Synchrony in Psychotherapy, example with F1044 patient data

Thomas Gargot

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Contents

```
rm(list = ls(all.names = TRUE))
```

```
setwd("/Users/Ofix/Documents/Fac/internat/Recherche/projets/synchro/synchroData/Git/INCANT/")
```

Import data

```
data <- importdata(fullNameList)
```

Lists

Functions list

MeanMotionByTime

Function that takes raw motion history data and compute the mean on a given interval. Intervals don't overlap, so the frequency of the data change (from 25 frames by seconde to 25 frames/interval by second).

Arguments:

- subject : Subject studied (patient, mother, father or therapist)
- indexOfvideos : List of videos studied (element eg 3 or list eg 1:3 or c(1,2,4))
- interval : number of frames in the studied interval
- data : data frame where there is data

```
## Revoir nom des variables : pas clair, faire un schéma
MeanMotionByTime <- function(subject, indexOfvideos=1:NumberOfvideos, interval, data){
  x <- c()
  for (file in indexList[indexOfvideos]){
        dataVector <- data[which(data$indexList==file), subject]
```

```
        ## with ceiling : superior limit of the round
        IntervalNumbersVideo <- ceiling(length(dataVector)/interval)
        for (i in 1:IntervalNumbersVideo){
                borneinf<- 1+(i-1)*interval
                bornesup <-i*interval
                dataVectorInterval <- dataVector[borneinf:bornesup]
                mean <- mean(dataVectorInterval, na.rm=TRUE)
                x <- c(x, mean)}}
  return (x)}
```

Slidinginterval

Function that takes raw motion history data and compute the mean on a given interval. The interval overlap, so the frequency of the data don't change. It stays at 25 frames/s.

Arguments:

- subject : subject studied (patient, mother, father or therapist)
- indexOfvideos : list of videos studied (element eg. 3 or list eg 1:3 or c(1,2,4))
- interval : number of frames in the studied interval
- data : data frame where there is data

```
## faire un schéma
SlidingInterval <- function(subject, indexOfvideos=1:NumberOfvideos, interval, data)
  {x <- c()
  for (file in indexList[indexOfvideos]){
      dataVector <- data[which(data$indexList==file), subject]
      NBofAnalysedFrames <- length(dataVector)-interval+1
          for (i in 1:NBofAnalysedFrames){
              borneinf<- (i)
              bornesup <-(interval-1+i)
              dataVectorInterval <- dataVector[borneinf:bornesup]
              mean <- mean(dataVectorInterval, na.rm=TRUE)
              x <- c(x, mean)}}
  return (x)}
```

MeanSynchronyByTime (TODO)

Constants generated from data and defining it (data list,)

```
labelvideolist  <-c()
for (i in indexList){
    a <- str_count(i)
    name <- substr(i, 6, a)
    labelvideolist <- c(labelvideolist, name)
}

FilesName <- data.frame(unique(data$file), filesList, indexList, labelvideolist)
NumberOfvideos <- length(indexList)
```

```r
# blue will refer to father
# red will refer to mother
# green to patient
# orange to therapist

colOrderList  <- c("blue","red", "green","orange")
```

Merge data frame, compute Time in minutes, compute log of motion history dataframe

```r
data <- merge(data, FilesName, by.x="file", by.y="unique.data.file.", all=TRUE)
data$timeMin <- data$frame/(25*60)

data$logFather <- log(data$father)
data$norm.logFather <- data$logFather+20
data$norm.logFather[which(data$norm.logFather==-Inf)] <- NA

data$logMother <- log(data$mother)
data$norm.logMother <- data$logMother+20
data$norm.logMother[which(data$norm.logMother==-Inf)] <- NA

data$logPatient <- log(data$patient)
data$norm.logPatient <- data$logPatient+20
data$norm.logPatient[which(data$norm.logPatient==-Inf)] <- NA

data$logTherapist <- log(data$therapist)
data$norm.logTherapist <- data$logTherapist+20
data$norm.logTherapist[which(data$norm.logTherapist==-Inf)] <- NA

data$file <- NULL
data$filesList <- NULL
```

- Time in minutes The timeMin is calculated with a frame rate of 25/sec.
- Motion history distribution The data is not normal at all but with very small movement very frequent and bigger movement much rare with a long tail.

To normalize the distribution to compute synchrony scores on it, we made the Napierian logarithm. It produces negative numbers. SyncPy can't compute negatives scores, they are so shifted to positives values with an arbitrary value of 20 to avoid to keep extreme negative values.

Values equal to 0 can't be loged. They generate a -Inf value. These values are set to NA. We lose the information of no movement at all. If we give a arbitrary value to this data (eg, the minimum value, they are over represented)

Presentation of the data

```
str(data)
```

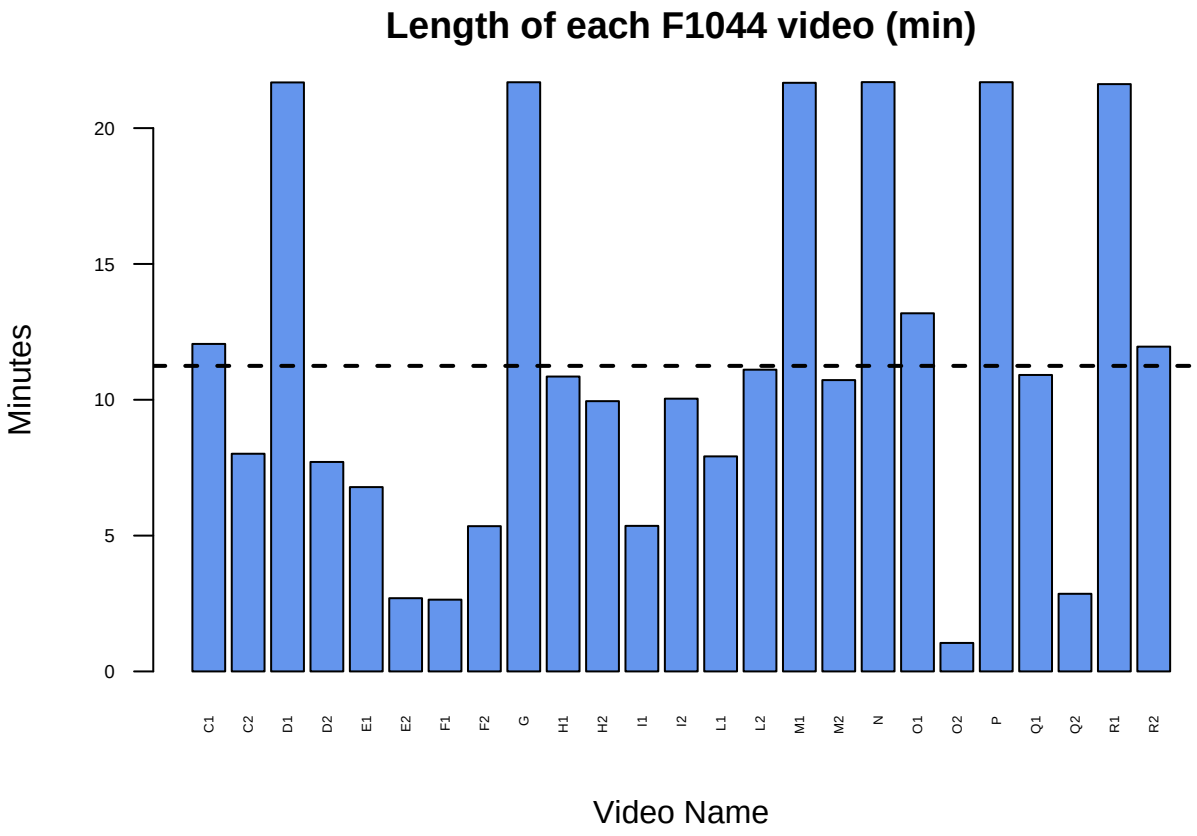
```
## 'data.frame':    421797 obs. of  16 variables:
##  $ frame            : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ father           : num  0.0339 0.0156 0.023 0.0304 0.0299 ...
##  $ mother           : num  2.28e-05 2.28e-05 4.56e-05 2.28e-05 1.14e-04 ...
##  $ patient          : num  NA NA NA NA NA NA NA NA NA NA ...
##  $ therapist        : num  0.00172 0.00529 0.00334 0.00223 0.00265 ...
##  $ indexList        : Factor w/ 25 levels "F1044C1","F1044C2",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ labelvideolist   : Factor w/ 25 levels "C1","C2","D1",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ timeMin          : num  0.000667 0.001333 0.002 0.002667 0.003333 ...
##  $ logFather        : num  -3.38 -4.16 -3.77 -3.49 -3.51 ...
##  $ norm.logFather   : num  16.6 15.8 16.2 16.5 16.5 ...
##  $ logMother        : num  -10.69 -10.69 -10 -10.69 -9.08 ...
##  $ norm.logMother   : num  9.31 9.31 10 9.31 10.92 ...
##  $ logPatient       : num  NA NA NA NA NA NA NA NA NA NA ...
##  $ norm.logPatient  : num  NA NA NA NA NA NA NA NA NA NA ...
##  $ logTherapist     : num  -6.37 -5.24 -5.7 -6.11 -5.93 ...
##  $ norm.logTherapist: num  13.6 14.8 14.3 13.9 14.1 ...
```

```
summary(data)
```

```
##      frame           father           mother         patient
##  Min.   :    1   Min.   :0.00     Min.   :0.00    Min.   :0.00
##  1st Qu.: 4362   1st Qu.:0.00     1st Qu.:0.00    1st Qu.:0.00
##  Median : 9526   Median :0.00     Median :0.00    Median :0.00
##  Mean   :11386   Mean   :0.00     Mean   :0.00    Mean   :0.01
##  3rd Qu.:16227   3rd Qu.:0.00     3rd Qu.:0.00    3rd Qu.:0.01
##  Max.   :32540   Max.   :0.16     Max.   :0.21    Max.   :0.26
##                  NA's   :217772   NA's   :46817   NA's   :211815
##    therapist       indexList      labelvideolist      timeMin
##  Min.   :0.00    F1044N : 32540   N      : 32540   Min.   : 0.000667
##  1st Qu.:0.00    F1044P : 32535   P      : 32535   1st Qu.: 2.908000
##  Median :0.00    F1044G : 32532   G      : 32532   Median : 6.350667
##  Mean   :0.00    F1044D1: 32523   D1     : 32523   Mean   : 7.590724
##  3rd Qu.:0.00    F1044M1: 32502   M1     : 32502   3rd Qu.:10.818000
##  Max.   :0.16    F1044R1: 32430   R1     : 32430   Max.   :21.693333
##  NA's   :58310   (Other):226735   (Other):226735
##    logFather      norm.logFather     logMother     norm.logMother
##  Min.   :-Inf     Min.   : 8.95    Min.   :-Inf    Min.   : 9.00
##  1st Qu.:-Inf     1st Qu.:10.34    1st Qu.:-Inf    1st Qu.:10.20
##  Median : -11     Median :12.80    Median :  -9    Median :11.78
##  Mean   :-Inf     Mean   :12.72    Mean   :-Inf    Mean   :12.24
##  3rd Qu.:  -7     3rd Qu.:14.90    3rd Qu.:  -7    3rd Qu.:14.23
##  Max.   :  -2     Max.   :18.15    Max.   :  -2    Max.   :18.45
##  NA's   :217772   NA's   :307289   NA's   :46817   NA's   :144295
##    logPatient     norm.logPatient   logTherapist   norm.logTherapist
##  Min.   :-Inf     Min.   : 8.90    Min.   :-Inf    Min.   :10.01
##  1st Qu.:  -8     1st Qu.:13.02    1st Qu.:  -7    1st Qu.:13.70
##  Median :  -6     Median :14.39    Median :  -6    Median :14.23
##  Mean   :-Inf     Mean   :14.08    Mean   :-Inf    Mean   :14.08
##  3rd Qu.:  -5     3rd Qu.:15.56    3rd Qu.:  -5    3rd Qu.:14.57
```

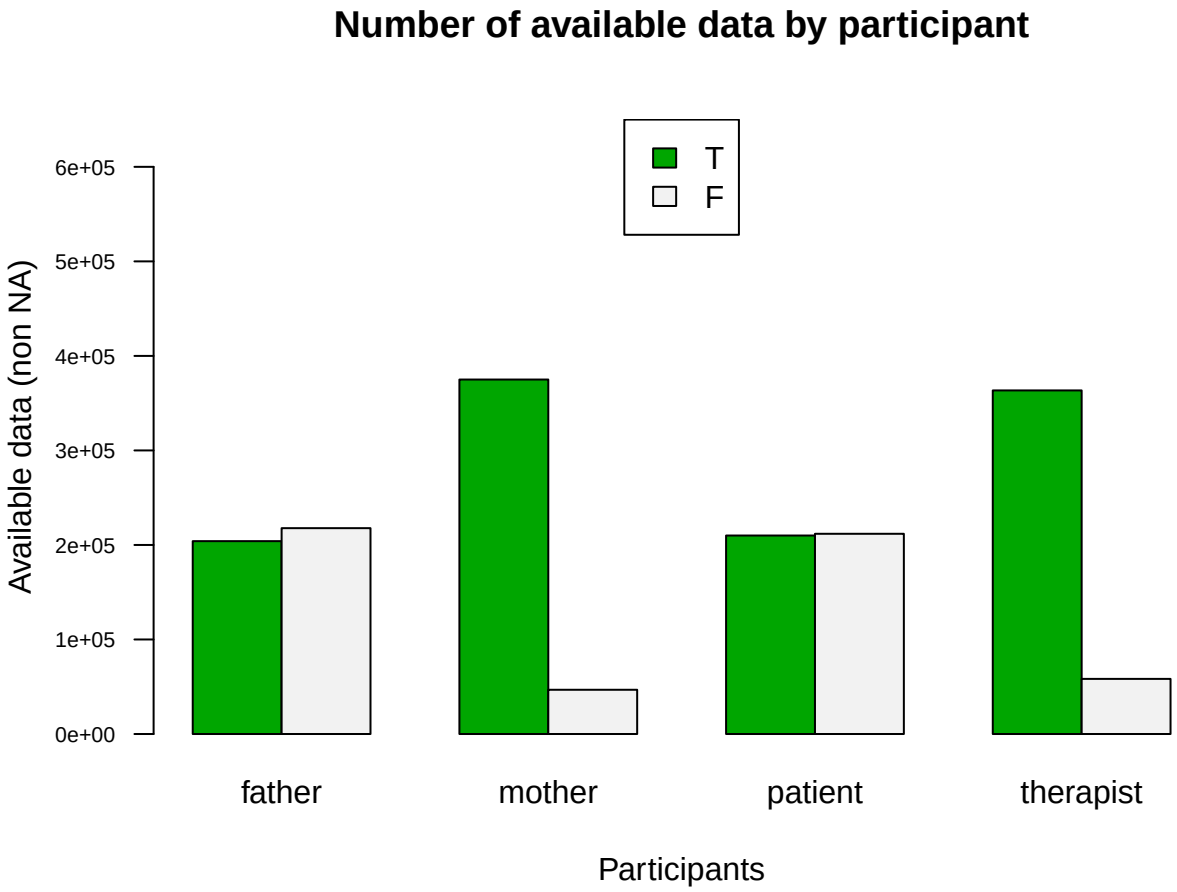
```
##  Max.   :  -1     Max.   :18.65    Max.   :  -2    Max.   :18.16
##  NA's   :211815   NA's   :228360   NA's   :58310   NA's   :103150
```

Length of the videos in minutes



Length of the videos in number of frames

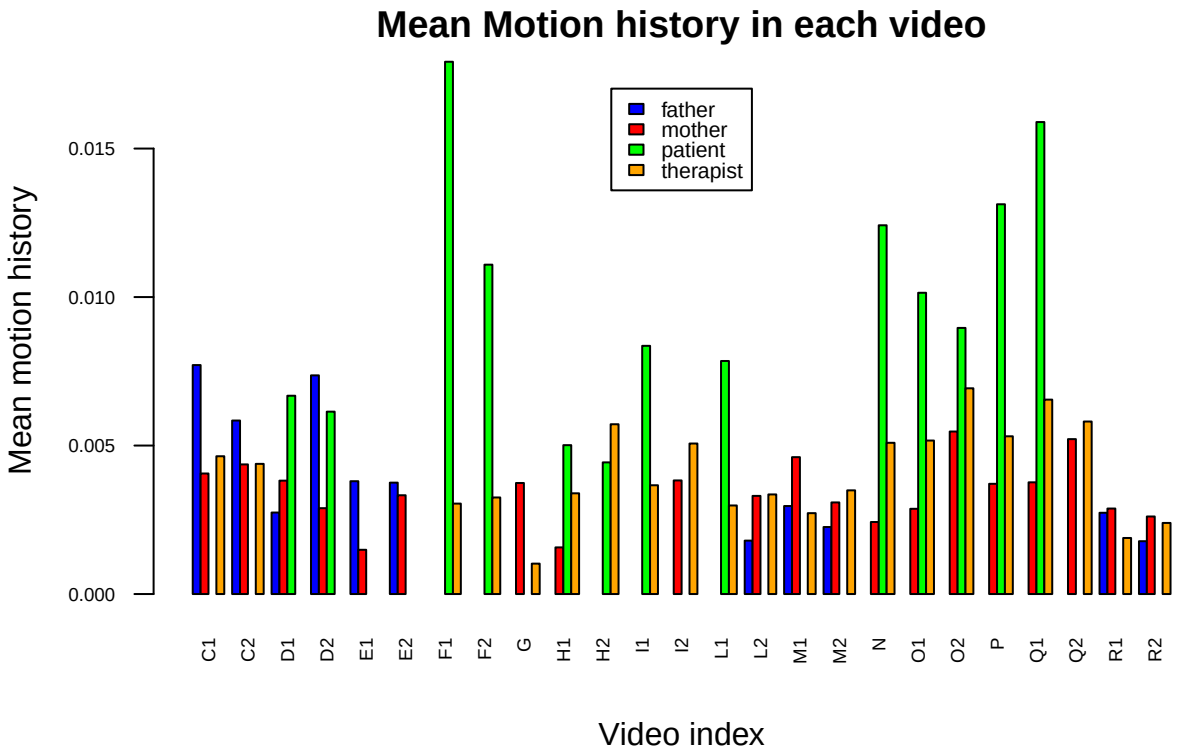
Number of Available (True) and Not Available (False) data for each participant



Some participants are not filmed (eg therapist) or don't come in the sessions (father, patient). Mother and therapist are the more often present participants.

Global Motion history

Mean Motion history by video by participant



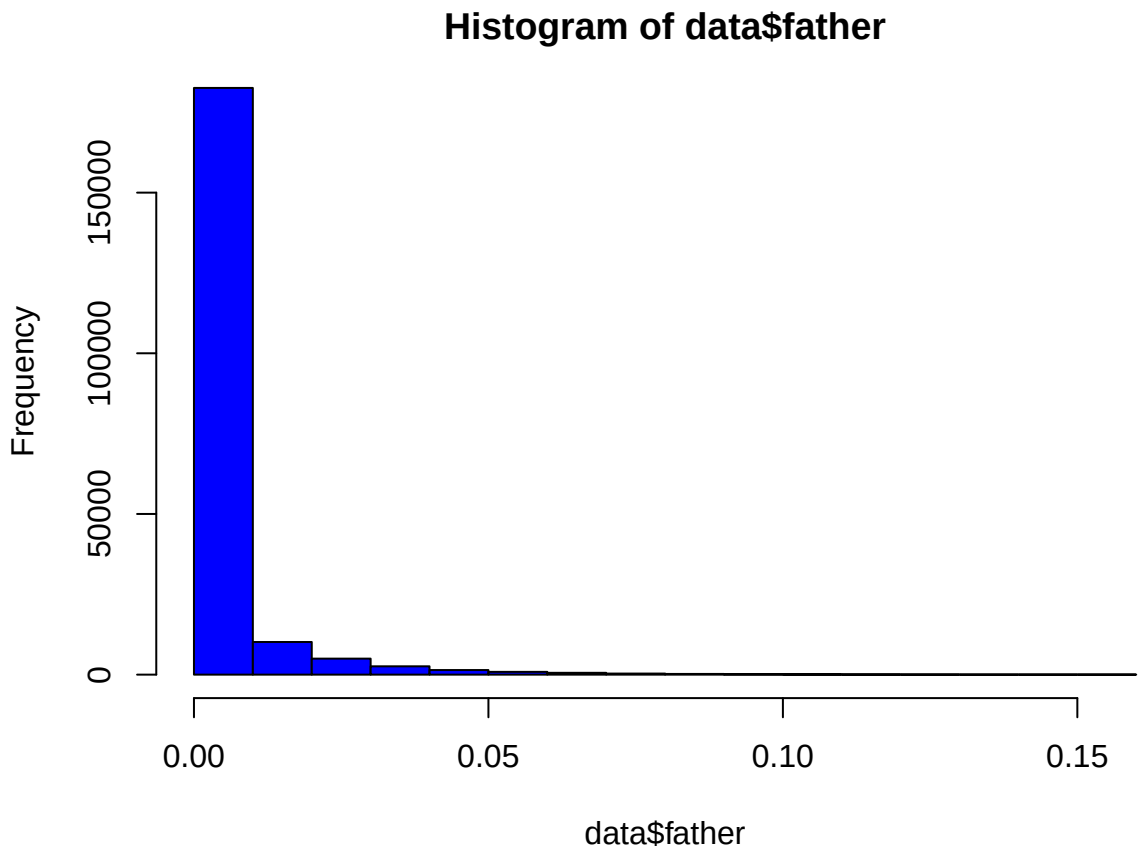
We can see that configurations of subjects are very different. Consequently, it makes the comparaisons of the videos quite complicated. It is not really relevant to compare the synchrony of two persons if the context is different (other people around them).

