Psychometry  
collection**  
(Excel)

### Legend

**Raw data**

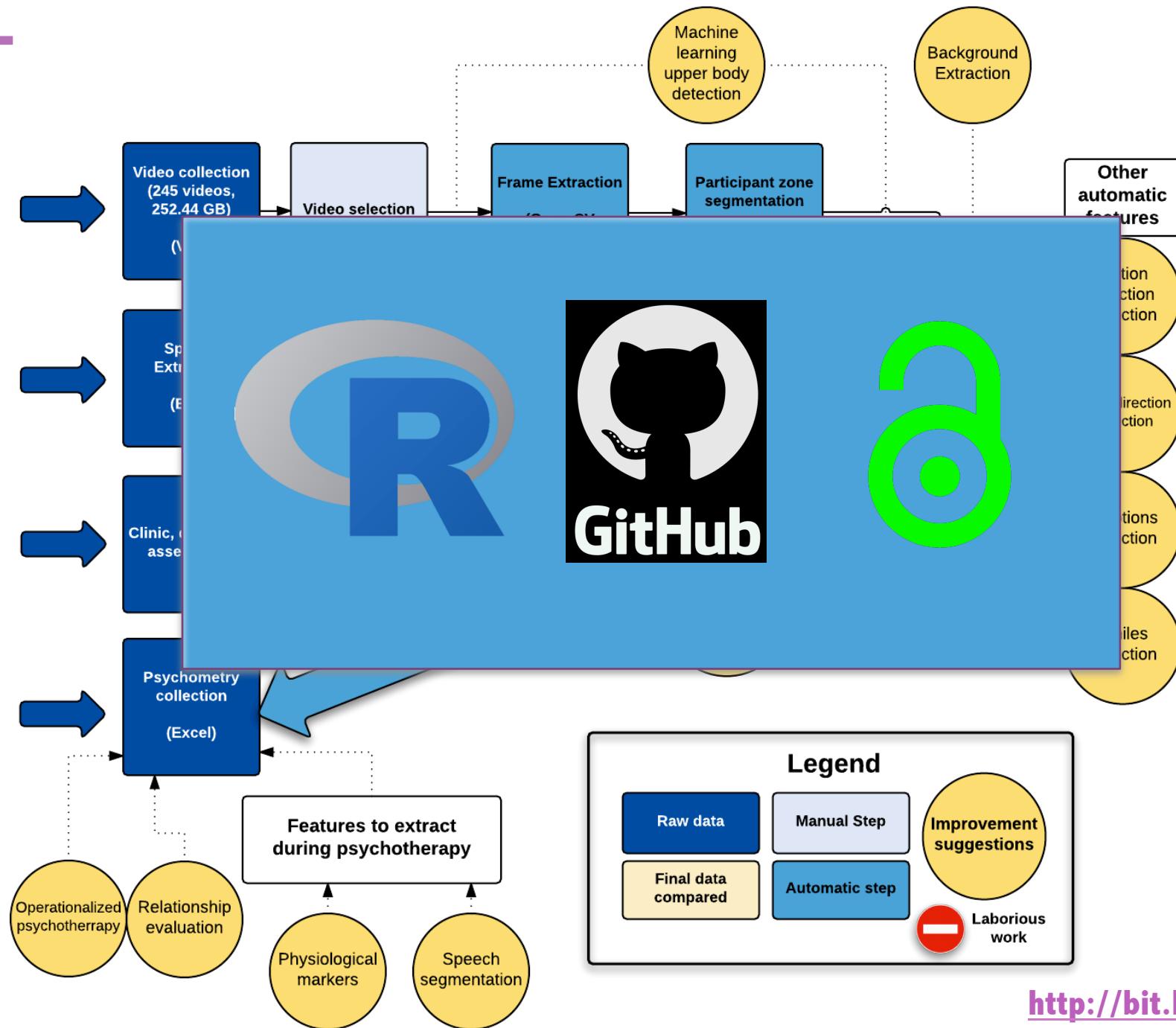
**Manual Step**

**Final data  
compared**

**Automatic step**

**Improvement  
suggestions**

**Laborious  
work**





Merci pour votre attention

<http://bit.ly/syncpsy>

## + ■ Granger causality

- Illustration of the idea of Granger causality. An interaction from infant to parent vocalization exists if the prediction using only past parental vocalizations is worse than the prediction using the past parental and infant vocalizations. (b) Average interaction strength from infant to parent (purple line) and from parent to infant (blue line). Larger values indicate stronger interactions. Dashed regions indicate the respective 95% confidence intervals.

## ■ S\_Estimator

- To compute the synchrony, we use the S\_Estimator algorithm that is drawn from information theory. It makes a matrix of correlation on the standardised motion history time series (mean =0 and SD = 1). Consequently, only the shape of the signal matters. Afterwards, it computes the eigenvalues of this matrix. Finally, after the normalization of the eigenvalues, it can
- compute the synchrony from a sort of entropy (Carneli et al, 2005). The index ranges from 0 (no synchrony) to 1 (full synchrony). If all signals are equals, the synchrony scores equals 1.

## ■ Cross-correlation

- Correlation entre deux signaux sur une fenêtre glissante

- Sélectionner +++
- Vidéo de psychothérapie à mettre - Transparent gris plutot que bleu