Raw Motion history by video by participant

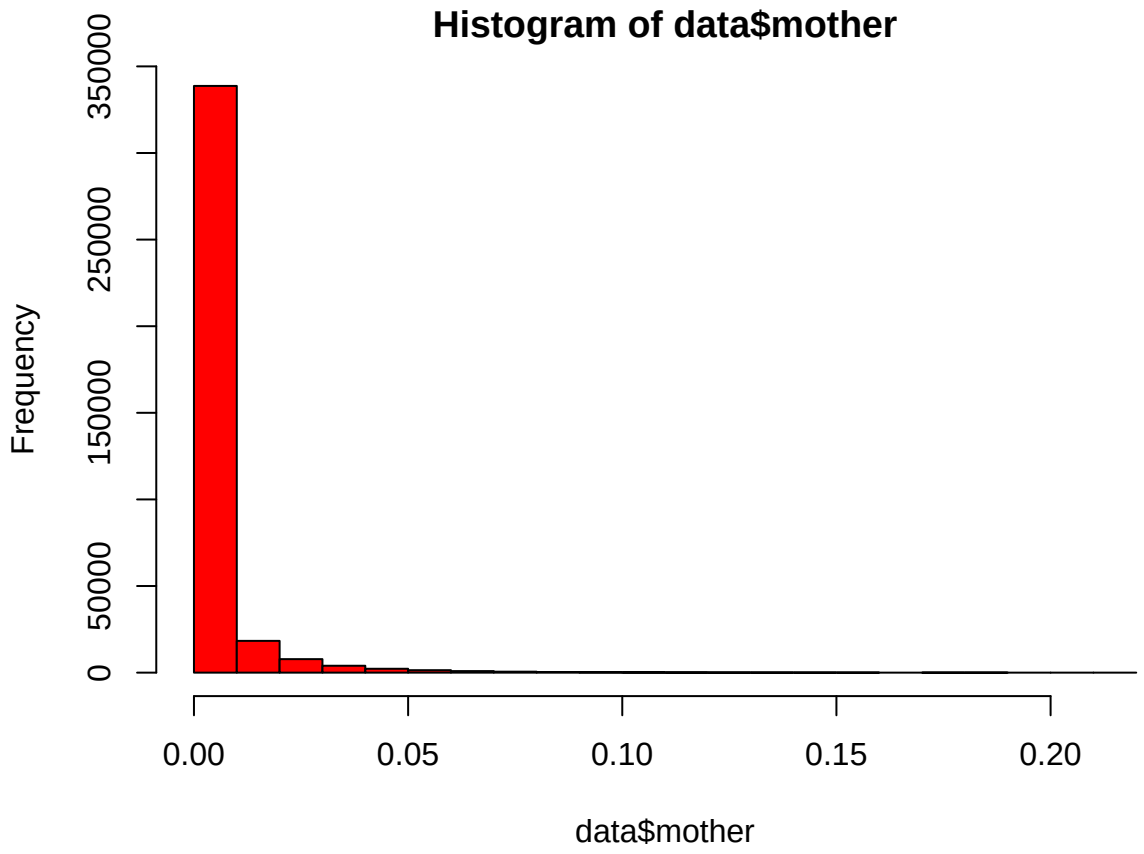
Boxplots

Histograms

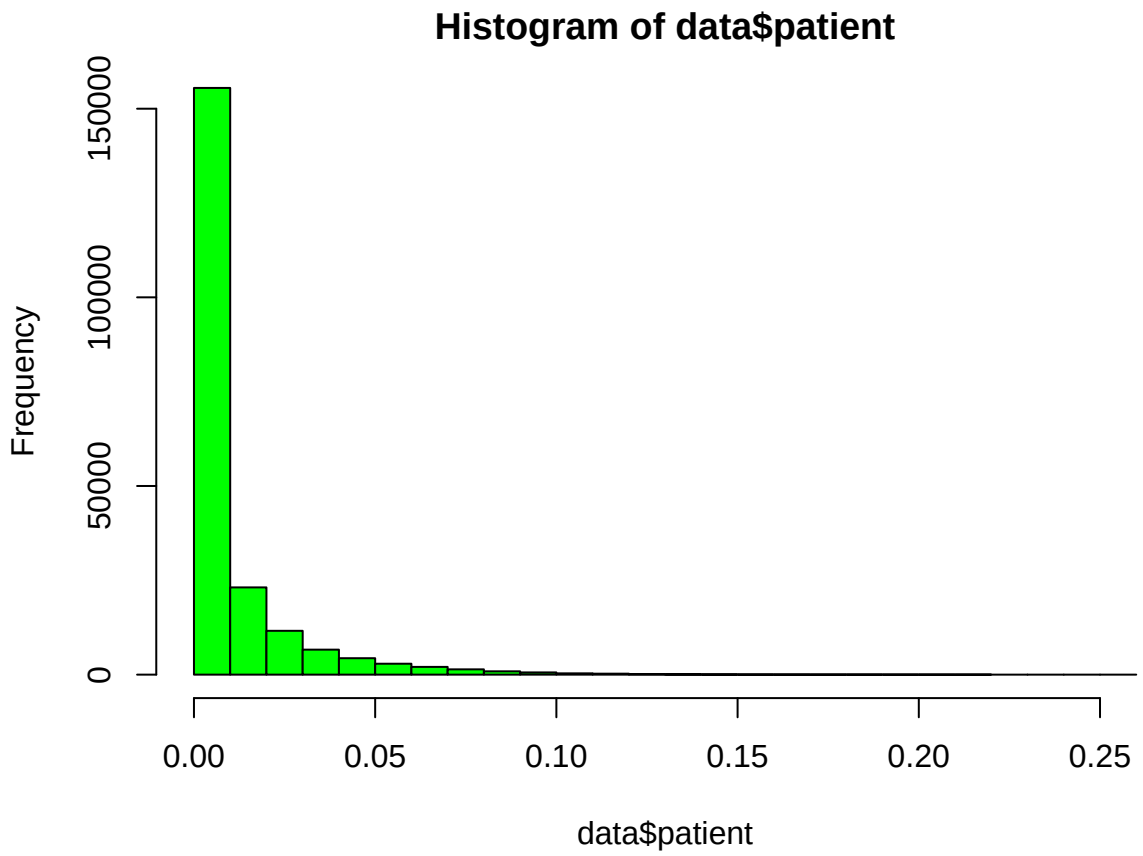
```
par(mar=c(4,4,2,2))
hist(data$father, col=colOrderList[1])
```



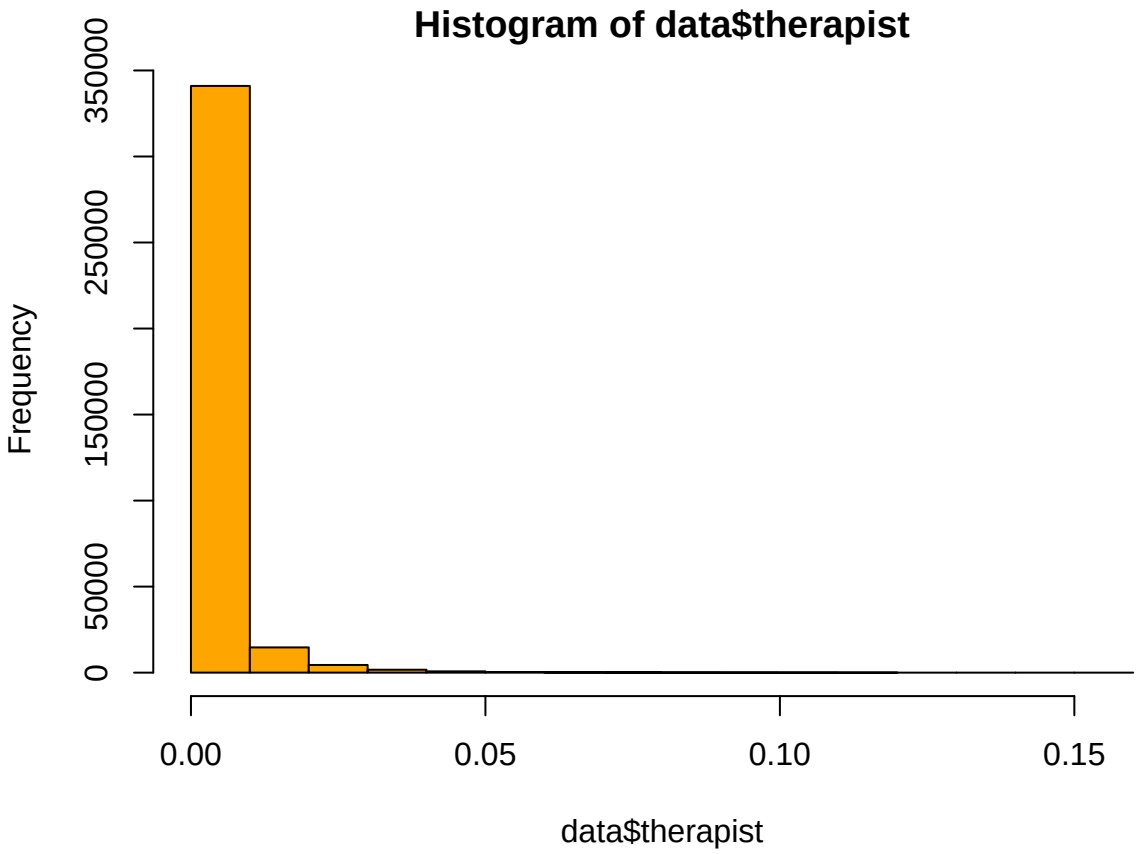

```
hist(data$mother, col=colOrderList[2])
```




```
hist(data$patient, col=colOrderList[3])
```




```
hist(data$therapist, col=colOrderList[4])
```

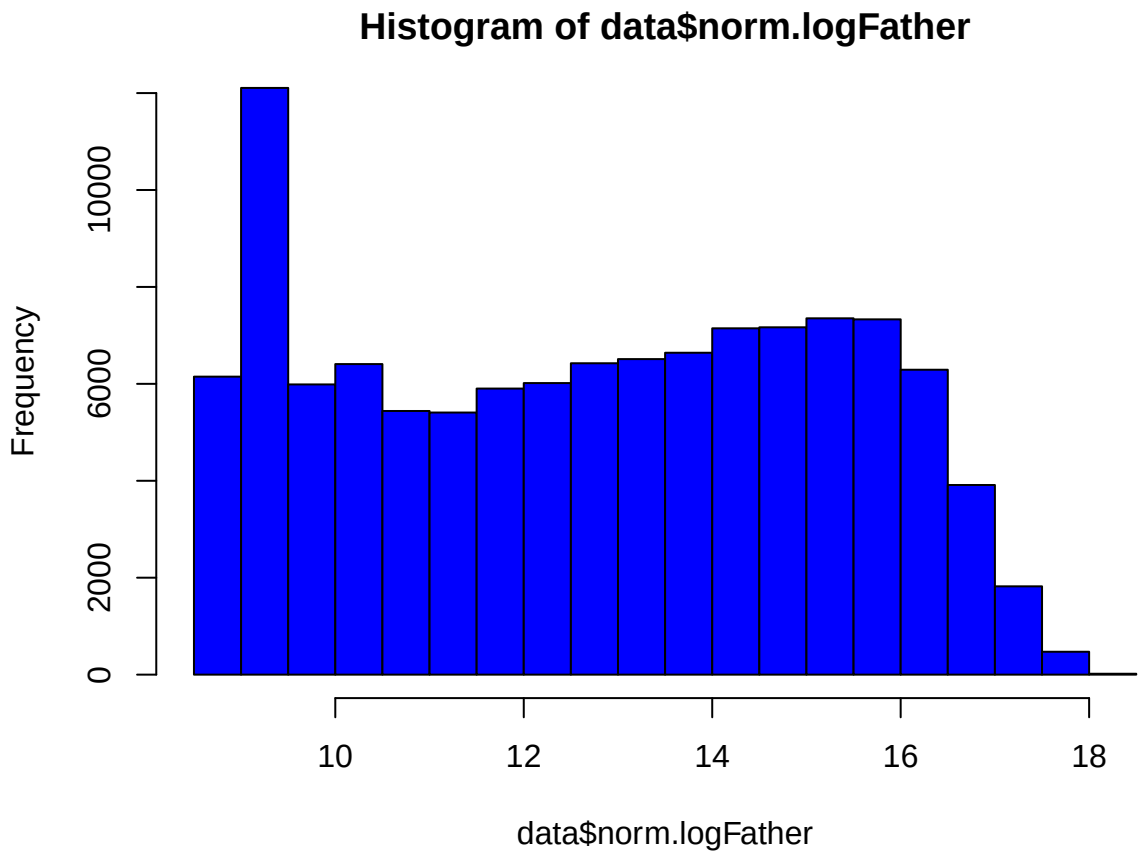


Normalized log Motion history by video by participant

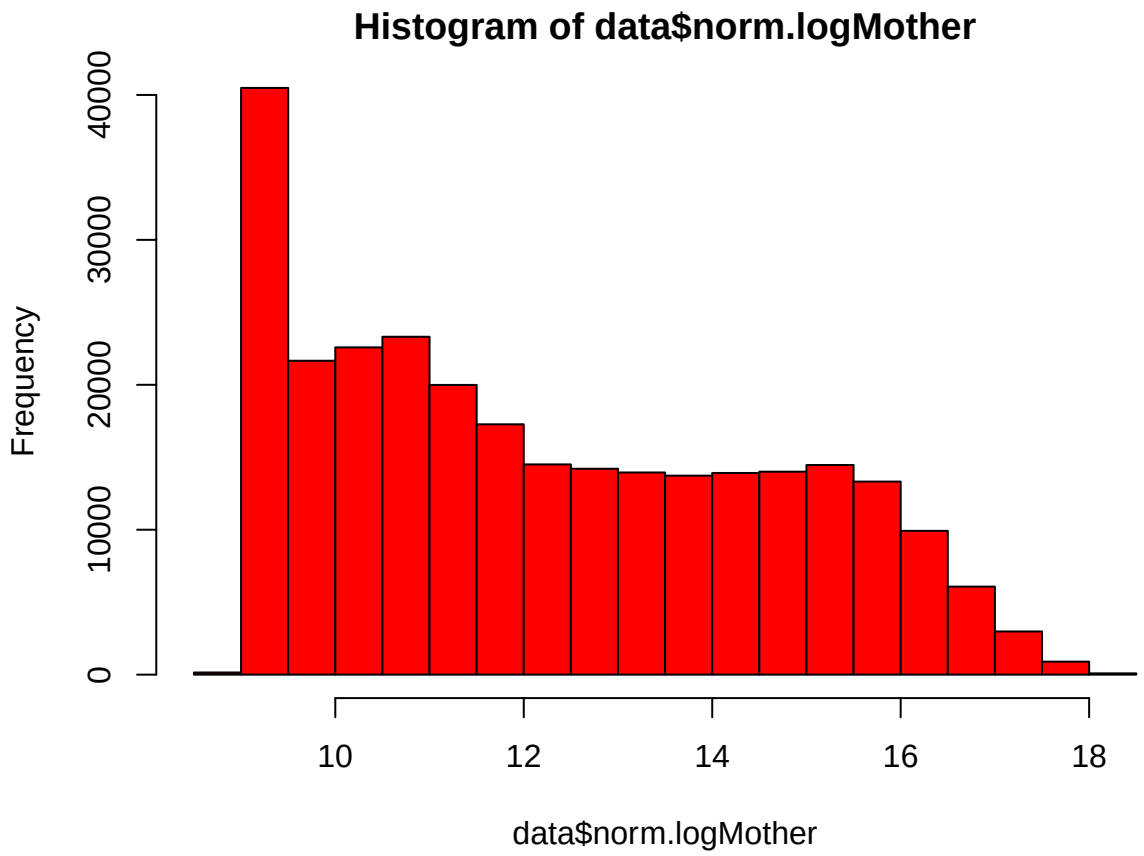
Boxplots

Histograms

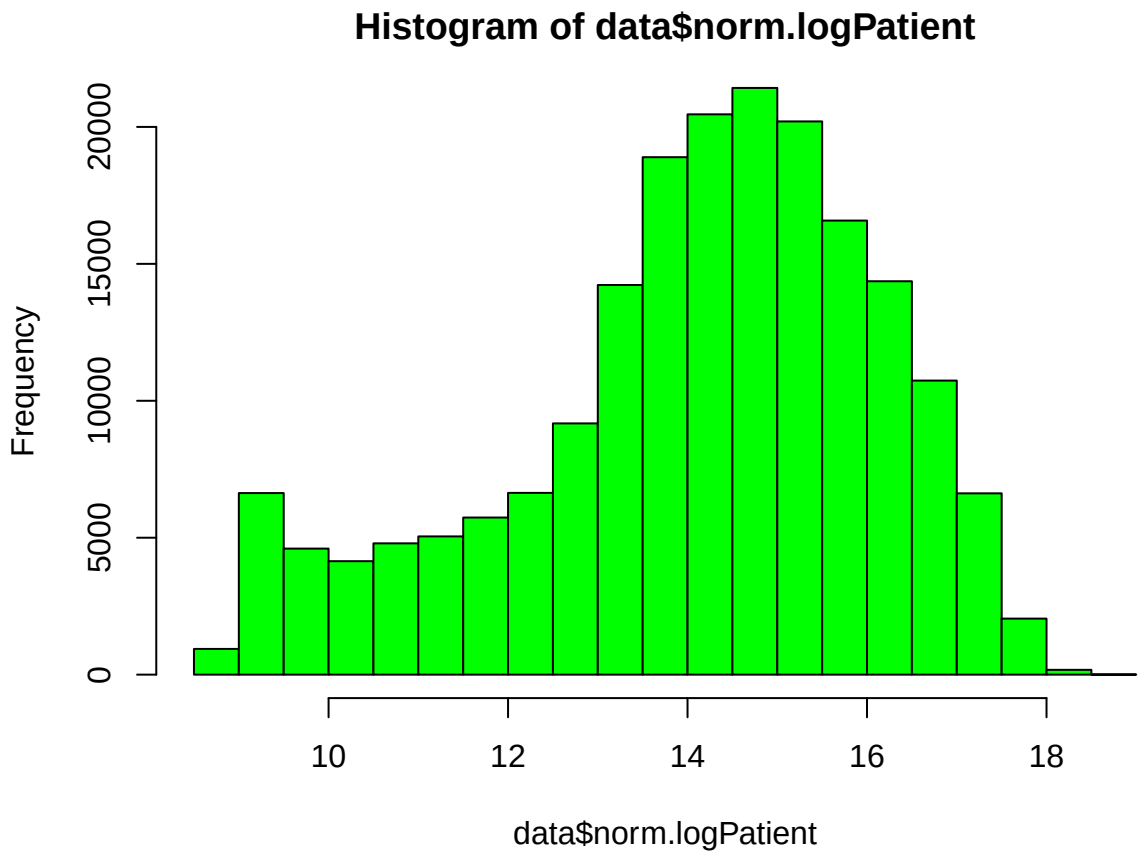
```
par(mar=c(4,4,2,2))
hist(data$norm.logFather, col=colOrderList[1])
```



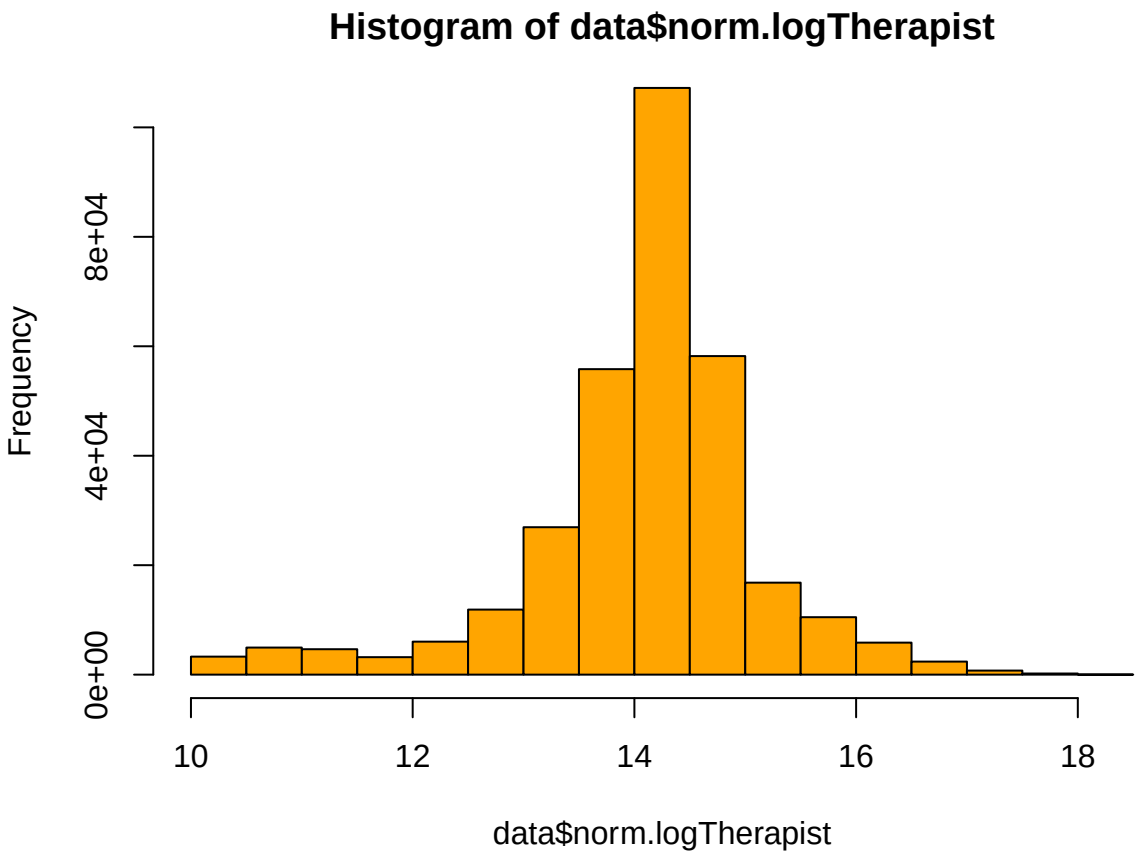

```
hist(data$norm.logMother, col=colOrderList[2])
```




```
hist(data$norm.logPatient, col=colOrderList[3])
```




```
hist(data$norm.logTherapist, col=colOrderList[4])
```



We can see that the father and the mother motion history is very similar. However. The therapist, which is always in a small window of the video, as a very different distribution. We have less signal on it. In some videos the patient is in this window, it explains, it intermediates position.

Raw data and mean of Motion History on sliding and non overlapping intervals on 1st video F1044C1 video

It is the first video of F1044C. The father, mother and therapist are present. The patient is absent.

Raw data

```
rawFatherF1044C1 <- data[which(data$indexList=="F1044C1"),]$father
rawMotherF1044C1 <- data[which(data$indexList=="F1044C1"),]$mother
rawTherapistF1044C1 <- data[which(data$indexList=="F1044C1"),]$therapist

logFatherF1044C1 <- data[which(data$indexList=="F1044C1"),]$norm.logFather
logMotherF1044C1 <- data[which(data$indexList=="F1044C1"),]$norm.logMother
logTherapistF1044C1 <- data[which(data$indexList=="F1044C1"),]$norm.logTherapist

summary(rawFatherF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 2.079e-05 6.862e-04 7.710e-03 7.278e-03 1.568e-01
```

```r
summary(rawMotherF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 4.563e-05 1.825e-04 4.059e-03 2.806e-03 1.116e-01
```

```r
summary(rawTherapistF1044C1)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.001393 0.002832 0.003482 0.004640 0.004411 0.083240
```

```r
summary(logFatherF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.219  11.780  13.940  13.600  15.620  18.150    4258
```

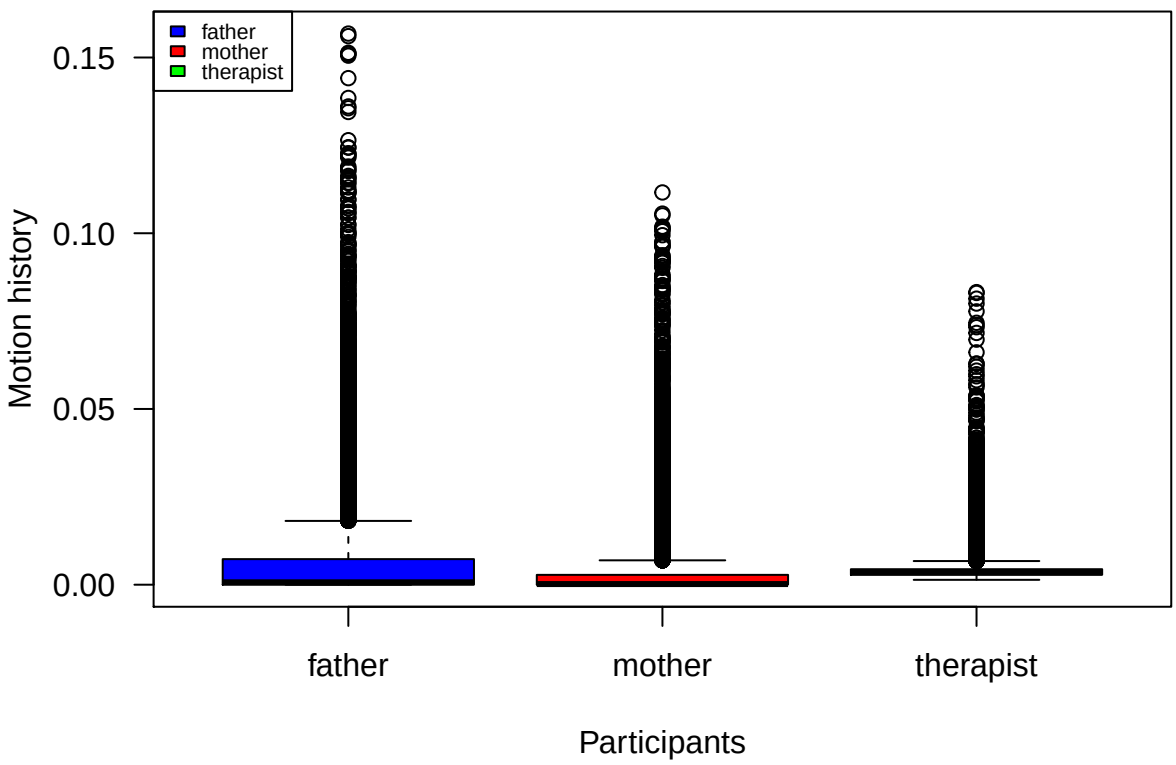
```r
summary(logMotherF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.312  10.410  11.880  12.390  14.390  17.810    1932
```

```r
summary(logTherapistF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.42   14.13   14.34   14.44   14.58   17.51
```

```r
par(mar=c(4,4,3,2))
boxplot(rawFatherF1044C1, rawMotherF1044C1, rawTherapistF1044C1,
        col=colOrderList[c(1,2,4)],
        names=ParticipantsList[c(1,2,4)],
        main= "Box plots of motion history raw data on F1044C1 video", las=1, ylab ="Motion history", x
par(mar=c(1,0.5,0.5,1))
legend("topleft", ParticipantsList[c(1,2,4)], fill=colOrderList, cex=0.7)
```



Sliding interval

```
## REMINDER:
# SlidingInterval <- function(subject, indexOfvideos=1:NumberOfvideos, interval, data) with :
# subject : subject studied (patient, mother, father or therapist)
# indexOfvideos : list of videos studied (element eg. 3 or list eg 1:3 or c(1,2,4))
# interval : number of frames in the studied interval
# data : data frame where there is data

slidedFatherF1044C1 <- SlidingInterval("father", 1 , 5, data)
slidedMotherF1044C1 <- SlidingInterval("mother", 1 , 5, data)
slidedPatientF1044C1 <- SlidingInterval("patient", 1 , 5, data)
slidedTherapistF1044C1 <- SlidingInterval("therapist", 1 , 5, data)

slidedLogFatherF1044C1 <- SlidingInterval("norm.logFather", 1 , 5, data)
slidedLogMotherF1044C1 <- SlidingInterval("norm.logMother", 1 , 5, data)
slidedLogPatientF1044C1 <- SlidingInterval("norm.logPatient", 1 , 5, data)
slidedLogTherapistF1044C1 <- SlidingInterval("norm.logTherapist", 1 , 5, data)

summary(slidedFatherF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 2.079e-05 1.011e-03 7.708e-03 7.678e-03 1.506e-01
```

```r
summary(slidedMotherF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 5.931e-05 2.464e-04 4.060e-03 3.185e-03 1.013e-01
```

```r
summary(slidedPatientF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##      NA      NA      NA     NaN      NA      NA   18080
```

```r
summary(slidedTherapistF1044C1)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.002126 0.003101 0.003436 0.004640 0.004067 0.077910
```

```r
summary(slidedLogFatherF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.219  10.670  13.100  12.980  15.180  18.110    1561
```

```r
summary(slidedLogMotherF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.312  10.280  11.400  12.140  14.010  17.710      94
```

```r
summary(slidedLogPatientF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##      NA      NA      NA     NaN      NA      NA   18080
```

```r
summary(slidedLogTherapistF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.84   14.20   14.30   14.44   14.47   17.45
```

Non overlapping interval

```r
fatherFiveF1044C1<- MeanMotionByTime("father", indexOfvideos=1, interval=5, data)

motherFiveF1044C1 <- MeanMotionByTime("mother", indexOfvideos=1, interval=5, data)

therapistFiveF1044C1 <- MeanMotionByTime("therapist", indexOfvideos=1, interval=5, data)

fatherLogFiveF1044C1<- MeanMotionByTime("norm.logFather", indexOfvideos=1, interval=5, data)

motherLogFiveF1044C1 <- MeanMotionByTime("norm.logMother", indexOfvideos=1, interval=5, data)

therapistLogFiveF1044C1 <- MeanMotionByTime("norm.logTherapist", indexOfvideos=1, interval=5, data)

summary(fatherFiveF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 2.079e-05 1.031e-03 7.709e-03 7.794e-03 1.500e-01
```

```
summary(motherFiveF1044C1)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 5.931e-05 2.464e-04 4.059e-03 3.194e-03 1.010e-01
```

```
summary(therapistFiveF1044C1)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## 0.002126 0.003101 0.003426 0.004640 0.004058 0.075780
```

```
summary(fatherLogFiveF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.219  10.700  13.140  12.980  15.190  18.100     309
```

```
summary(motherLogFiveF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   9.312  10.280  11.410  12.150  14.030  17.710      22
```

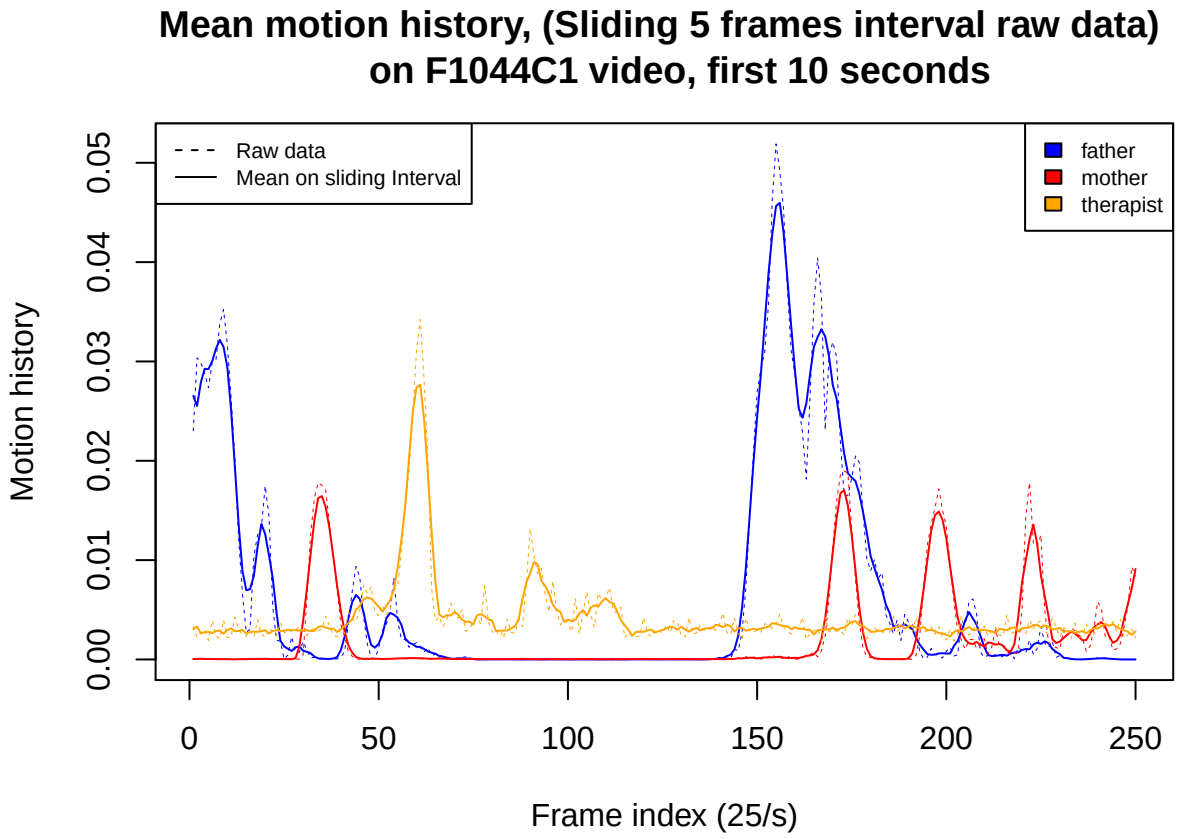
```
summary(therapistLogFiveF1044C1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.84   14.20   14.30   14.44   14.47   17.42
```

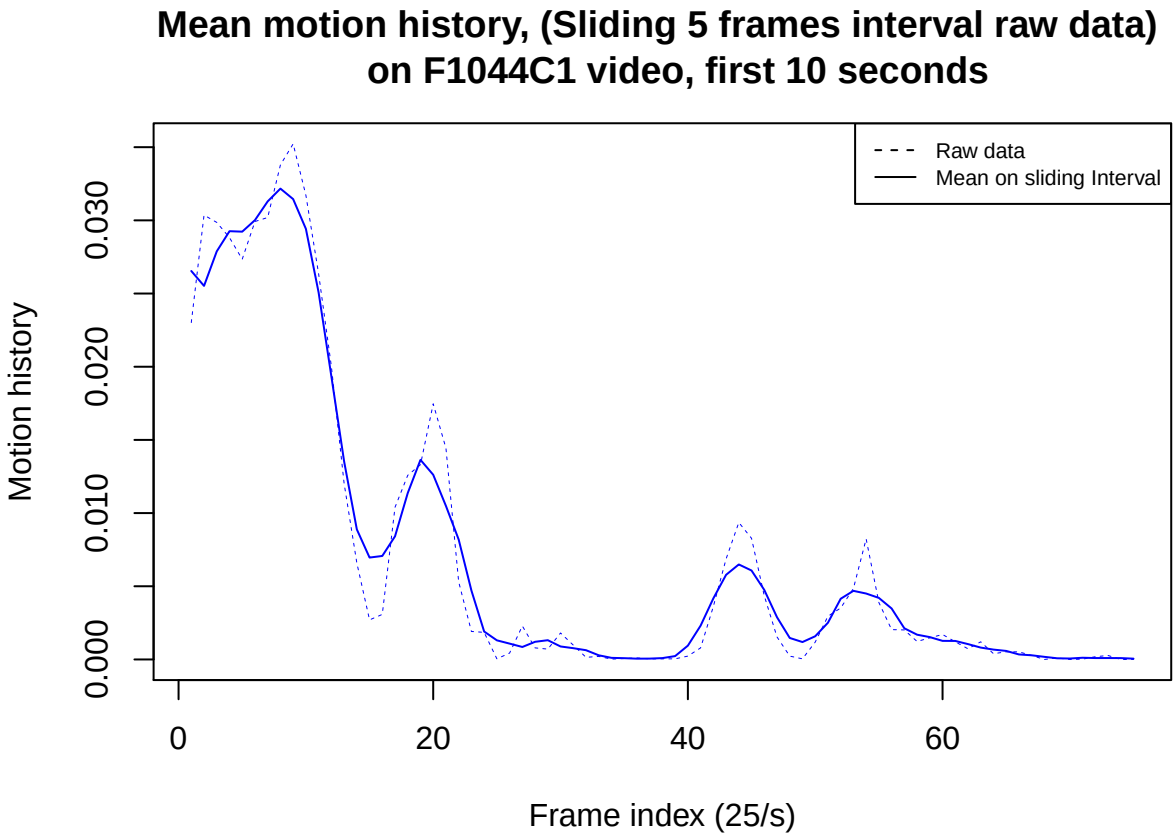
Focus on the motion history of the first 10 seconds of the first video(C)

Sliding interval function on a raw data, 5 frames interval

```
par(mar=c(4,4,4,2))
plot(1:250, data$father[3:252], main="Mean motion history, (Sliding 5 frames interval raw data)
    on F1044C1 video, first 10 seconds ", xlab="Frame index (25/s)",
     ylab="Motion history",
     col="blue", type="l", lty=2, lwd=0.5)
lines(slidedFatherF1044C1[1:250],  col="blue", lty=1)
lines(data$mother[3:252],  col="red", lty=2, lwd=0.5)
lines(slidedMotherF1044C1[1:250],  col="red", lty=1)
lines(data$therapist[3:252],  col="orange", lty=2, lwd=0.5)
lines(slidedTherapistF1044C1[1:250],  col="orange", lty=1)
legend("topleft", c("Raw data", "Mean on sliding Interval") , lty=c(2, 1), cex=0.7)
legend("topright", ParticipantsList[c(1,2,4)], fill=colOrderList[c(1,2,4)], cex=0.7)
```

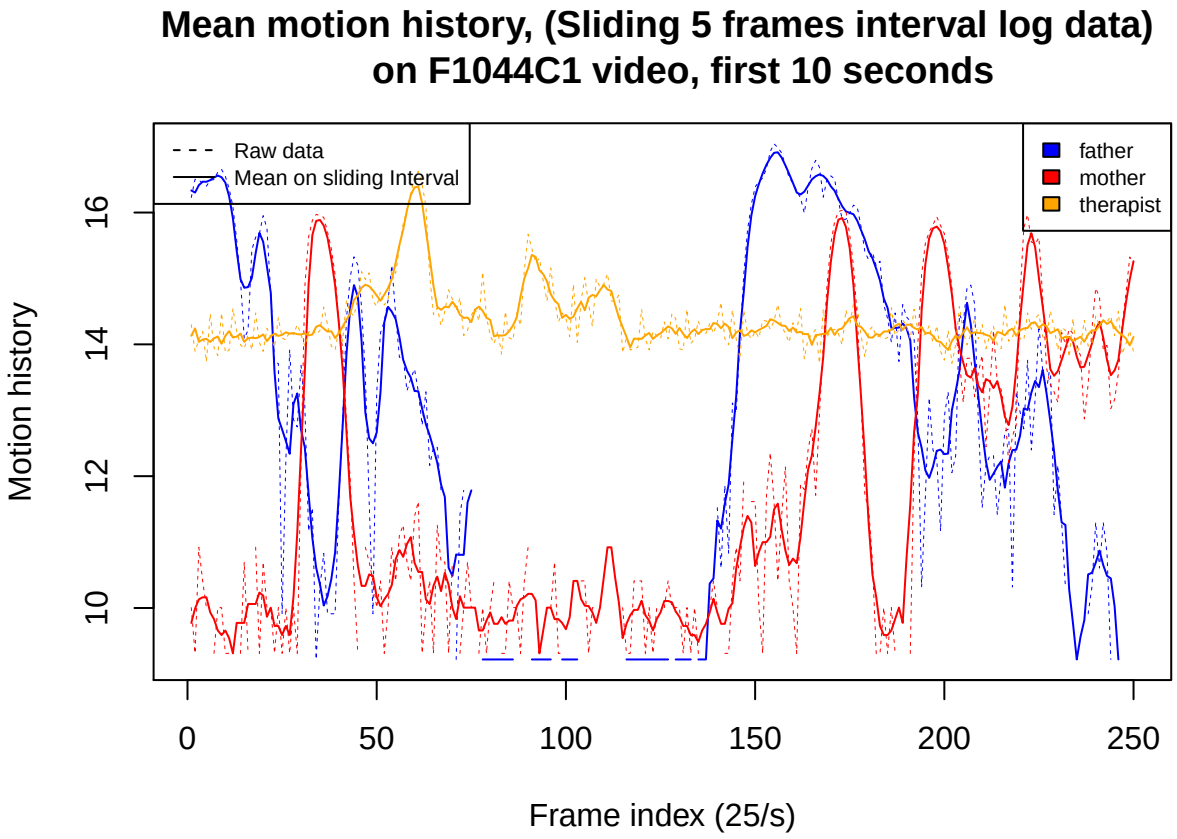



```
par(mar=c(4,4,4,2))
plot(1:75, data$father[3:77], main="Mean motion history, (Sliding 5 frames interval raw data)
    on F1044C1 video, first 10 seconds ", xlab="Frame index (25/s)",
     ylab="Motion history",
     col="blue", type="l", lty=2, lwd=0.5)
lines(slidedFatherF1044C1[1:75],  col="blue", lty=1)
legend("topright", c("Raw data", "Mean on sliding Interval") , lty=c(2, 1), cex=0.7)
```



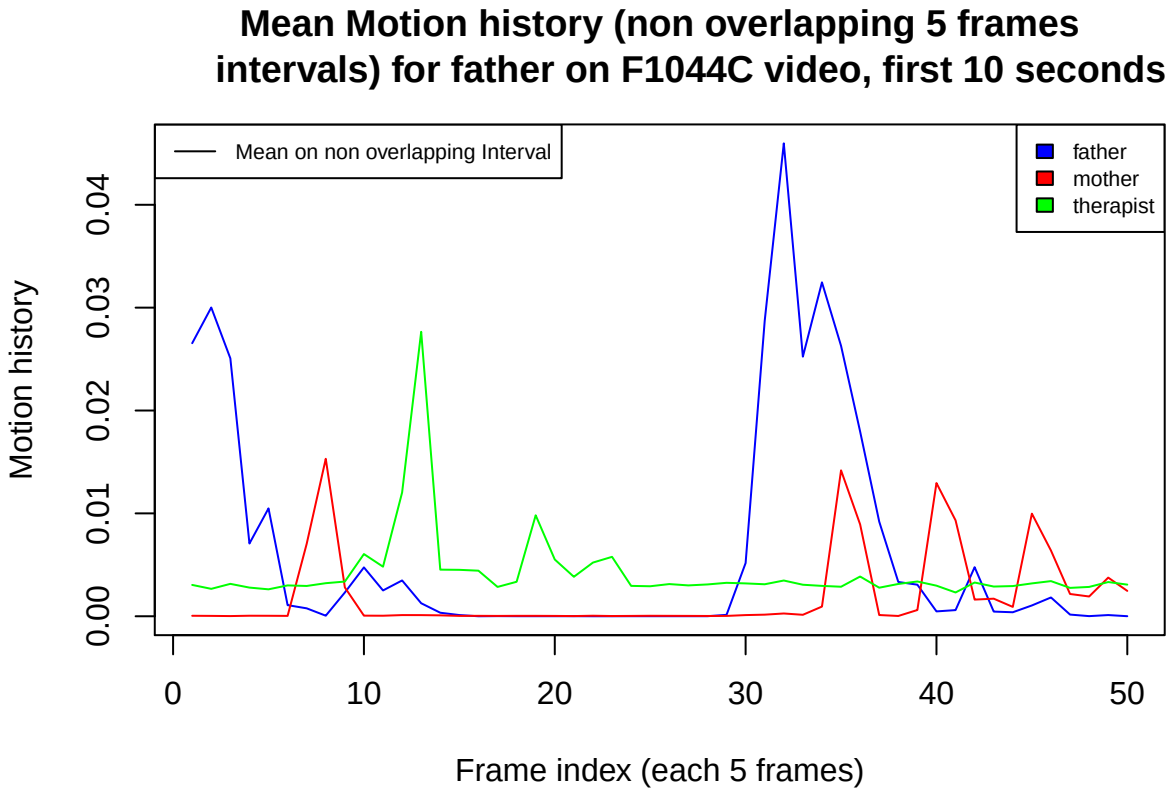
Sliding interval function on log data, 5 frames interval

```
par(mar=c(4,4,4,2))
plot(1:250, data$norm.logFather[3:252], main="Mean motion history, (Sliding 5 frames interval log data)
    on F1044C1 video, first 10 seconds", xlab="Frame index (25/s)",
     ylab="Motion history",
     col="blue", type="l", lty=2, lwd=0.5)
lines(slidedLogFatherF1044C1[1:250],  col="blue", lty=1)
lines(data$norm.logMother[3:252],  col="red", lty=2, lwd=0.5)
lines(slidedLogMotherF1044C1[1:250],  col="red", lty=1)
lines(data$norm.logTherapist[3:252],  col="orange", lty=2, lwd=0.5)
lines(slidedLogTherapistF1044C1[1:250],  col="orange", lty=1)
legend("topleft", c("Raw data", "Mean on sliding Interval") , lty=c(2, 1), cex=0.7)
legend("topright", ParticipantsList[c(1,2,4)], fill=colOrderList[c(1,2,4)], cex=0.7)
```



Non overlapping interval function on a 5 frames interval

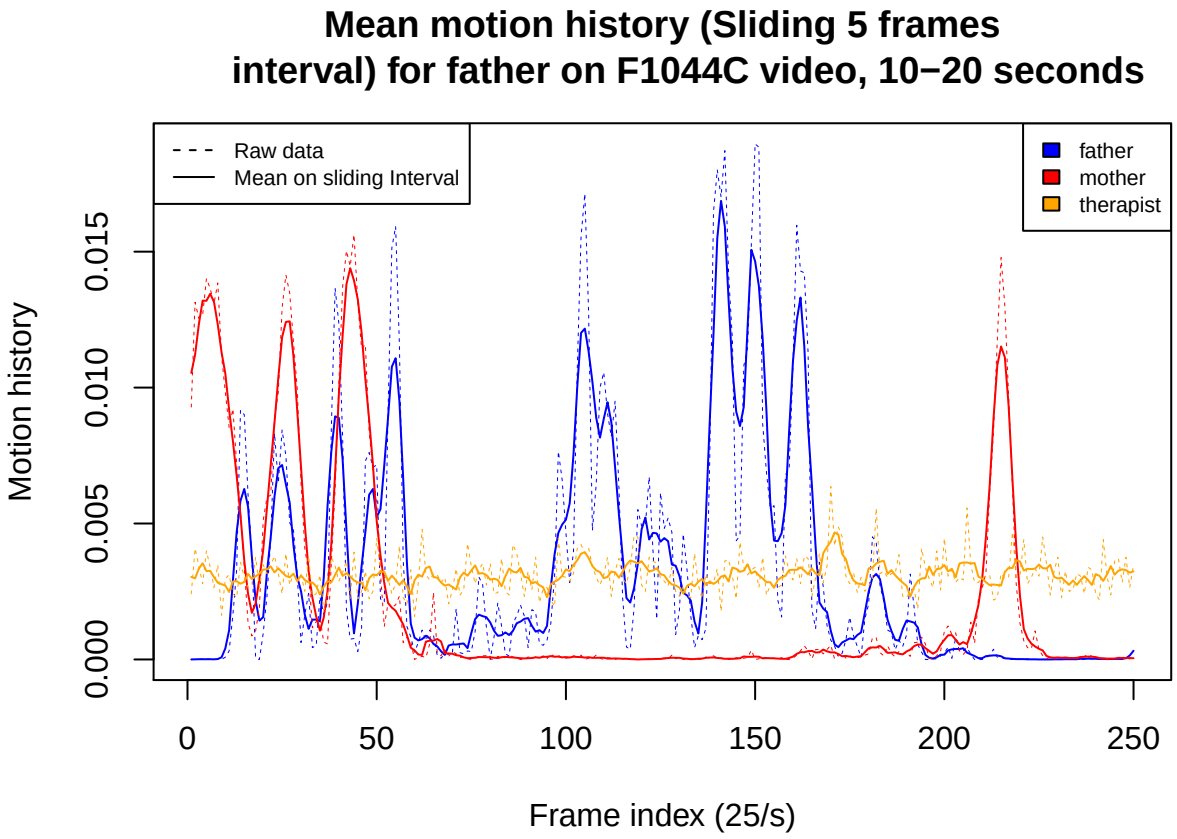
```
plot (1:50, fatherFiveF1044C1[1:50], type="l", col="blue",
main="Mean Motion history (non overlapping 5 frames
      intervals) for father on F1044C video, first 10 seconds",
ylab="Motion history", xlab="Frame index (each 5 frames)" )
lines(motherFiveF1044C1[1:50], col="red", lty=1)
lines(therapistFiveF1044C1[1:50], col="green", lty=1)
legend("topleft", "Mean on non overlapping Interval" , lty=1, cex=0.7)
legend("topright", ParticipantsList[c(1,2,4)], fill=colOrderList, cex=0.7)
```



Motion history of the father during 10-20 seconds of the first video(C)

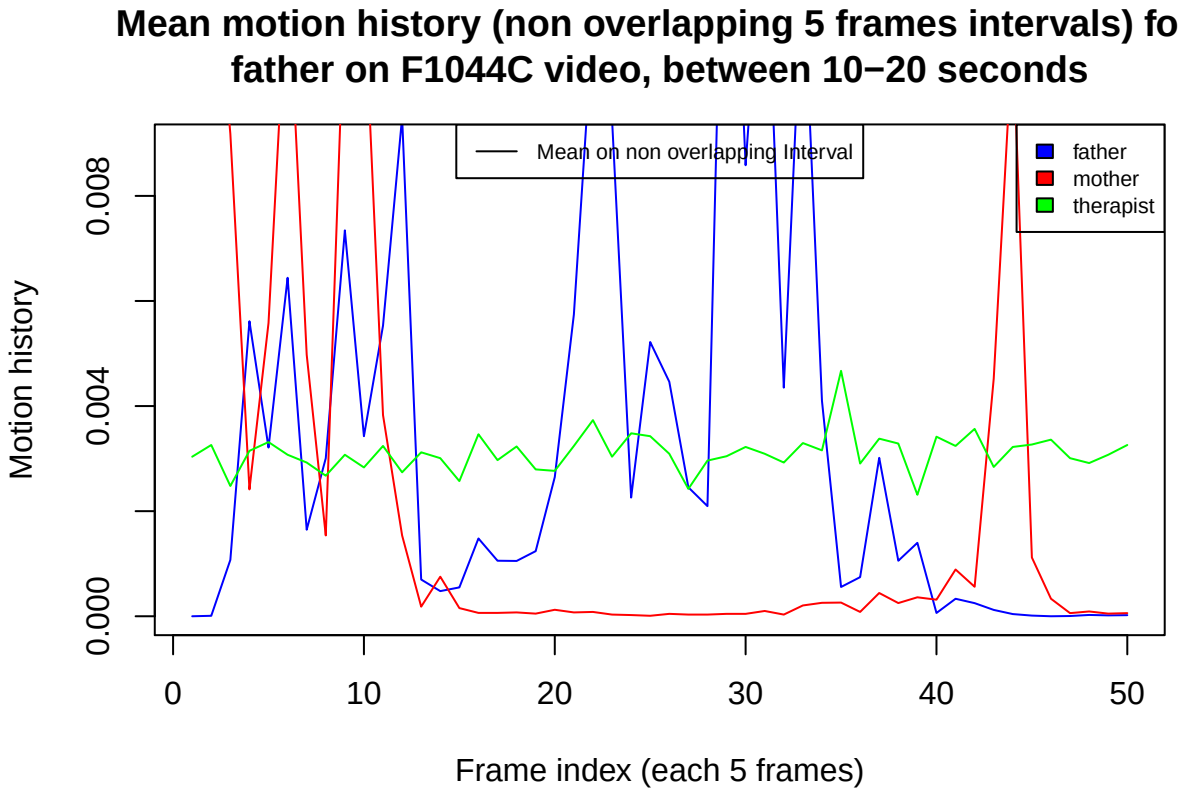
Non overlapping interval function on a 5 frames interval

```
par(mar=c(4,4,4,2))
plot(1:250, data$father[253:502], main="Mean motion history (Sliding 5 frames
     interval) for father on F1044C video, 10-20 seconds", xlab="Frame index (25/s)",
     ylab="Motion history", col="blue", type="l", lty=2, lwd=0.5)
lines(slidedFatherF1044C1[251:500],  col="blue", lty=1)
lines(data$mother[253:502],  col="red", lty=2, lwd=0.5)
lines(slidedMotherF1044C1[251:500],  col="red", lty=1)
lines(data$therapist[253:502],  col="orange", lty=2, lwd=0.5)
lines(slidedTherapistF1044C1[251:500],  col="orange", lty=1)
legend("topleft", c("Raw data", "Mean on sliding Interval") , lty=c(2, 1), cex=0.7)
legend("topright", ParticipantsList[c(1,2,4)], fill=colOrderList[c(1,2,4)], cex=0.7)
```



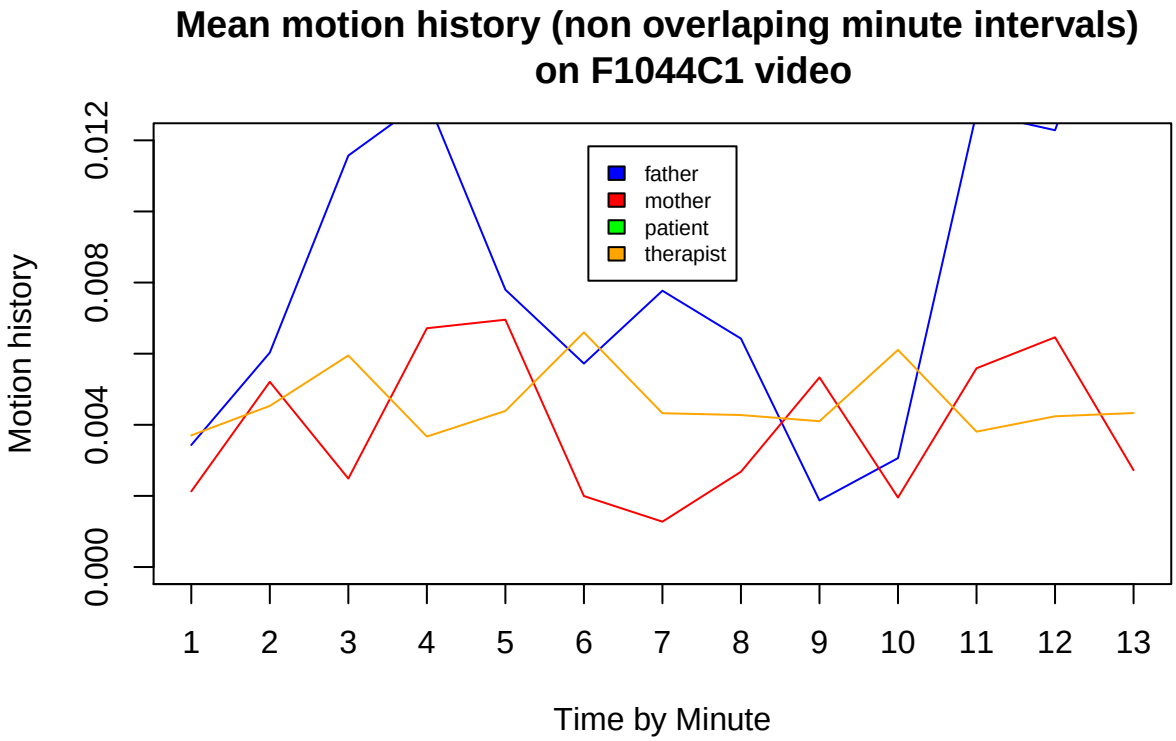
Non overlapping interval function on a 5 frames interval

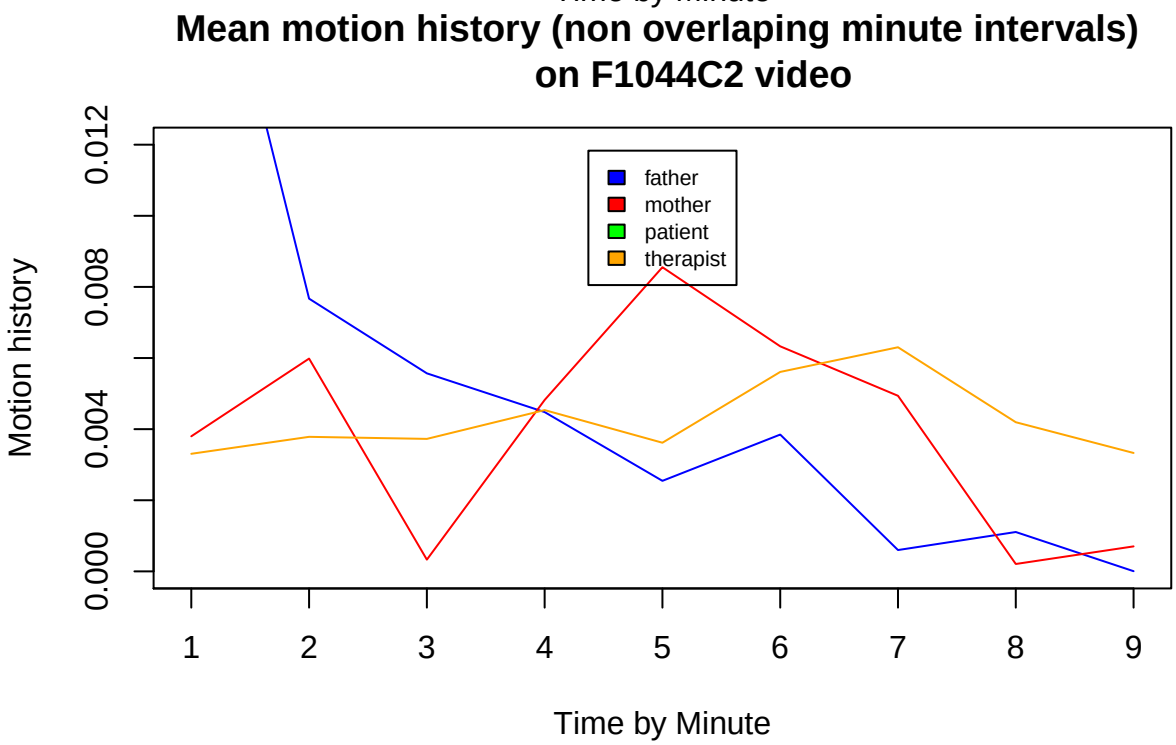
```
plot (1:50, fatherFiveF1044C1[51:100], type="l", col="blue",
main="Mean motion history (non overlapping 5 frames intervals) for
father on F1044C video, between 10-20 seconds",
ylab="Motion history", xlab="Frame index (each 5 frames)", ylim=c(0, 0.009))
lines(motherFiveF1044C1[51:100], col="red", lty=1)
lines(therapistFiveF1044C1[51:100], col="green", lty=1)
legend("top", "Mean on non overlapping Interval" , lty=1, cex=0.7)
legend("topright", ParticipantsList[c(1,2,4)], fill=colOrderList, cex=0.7)
```

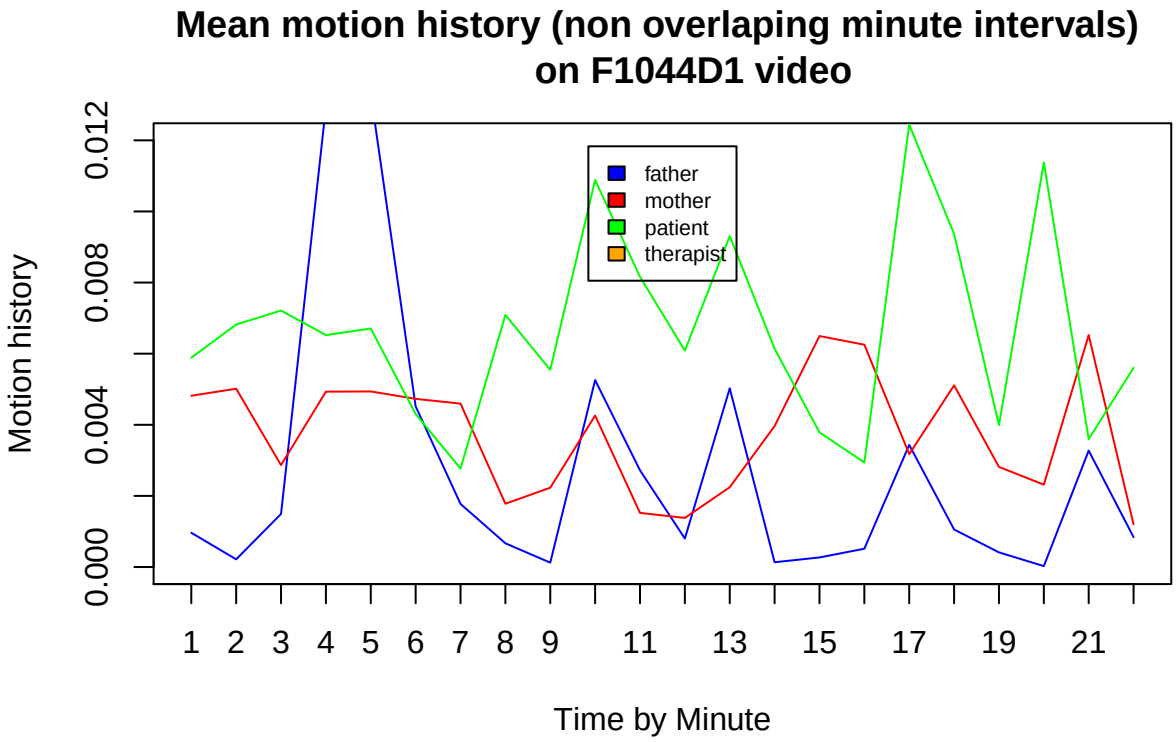


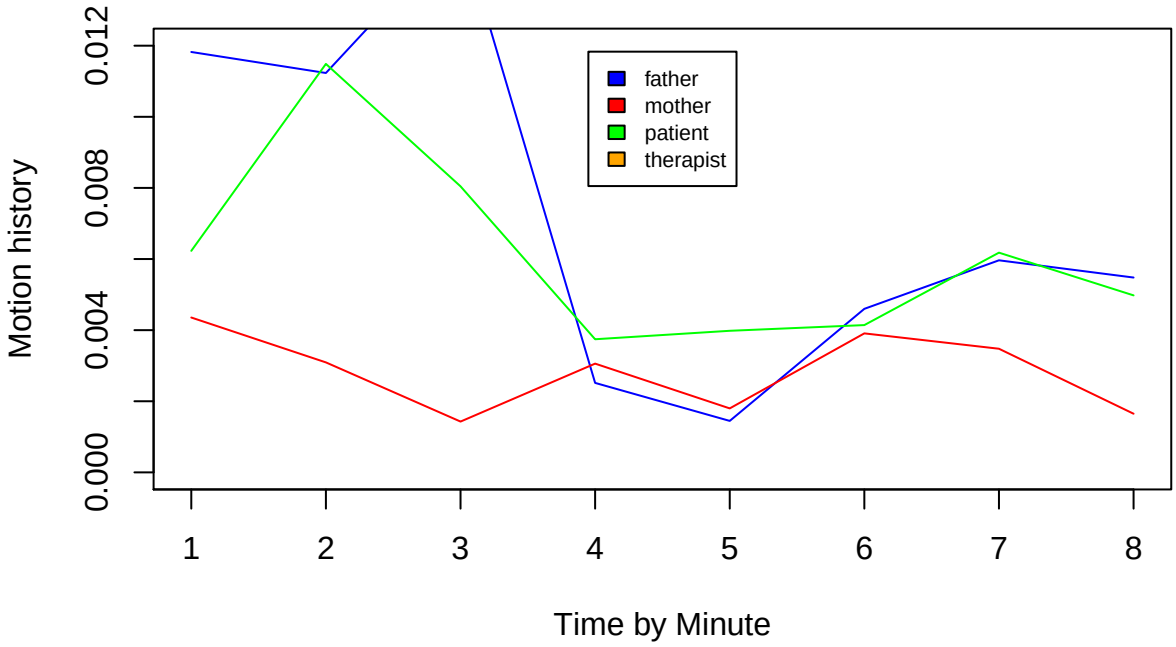
Mean motion history by minute plots

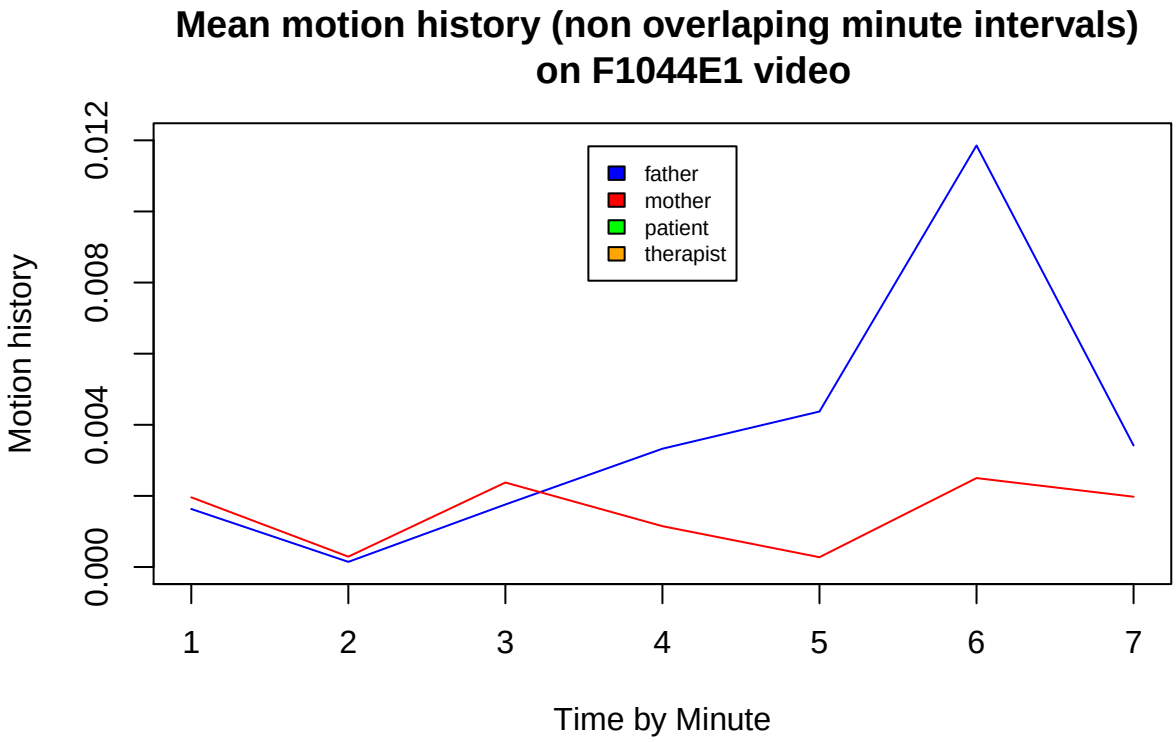
```
for (i in 1:NumberOfvideos){
  fatherMinute<- MeanMotionByTime("father", indexOfvideos=i, interval=1500, data)

  MotherMinute<- MeanMotionByTime("mother", indexOfvideos=i, interval=1500, data)

  TherapistMinute<- MeanMotionByTime("therapist", indexOfvideos=i, interval=1500, data)

  PatientMinute<- MeanMotionByTime("patient", indexOfvideos=i, interval=1500, data)

  par(mar=c(4,4,4,2))
      plot (1:length(fatherMinute), fatherMinute, type="l", col="blue",
      main=paste("Mean motion history (non overlaping minute intervals)
      on F1044", labelvideolist[i], " video" , sep=""),
      ylab="Motion history", xlab="Time by Minute", ylim=c(0, 12E-03),
      xaxp=c(0, length(fatherMinute), length(fatherMinute)))
      lines(MotherMinute, col="red")
      lines(TherapistMinute, col="orange")
      lines(PatientMinute, col="green")
      legend("top", inset=.05, ParticipantsList,
             fill=colOrderList, cex=0.7)}
```

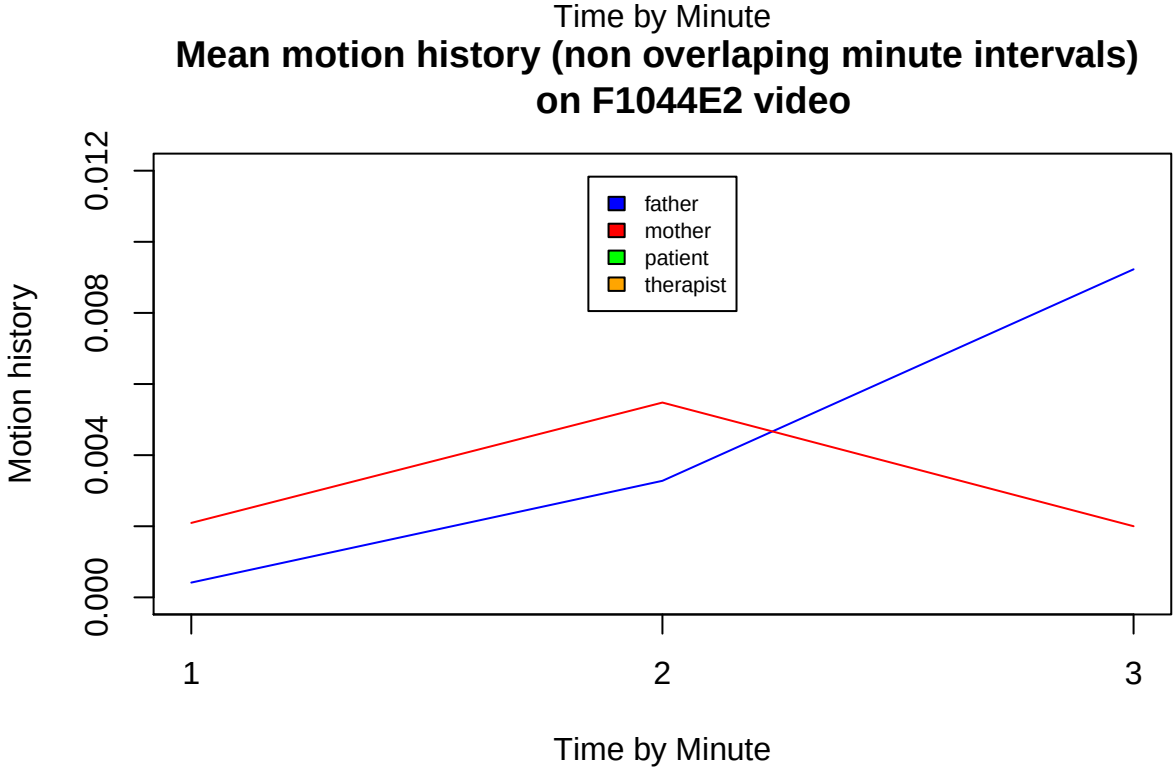

Mean motion history (non overlaping minute intervals)
on F1044C1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
12
13
Time by Minute

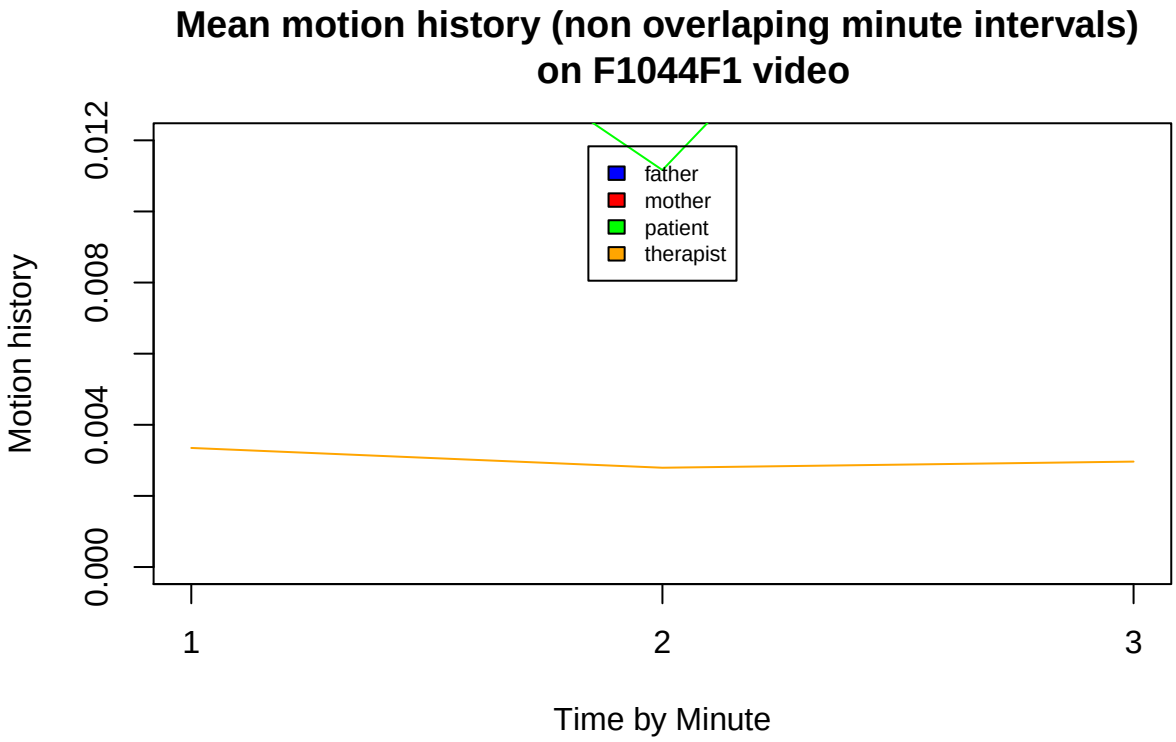

Mean motion history (non overlaping minute intervals)
on F1044C2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
Time by Minute

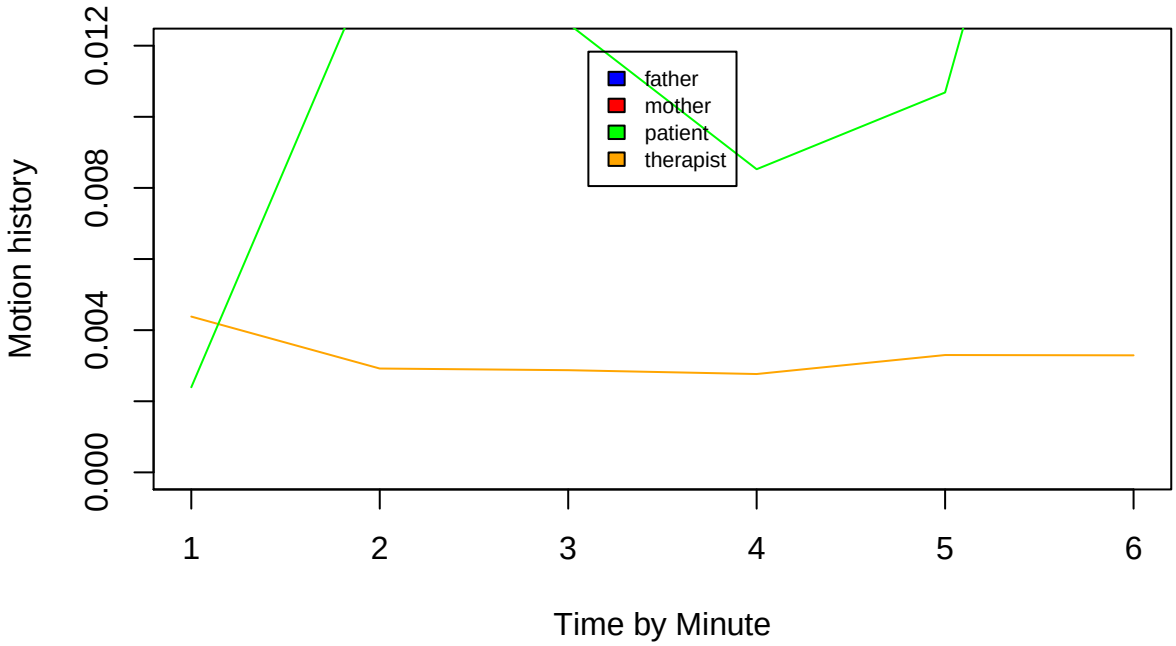

Mean motion history (non overlaping minute intervals)
on F1044D1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 11 13 15 17 19 21
Time by Minute

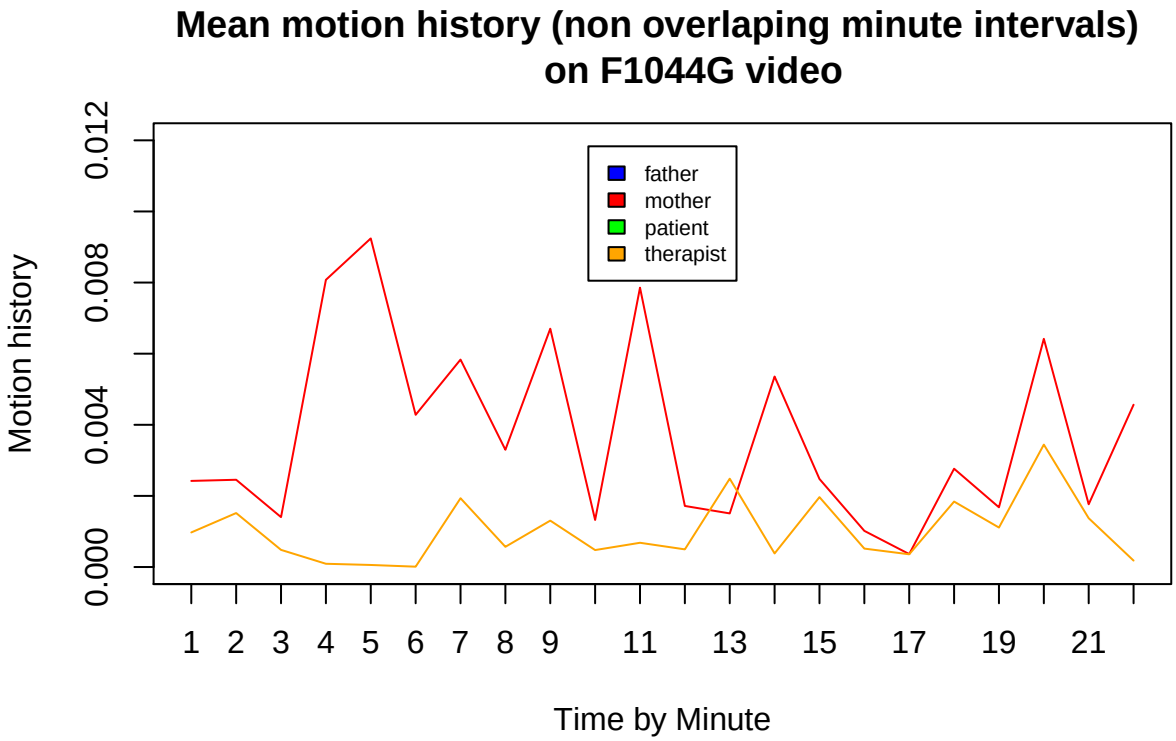

Mean motion history (non overlaping minute intervals)
on F1044D2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8
Time by Minute

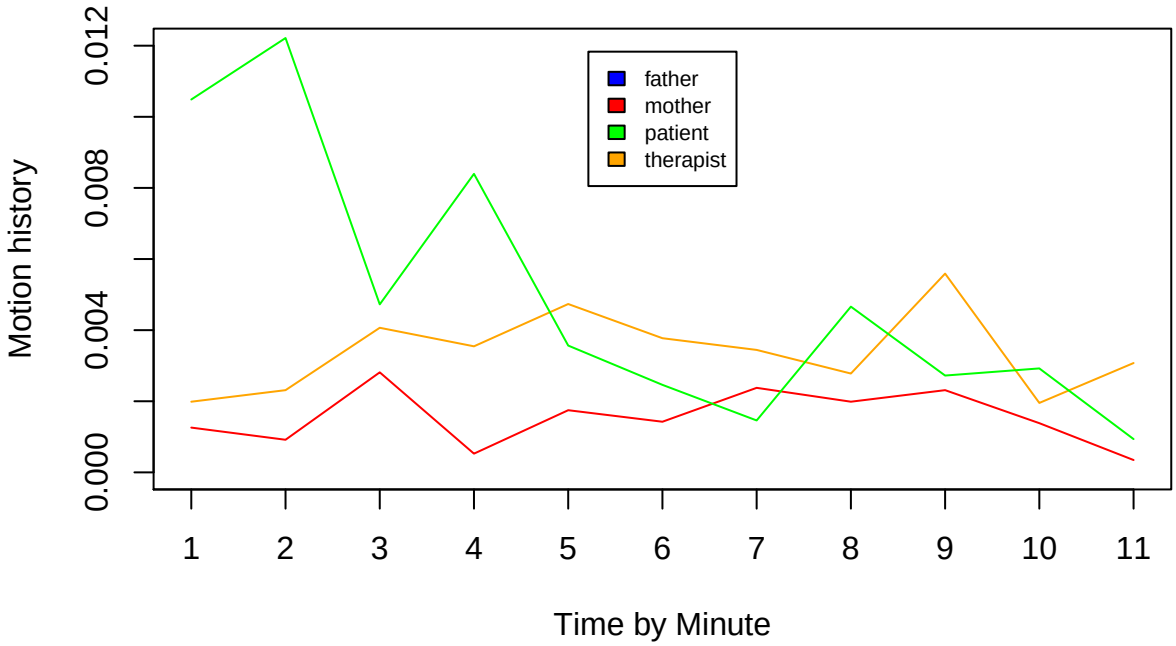

Mean motion history (non overlaping minute intervals)
on F1044E1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
Time by Minute

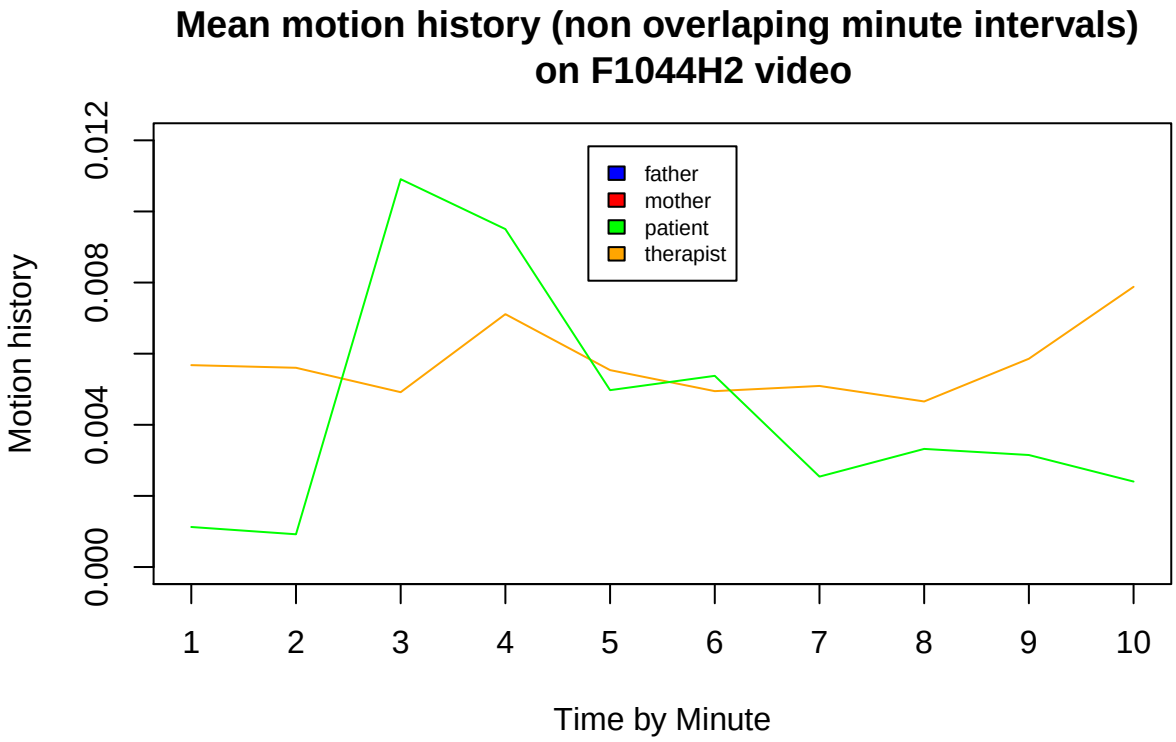

Mean motion history (non overlaping minute intervals)
on F1044E2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
Time by Minute

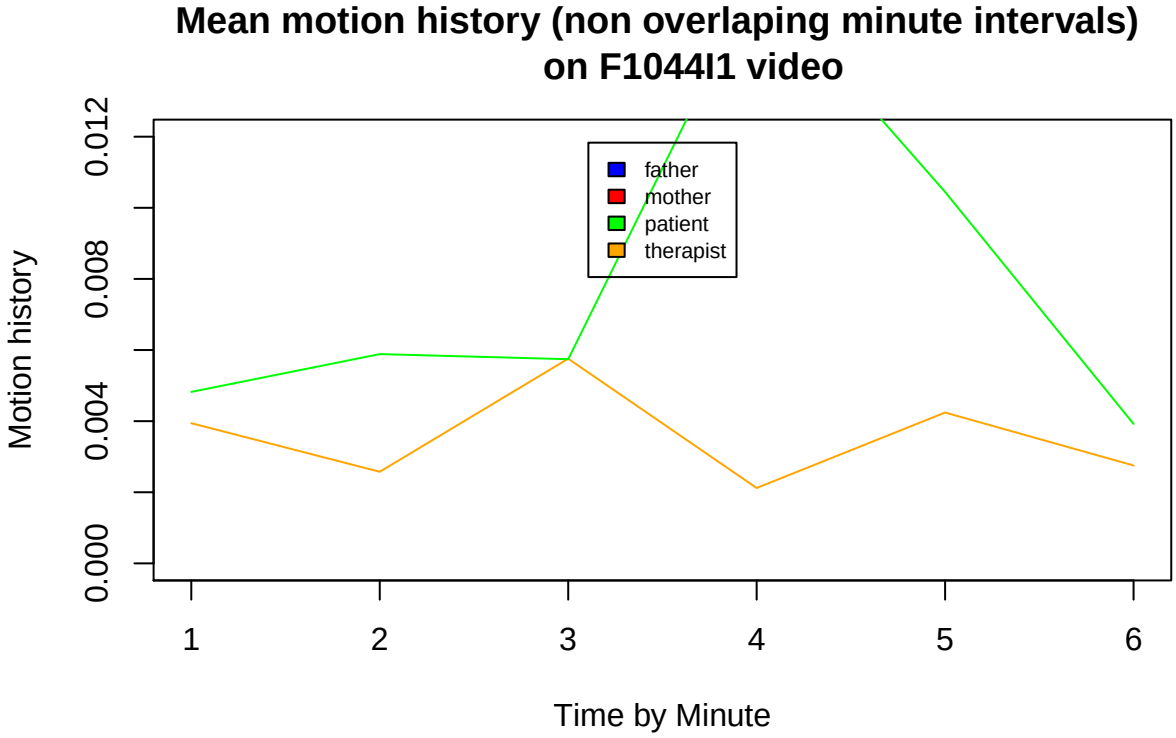

Mean motion history (non overlaping minute intervals)
on F1044F1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
Time by Minute

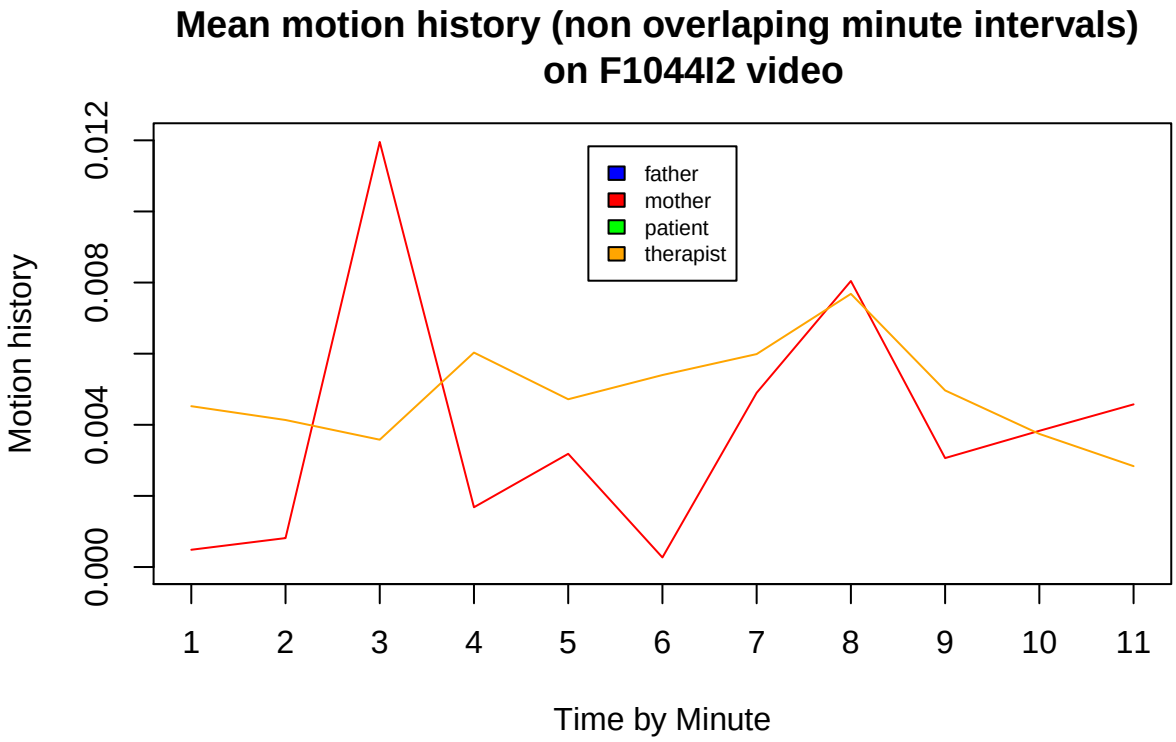

Mean motion history (non overlaping minute intervals)
on F1044F2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
Time by Minute

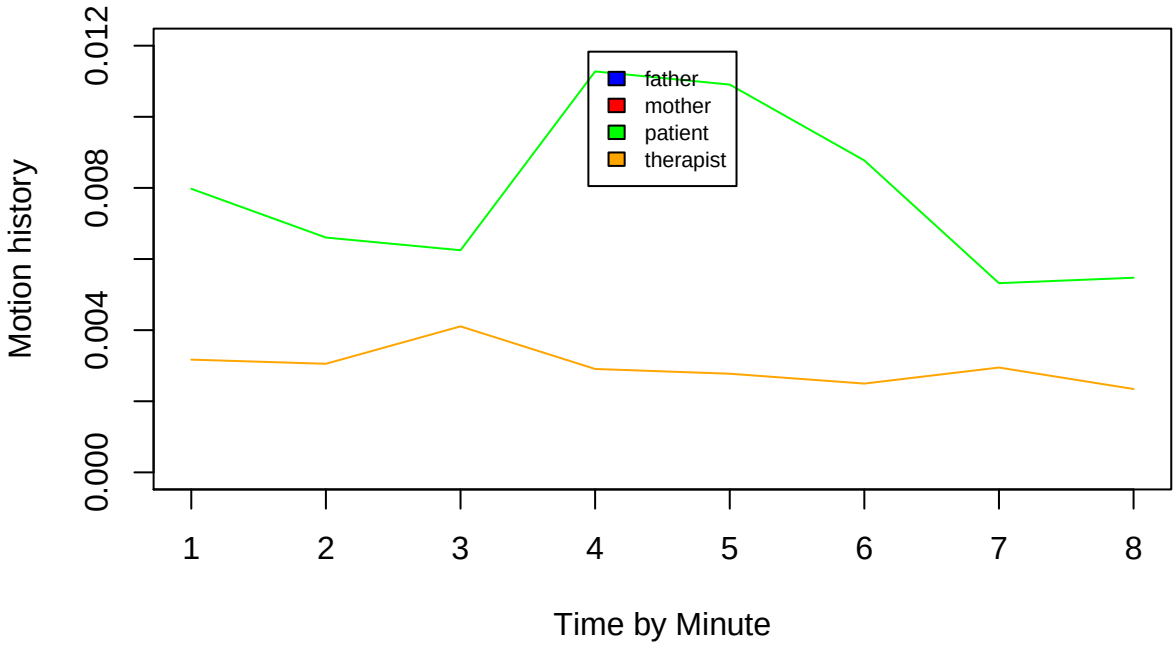

Mean motion history (non overlaping minute intervals)
on F1044G video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 11 13 15 17 19 21
Time by Minute

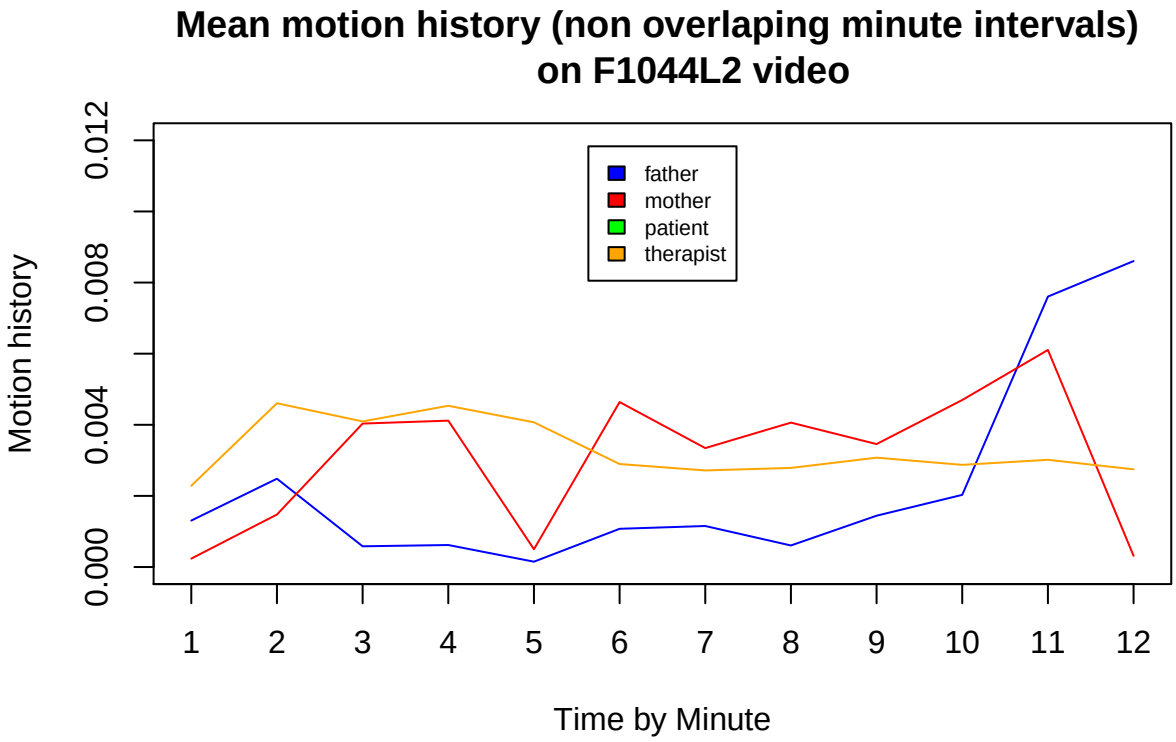

Mean motion history (non overlaping minute intervals)
on F1044H1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 10 11
Time by Minute

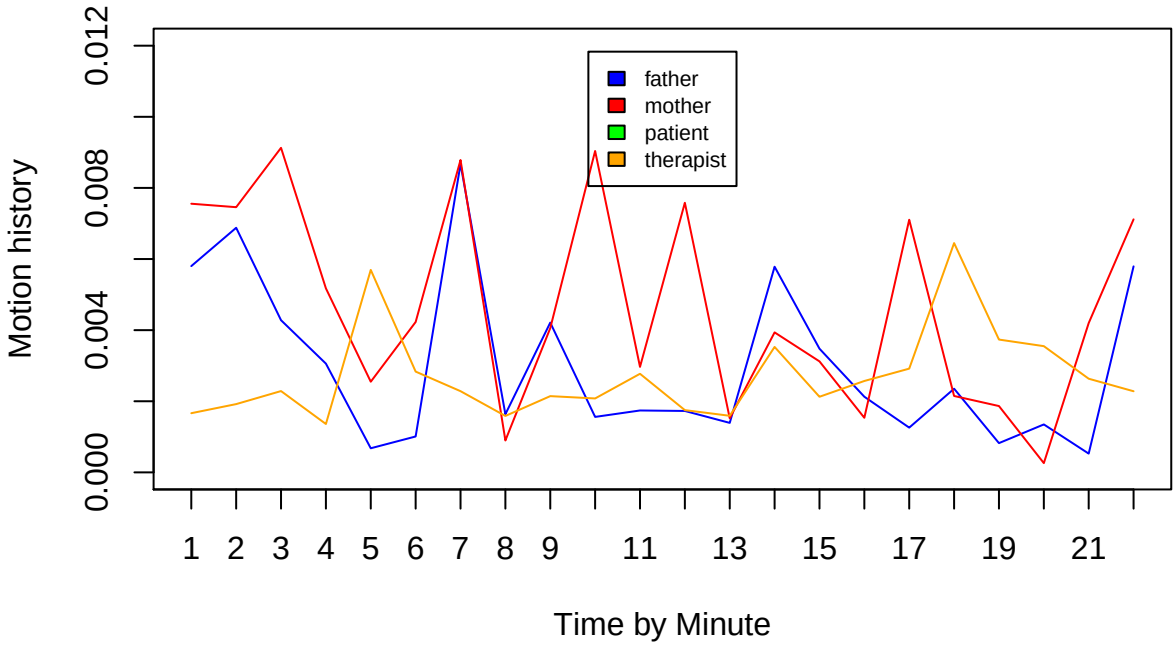

Mean motion history (non overlaping minute intervals)
on F1044H2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
Time by Minute

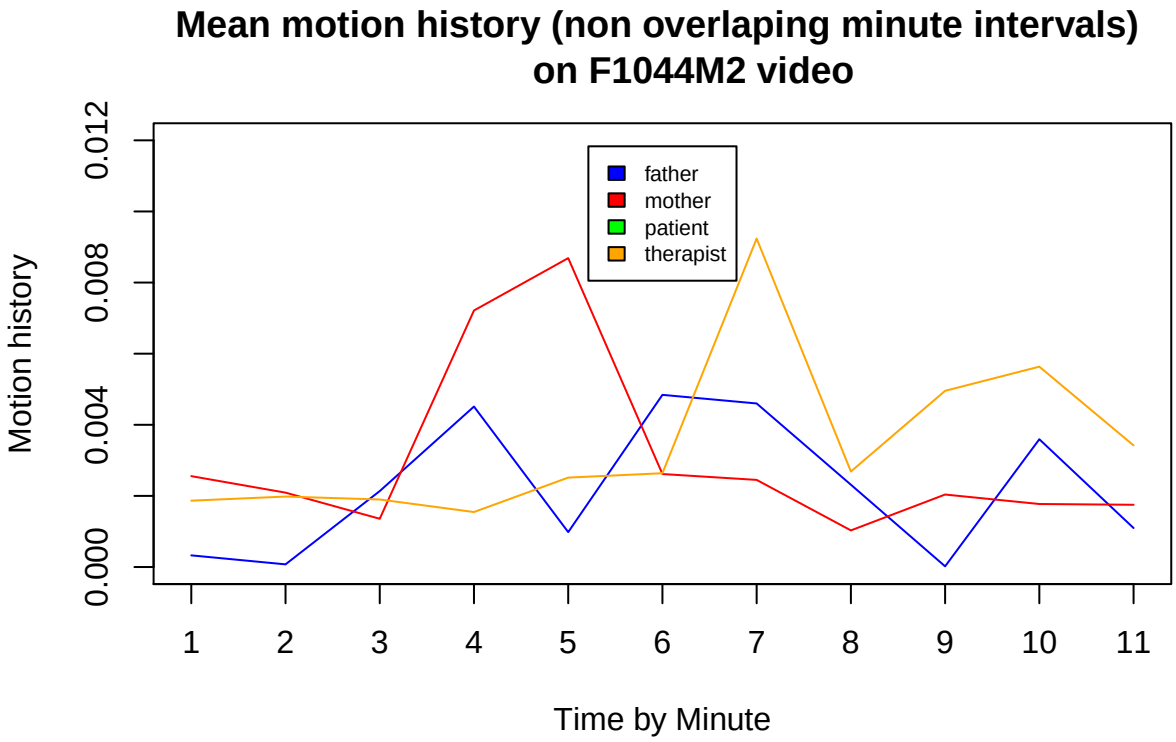

Mean motion history (non overlaping minute intervals)
on F1044I1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
Time by Minute

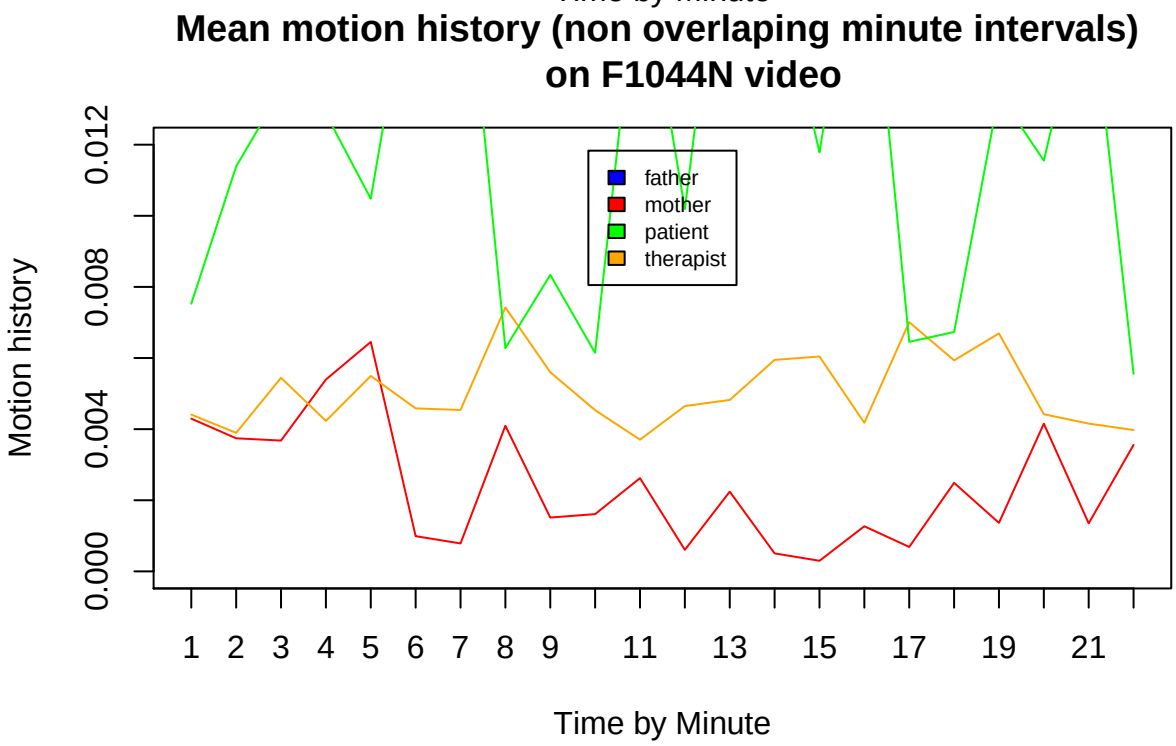

Mean motion history (non overlaping minute intervals)
on F1044I2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
Time by Minute

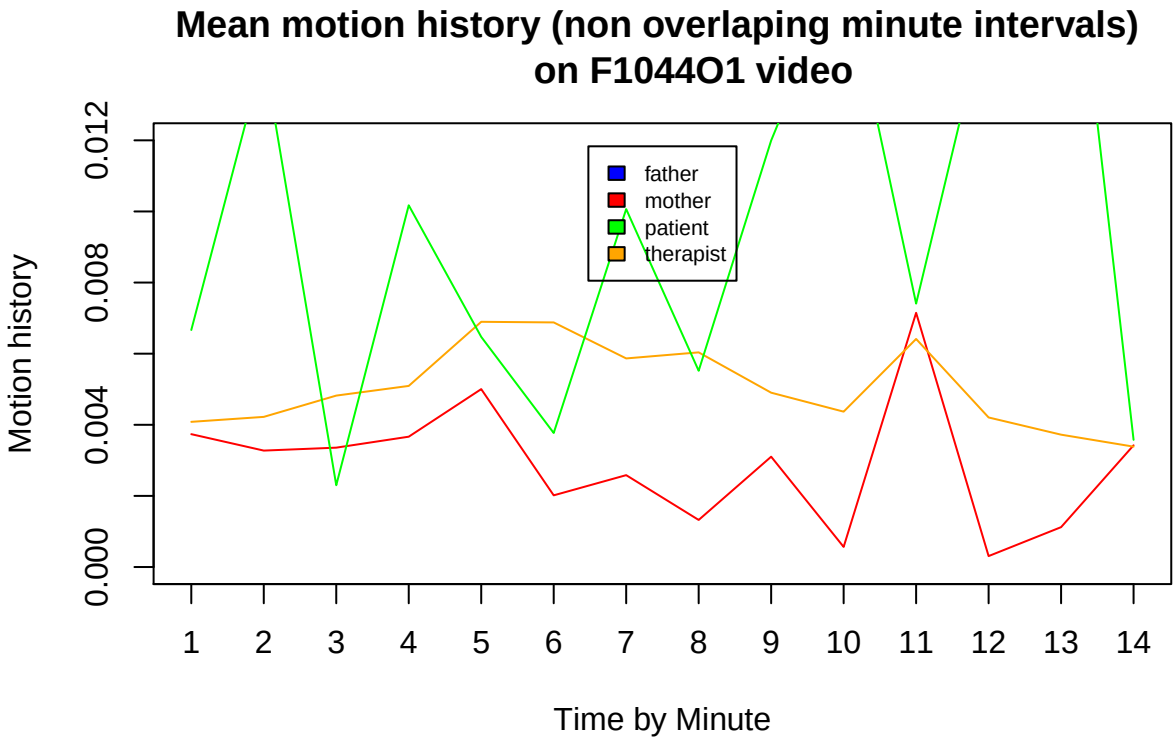

Mean motion history (non overlaping minute intervals)
on F1044L1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
Time by Minute

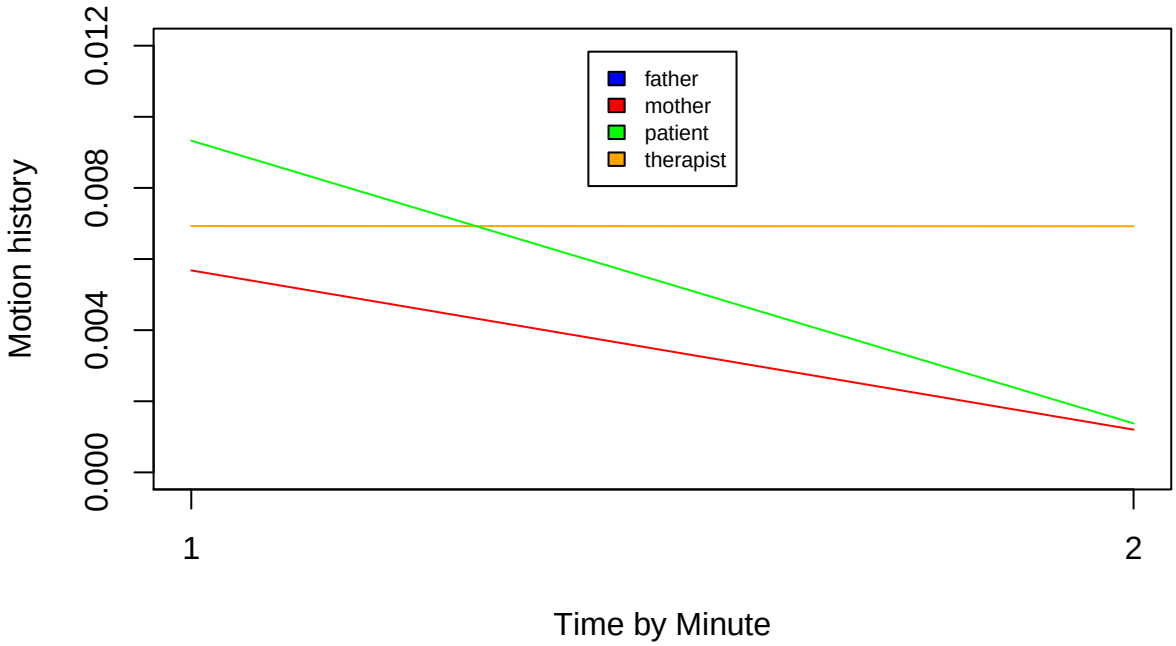

Mean motion history (non overlaping minute intervals)
on F1044L2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
12
Time by Minute

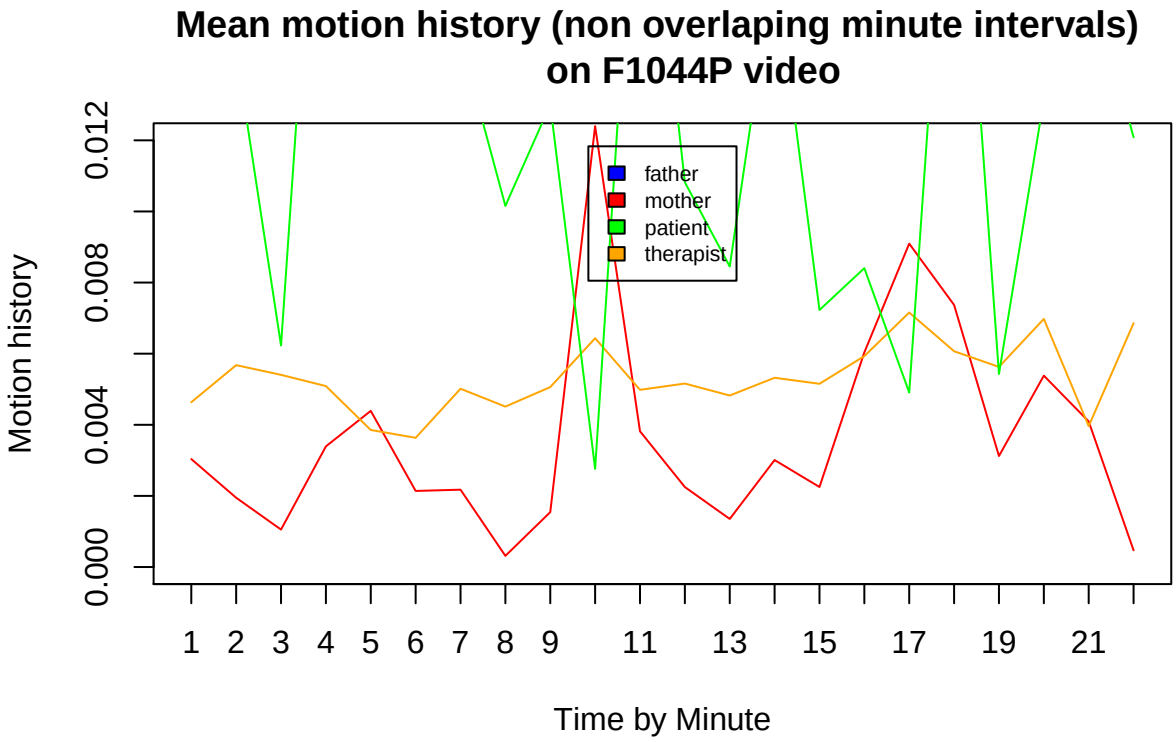

Mean motion history (non overlaping minute intervals)
on F1044M1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute

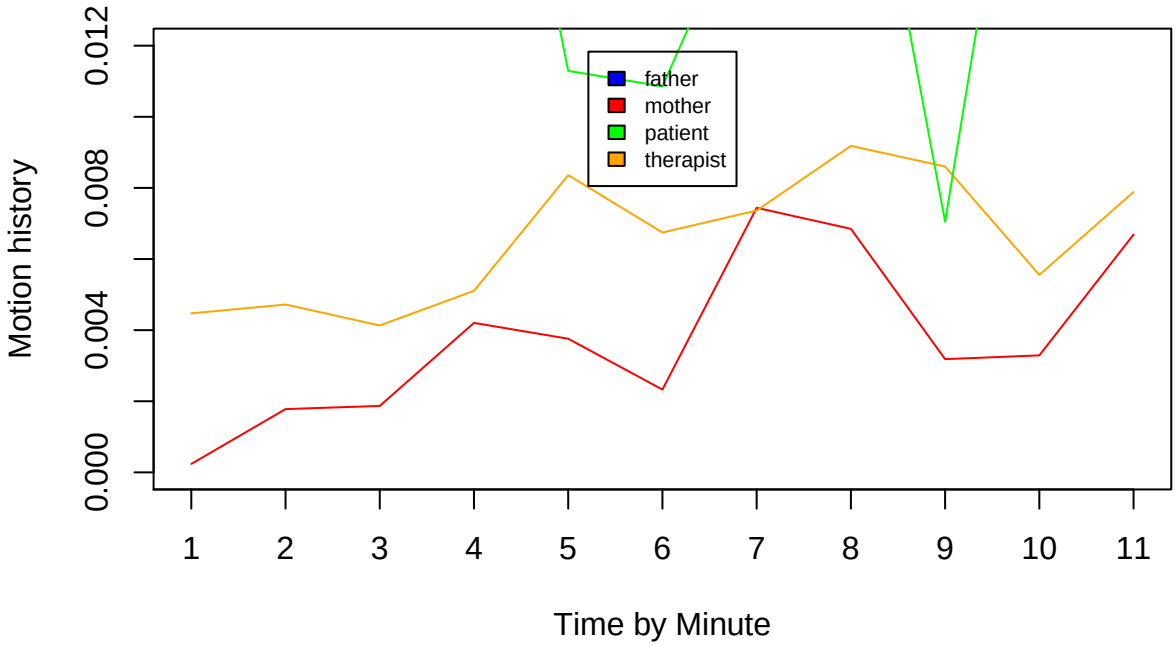

Mean motion history (non overlaping minute intervals)
on F1044M2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
Time by Minute

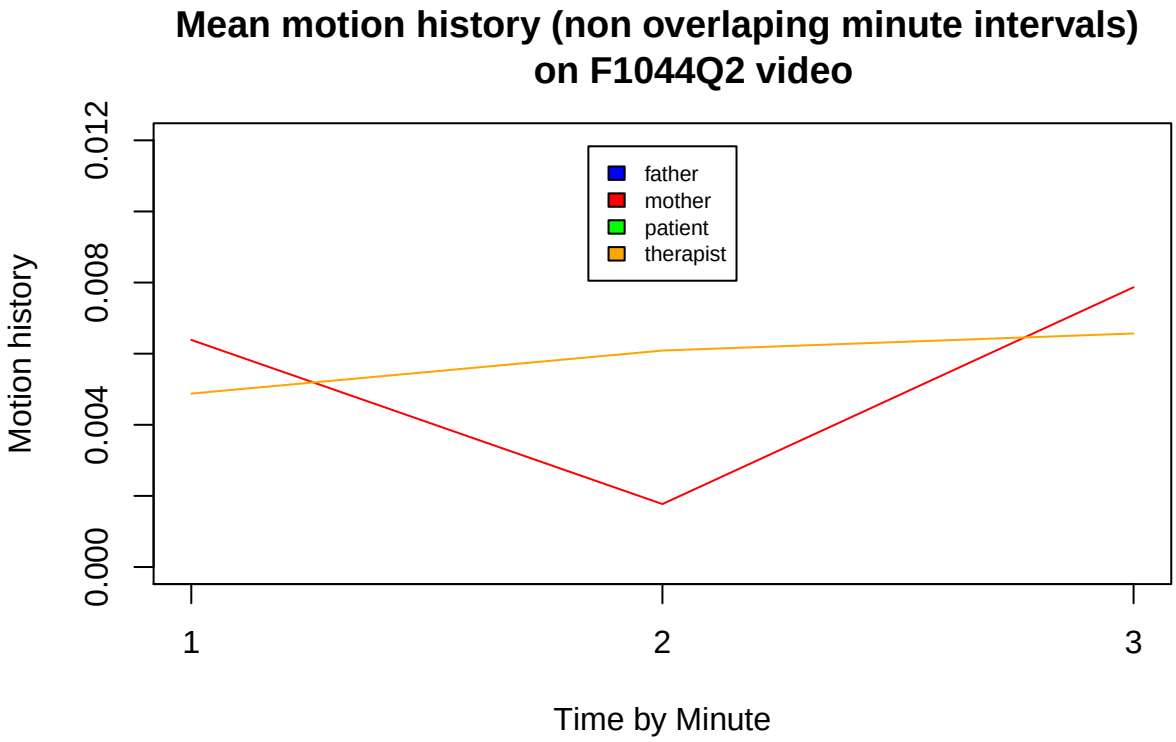

Mean motion history (non overlaping minute intervals)
on F1044N video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute

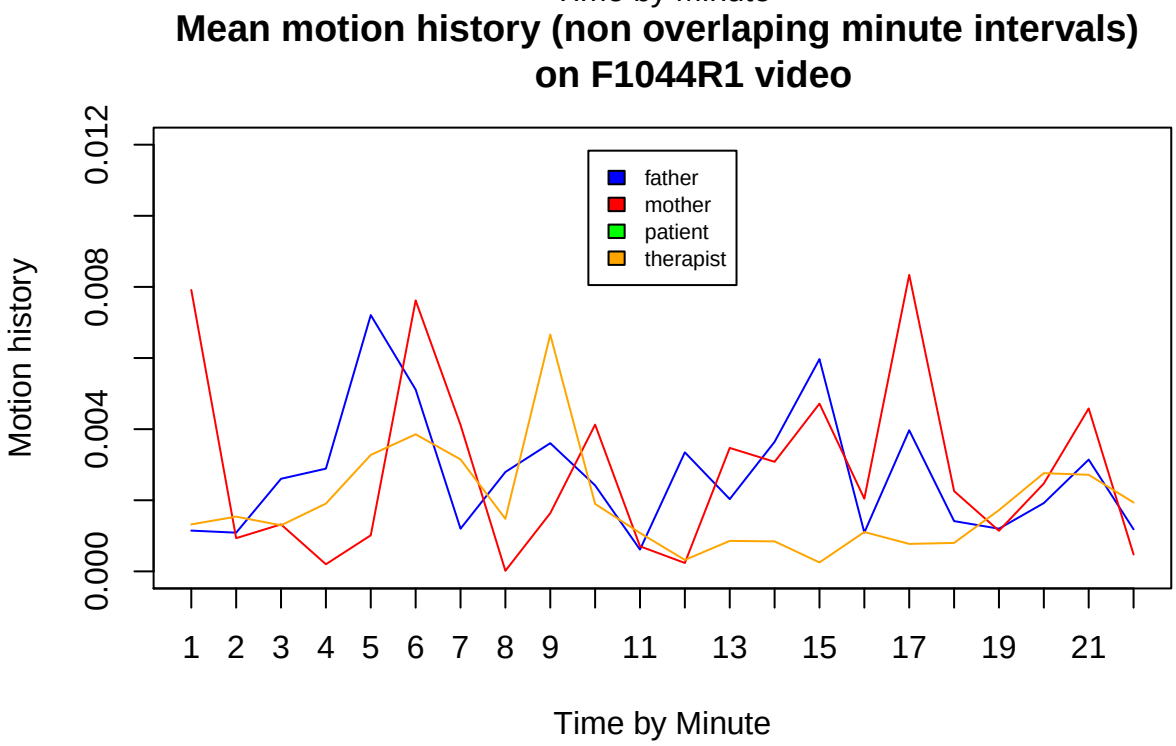

Mean motion history (non overlaping minute intervals)
on F1044O1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Time by Minute

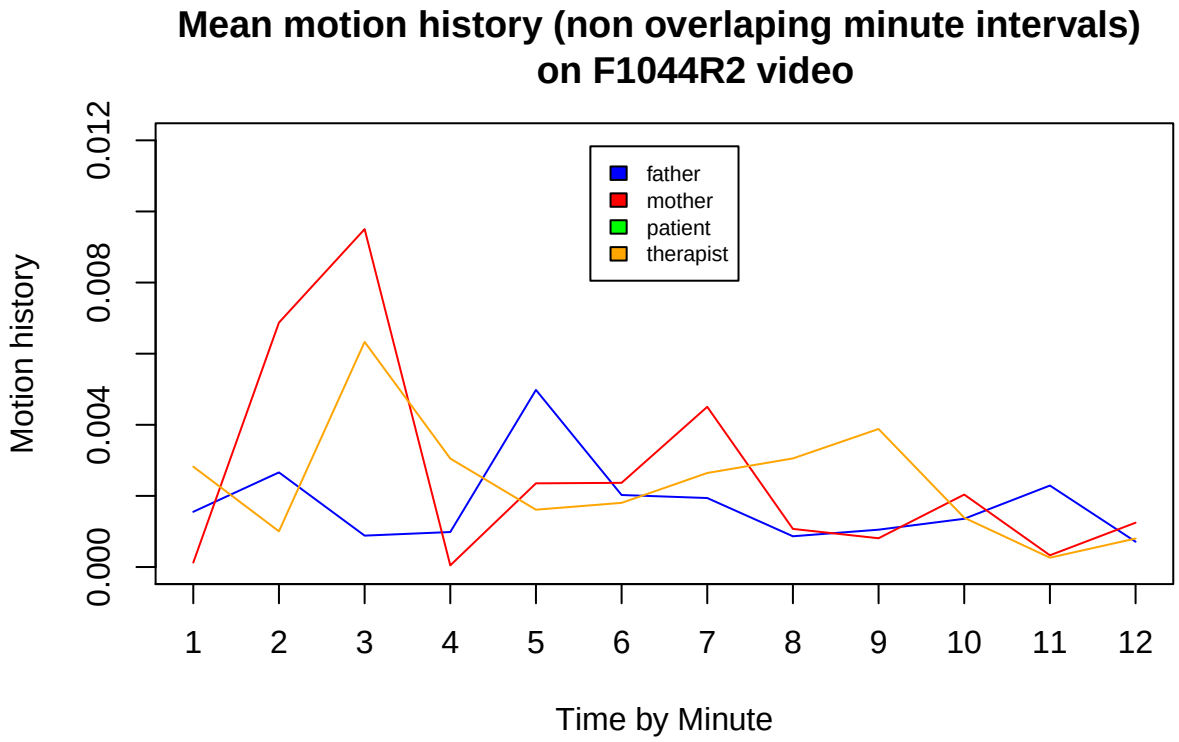

Mean motion history (non overlaping minute intervals)
on F1044O2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044P video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 11 13 15 17 19 21
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044Q1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 10 11
Time by Minute

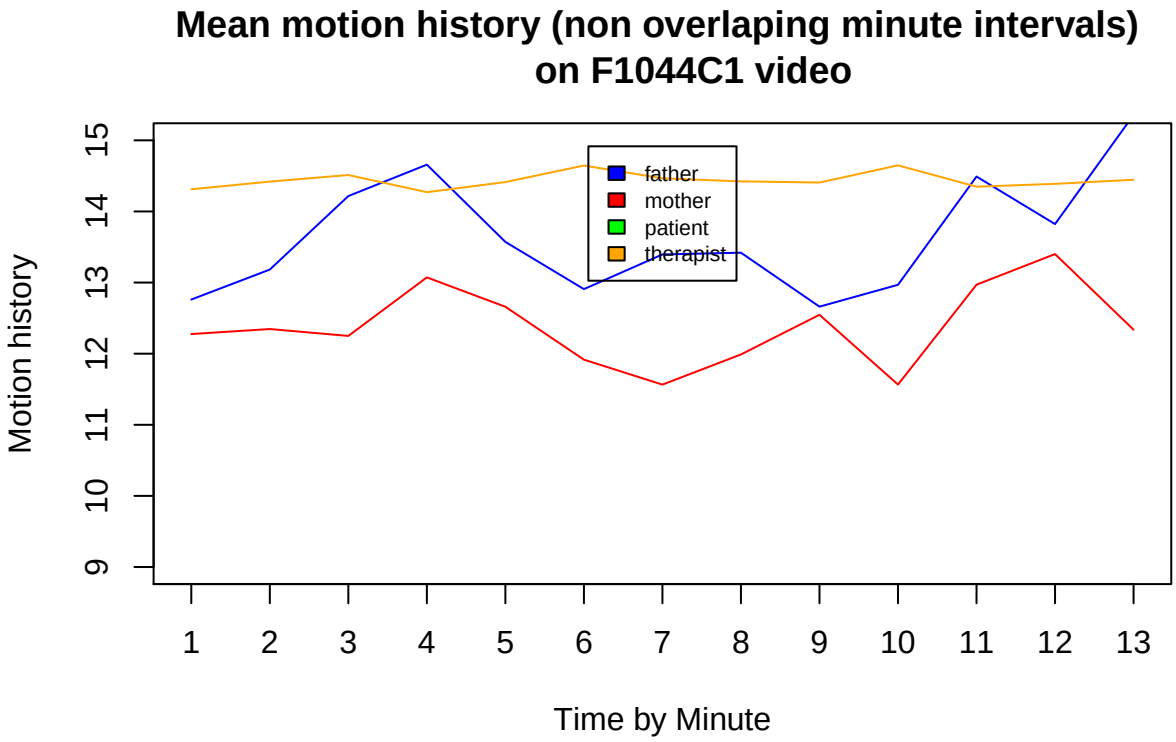

Mean motion history (non overlaping minute intervals)
on F1044Q2 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1
2
3
Time by Minute

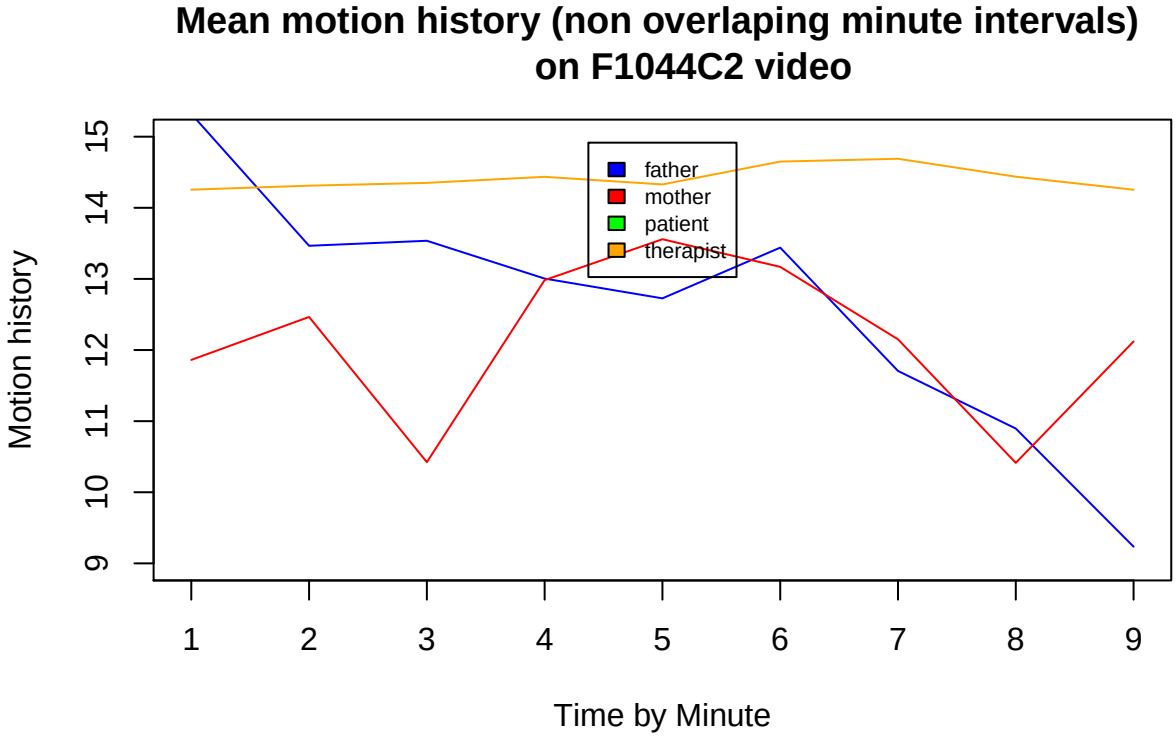

Mean motion history (non overlaping minute intervals)
on F1044R1 video
Motion history
0.000
0.004
0.008
0.012
father
mother
patient
therapist
1 2 3 4 5 6 7 8 9 11 13 15 17 19 21
Time by Minute

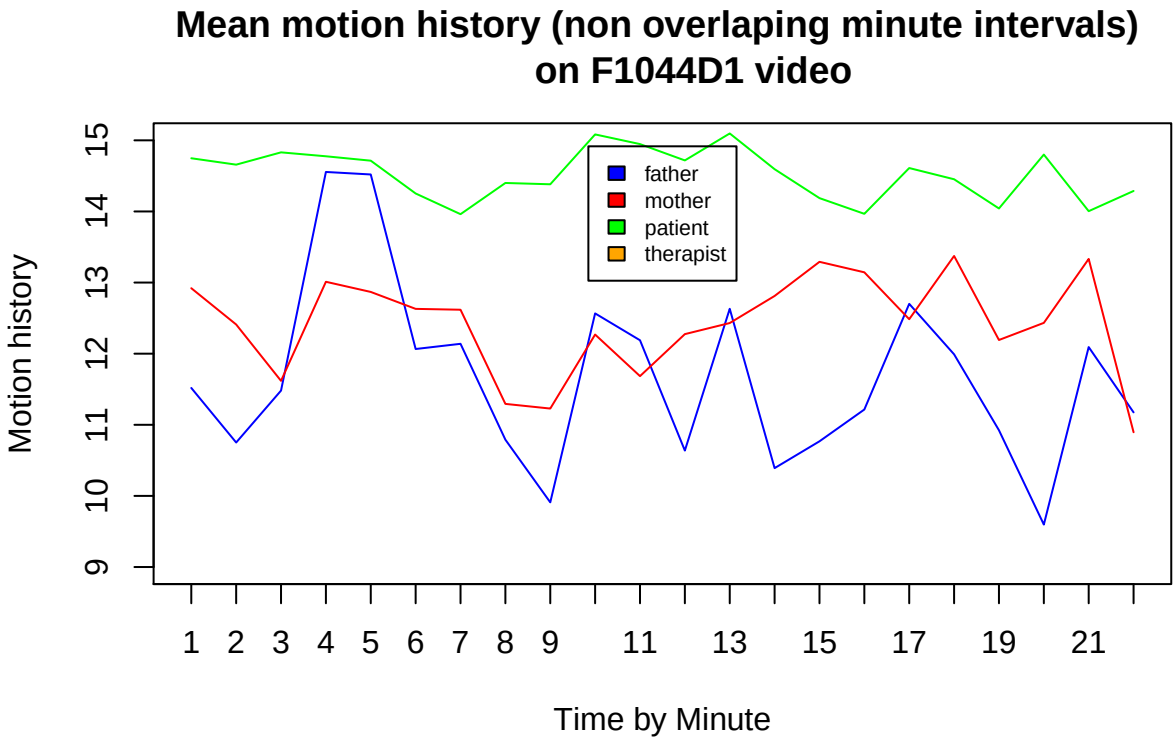


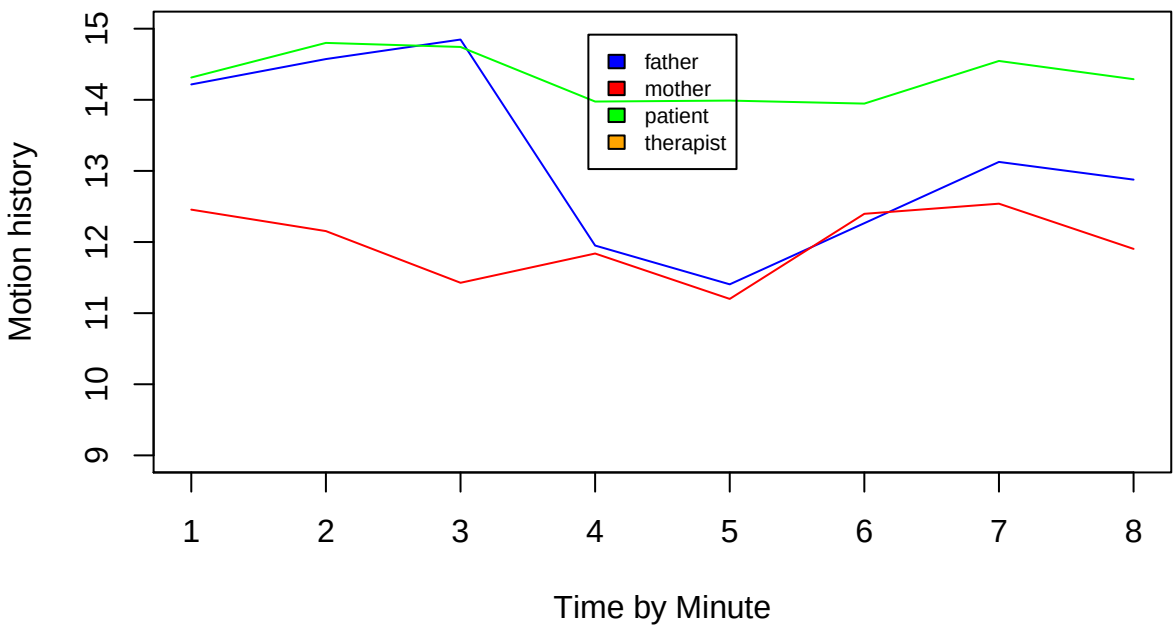
Mean log motion history by minute plots

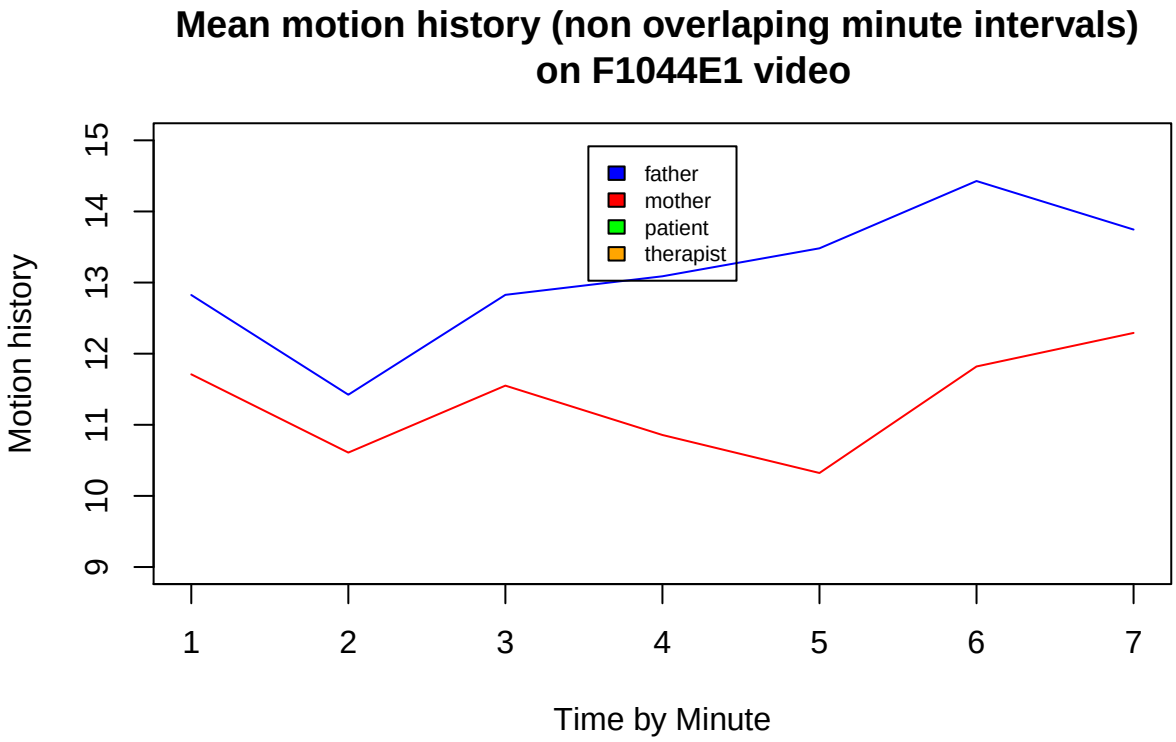
```
for (i in 1:NumberOfvideos){
  fatherMinute<- MeanMotionByTime("norm.logFather", indexOfvideos=i, interval=1500, data)

  MotherMinute<- MeanMotionByTime("norm.logMother", indexOfvideos=i, interval=1500, data)

  TherapistMinute<- MeanMotionByTime("norm.logTherapist", indexOfvideos=i, interval=1500, data)

  PatientMinute<- MeanMotionByTime("norm.logPatient", indexOfvideos=i, interval=1500, data)

  par(mar=c(4,4,4,2))
      plot (1:length(fatherMinute), fatherMinute, type="l", col="blue",
      main=paste("Mean motion history (non overlaping minute intervals)
      on F1044", labelvideolist[i], " video" , sep=""),
      ylab="Motion history", xlab="Time by Minute", ylim=c(9, 15),
      xaxp=c(0, length(fatherMinute), length(fatherMinute)))
      lines(MotherMinute, col="red")
      lines(TherapistMinute, col="orange")
      lines(PatientMinute, col="green")
      legend("top", inset=.05, ParticipantsList,
             fill=colOrderList, cex=0.7)}
```

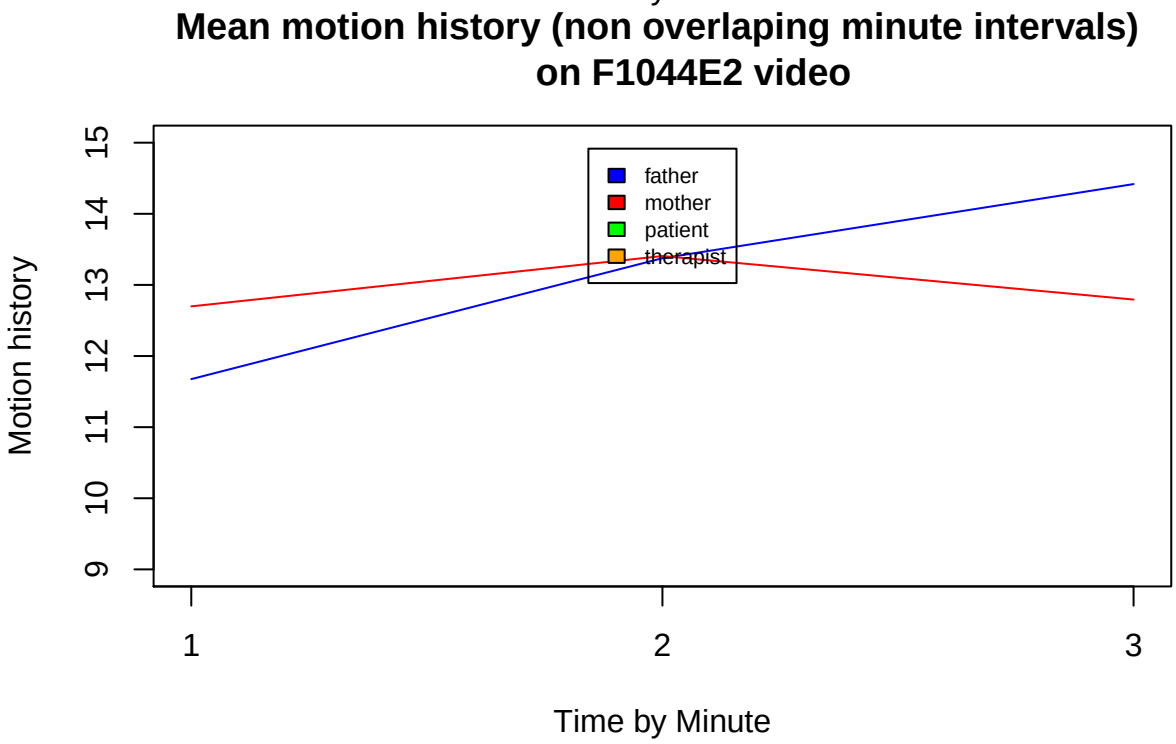

Mean motion history (non overlaping minute intervals)
on F1044C1 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
10
11
12
13
Time by Minute
father
mother
patient
therapist

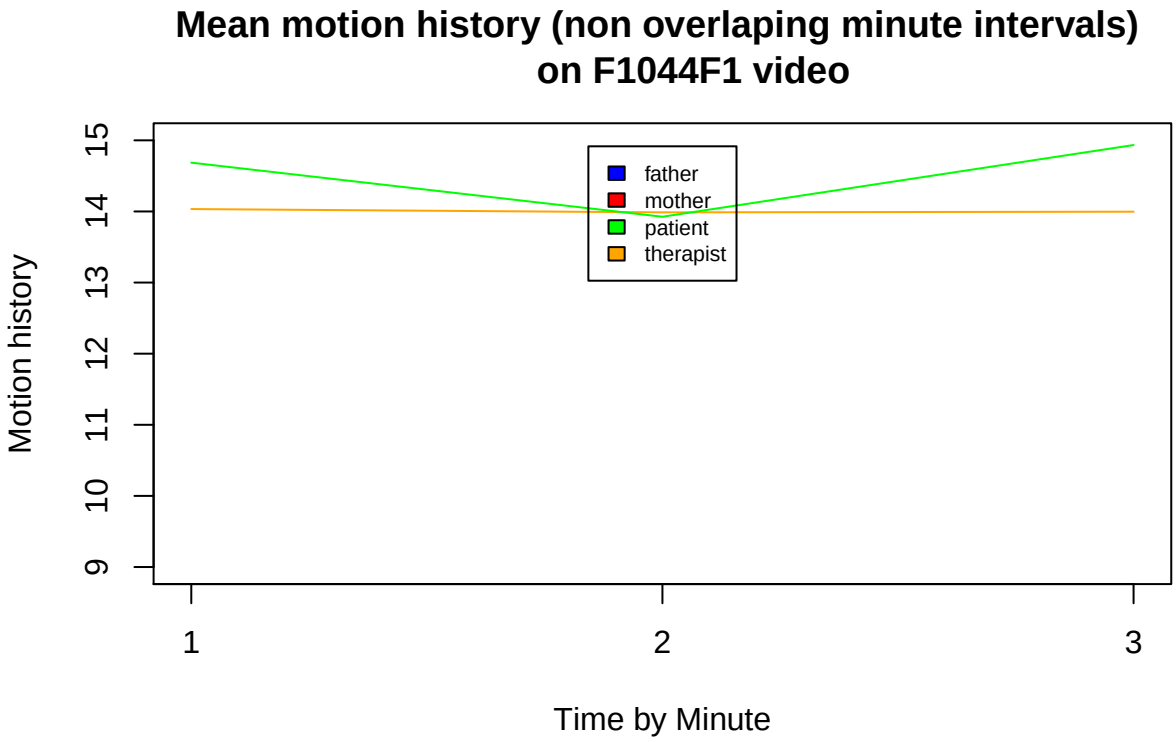

Mean motion history (non overlaping minute intervals)
on F1044C2 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
Time by Minute
father
mother
patient
therapist

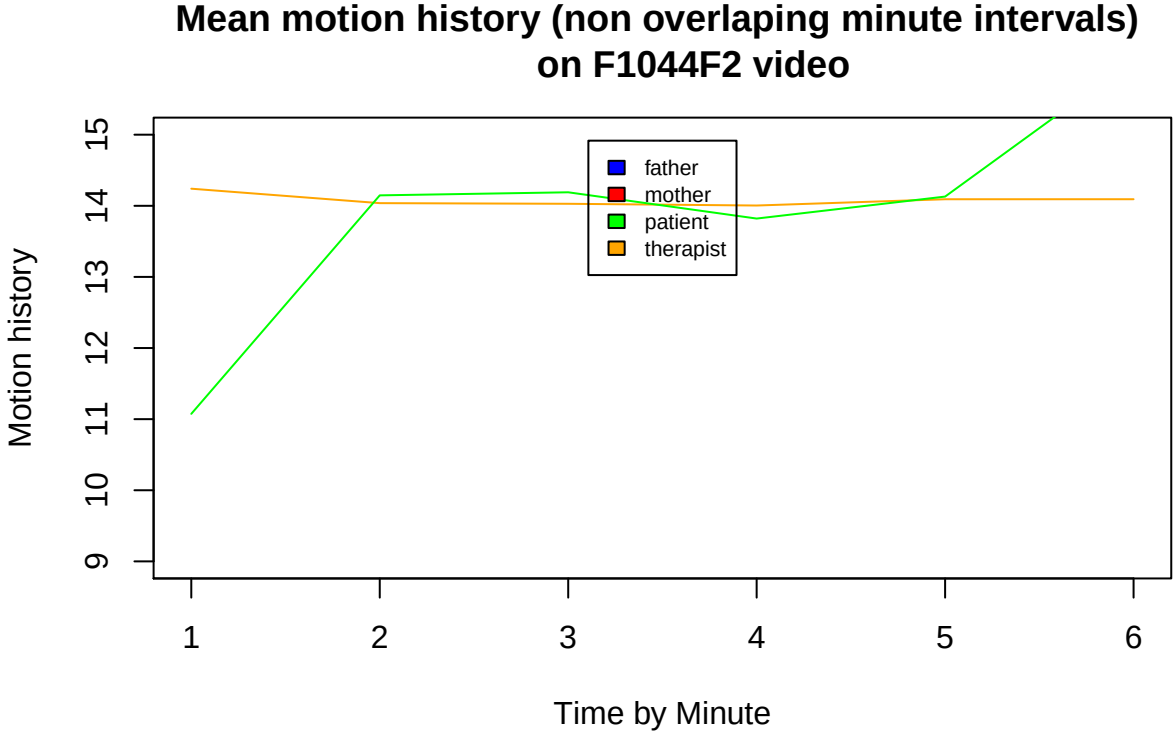

Mean motion history (non overlaping minute intervals)
on F1044D1 video
Motion history
9
10
11
12
13
14
15
1 2 3 4 5 6 7 8 9 11 13 15 17 19 21
Time by Minute
father
mother
patient
therapist

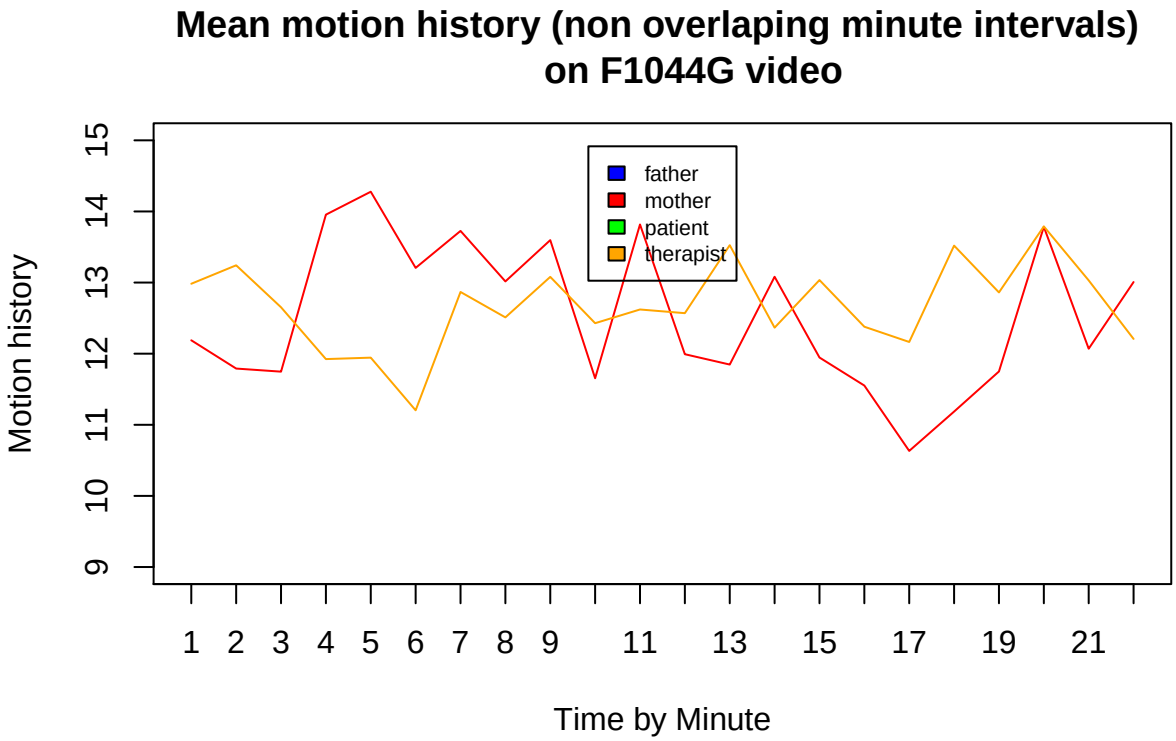

Mean motion history (non overlaping minute intervals)
on F1044D2 video
Motion history
9
10
11
12
13
14
15
1 2 3 4 5 6 7 8
Time by Minute
father
mother
patient
therapist

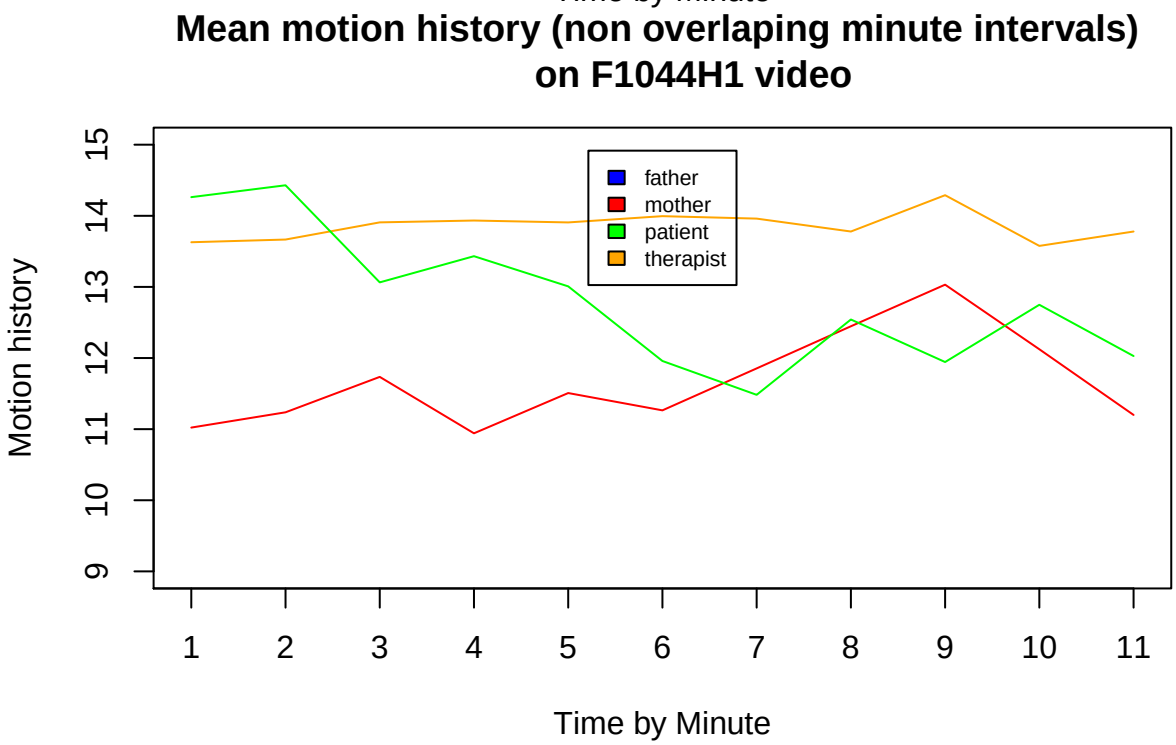

Mean motion history (non overlaping minute intervals)
on F1044E1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
Time by Minute

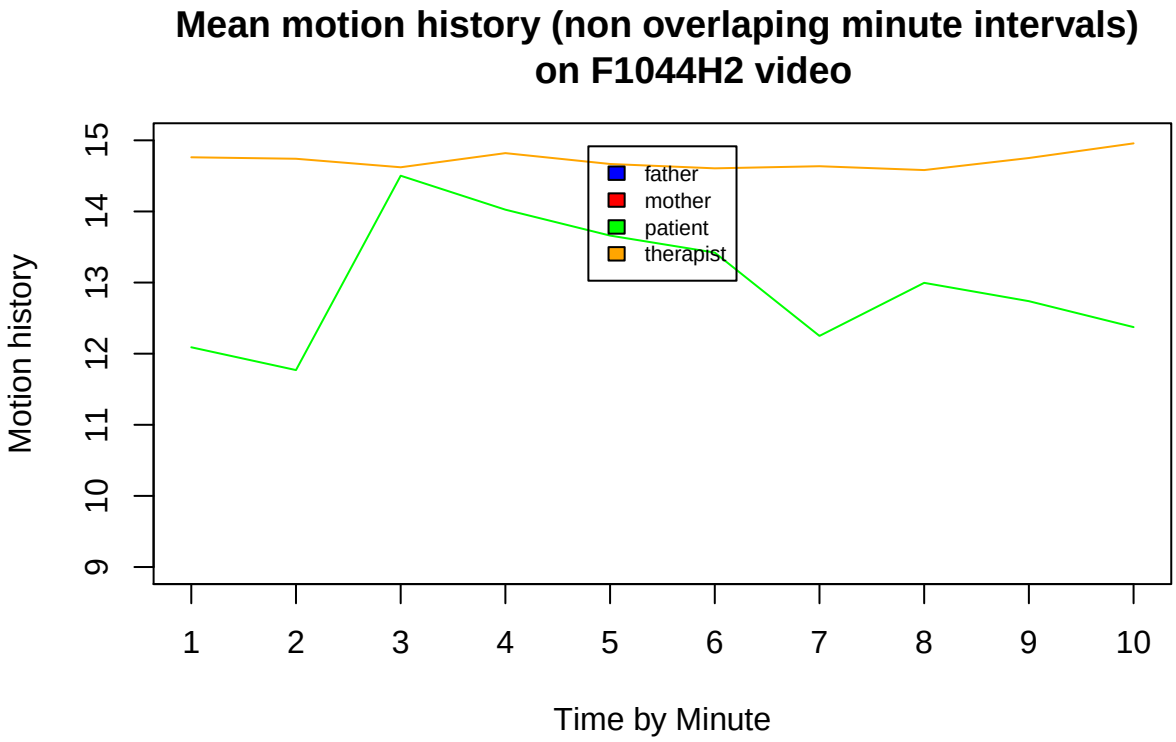

Mean motion history (non overlaping minute intervals)
on F1044E2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
Time by Minute

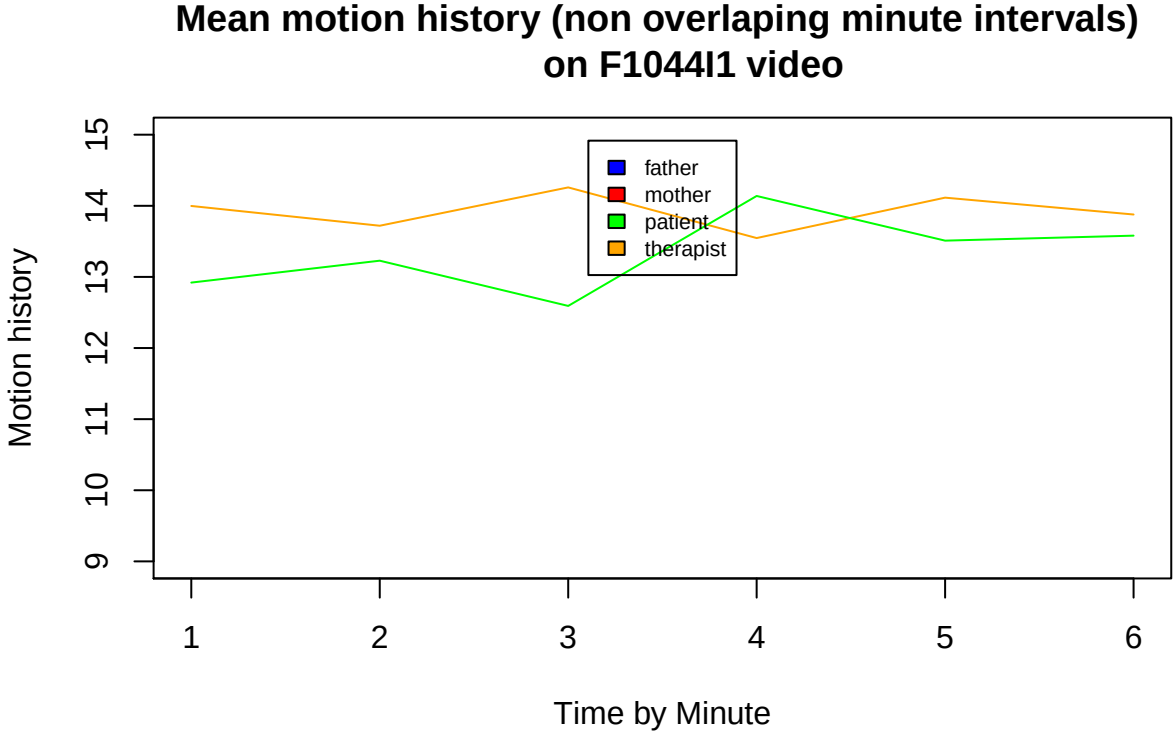

Mean motion history (non overlaping minute intervals)
on F1044F1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
Time by Minute

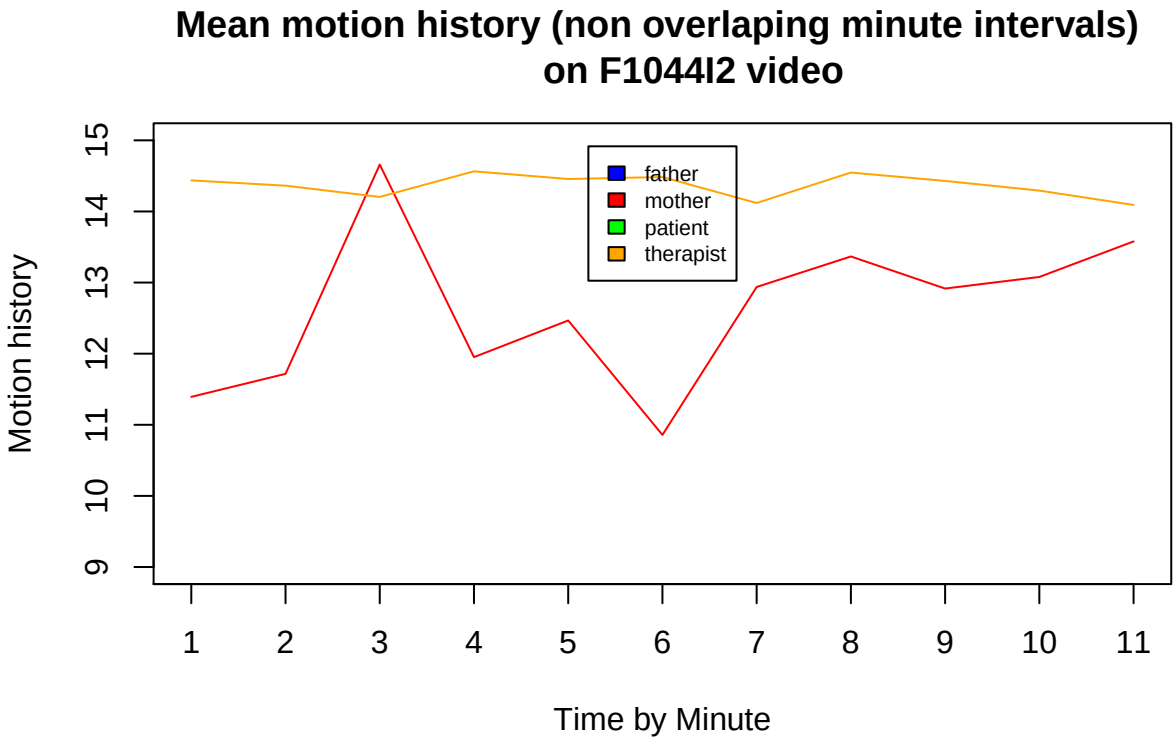

Mean motion history (non overlaping minute intervals)
on F1044F2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
Time by Minute

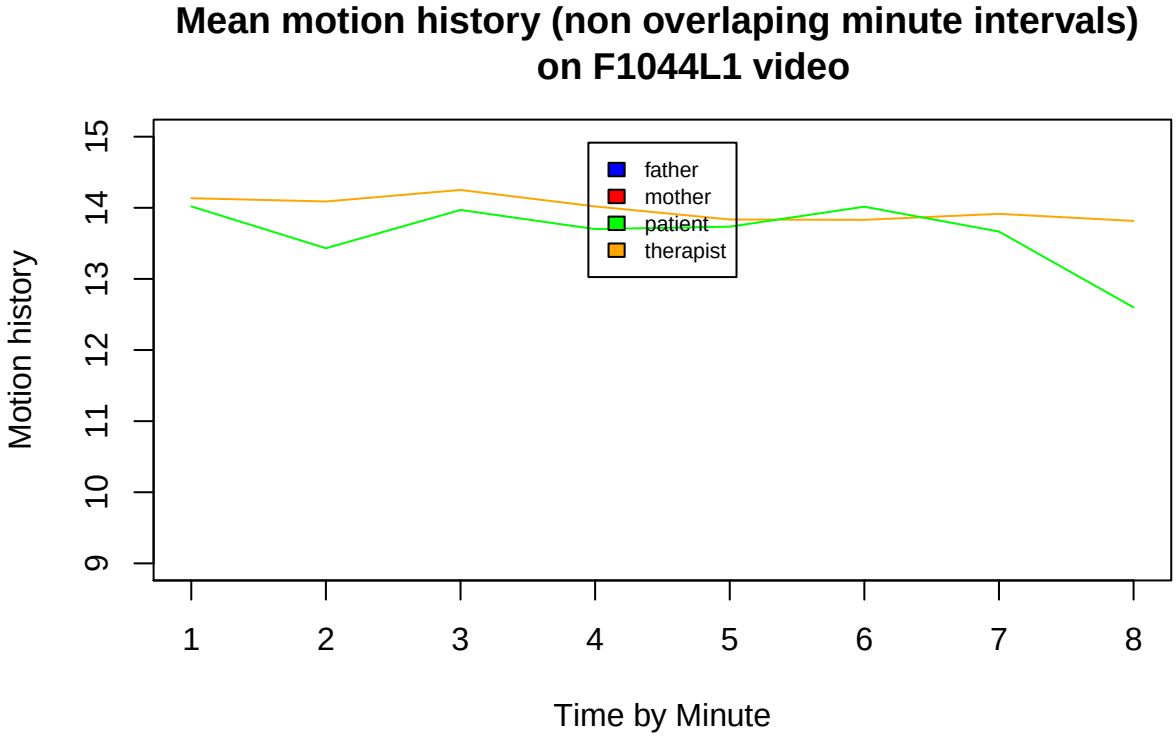

Mean motion history (non overlaping minute intervals)
on F1044G video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute
father
mother
patient
therapist

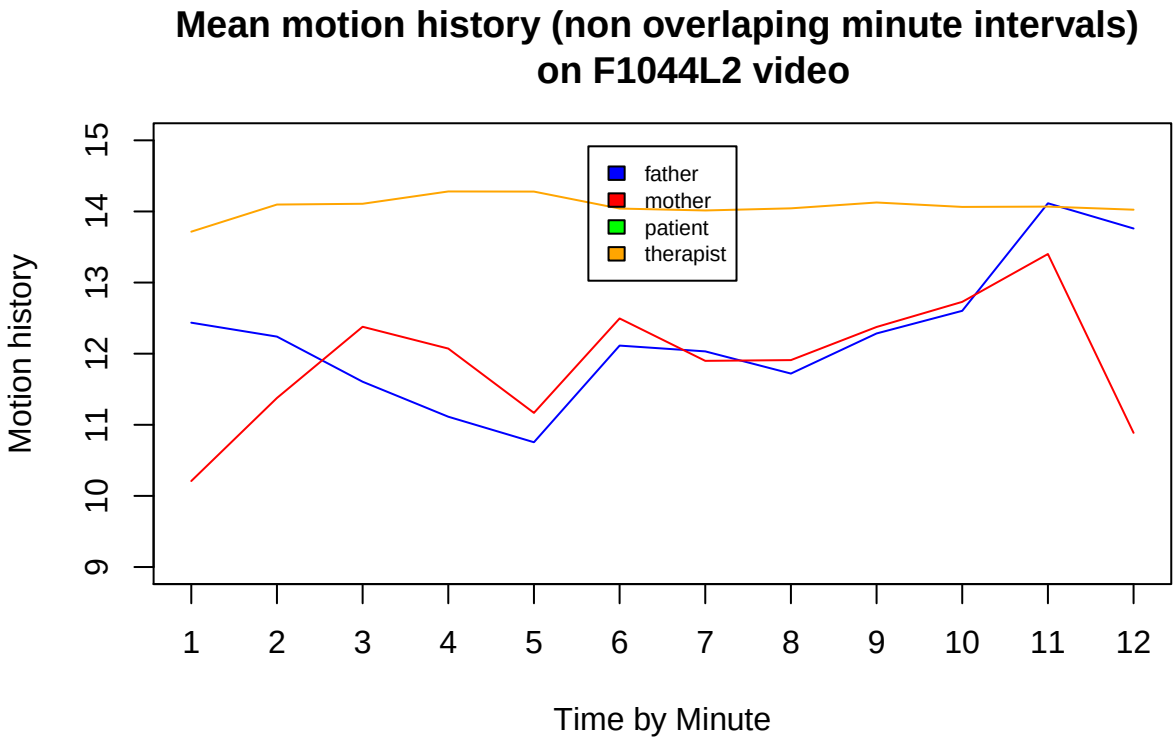

Mean motion history (non overlaping minute intervals)
on F1044H1 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
10
11
Time by Minute
father
mother
patient
therapist

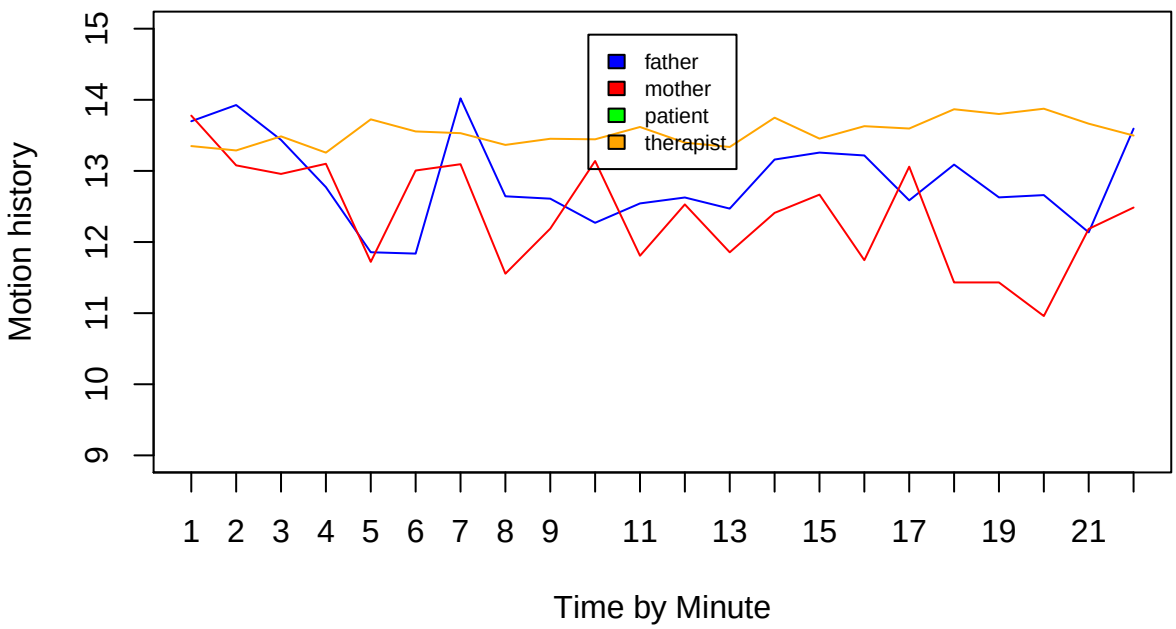

Mean motion history (non overlaping minute intervals)
on F1044H2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
Time by Minute

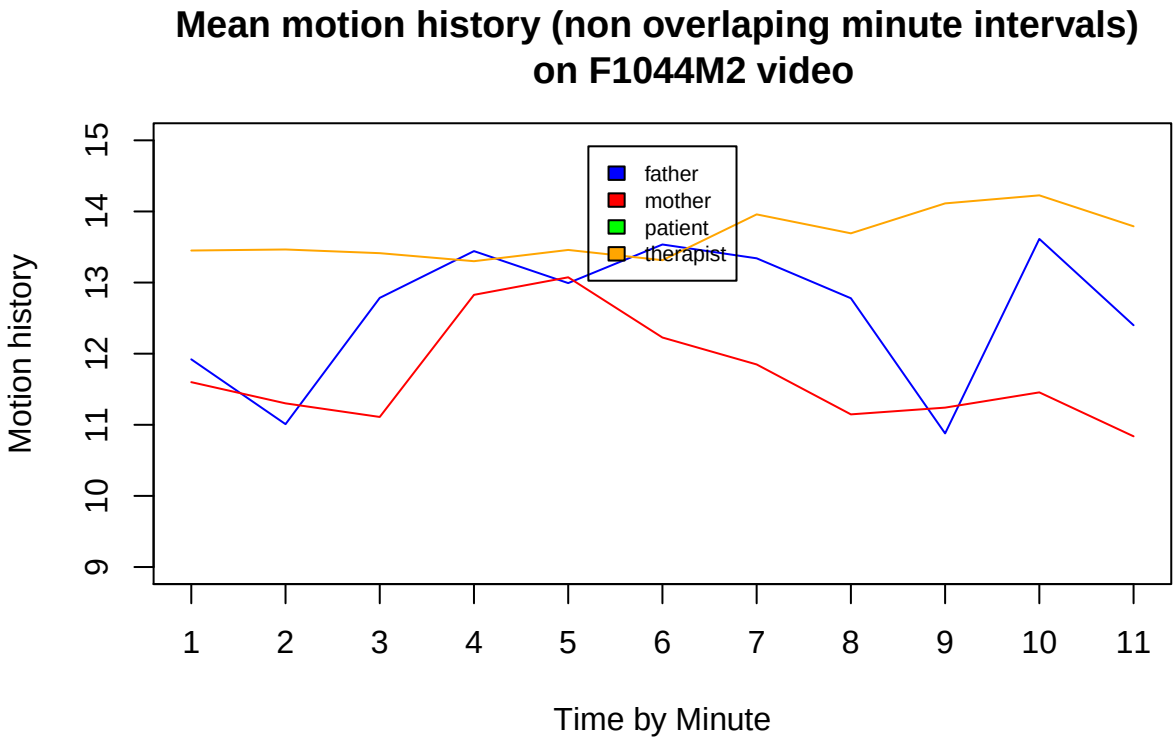

Mean motion history (non overlaping minute intervals)
on F1044I1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
Time by Minute

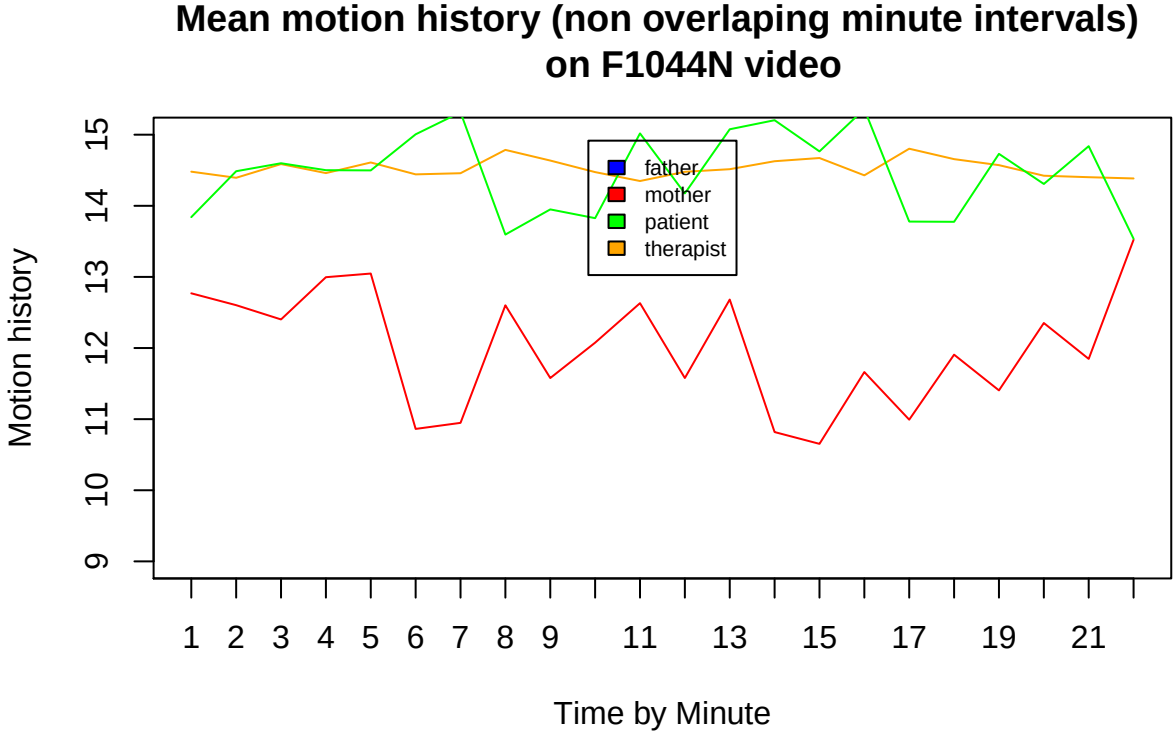

Mean motion history (non overlaping minute intervals)
on F1044I2 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
10
11
Time by Minute
father
mother
patient
therapist

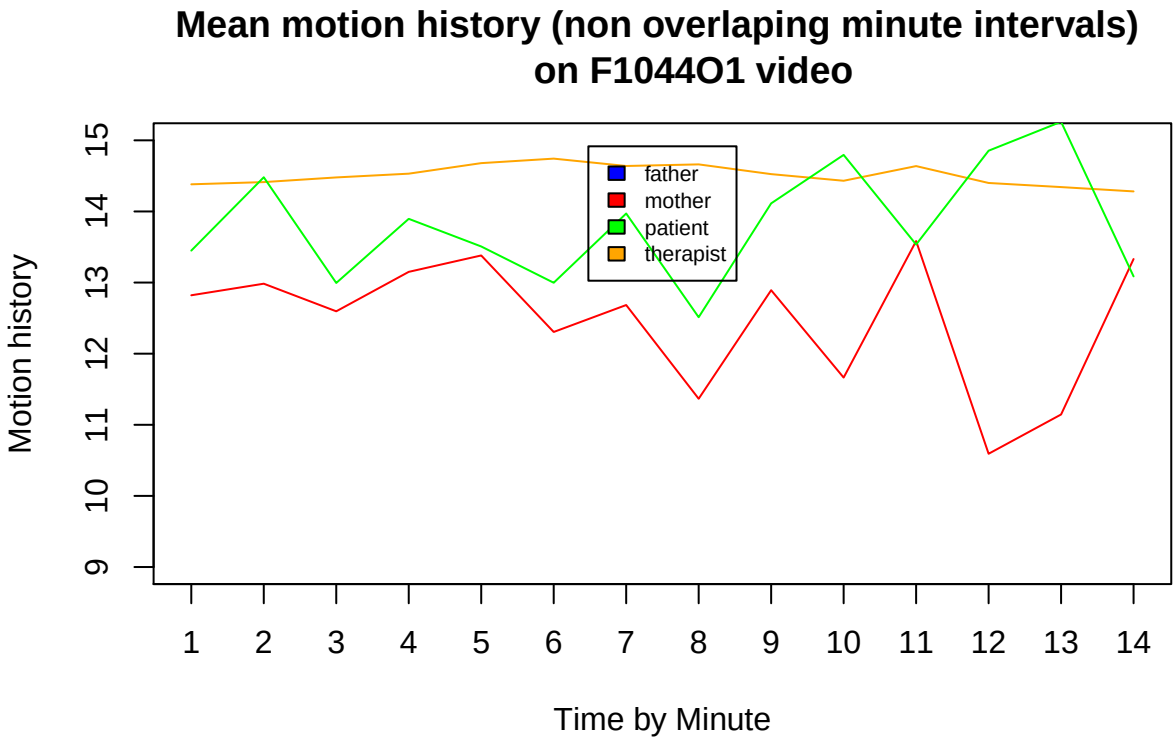

Mean motion history (non overlaping minute intervals)
on F1044L1 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
Time by Minute
father
mother
patient
therapist

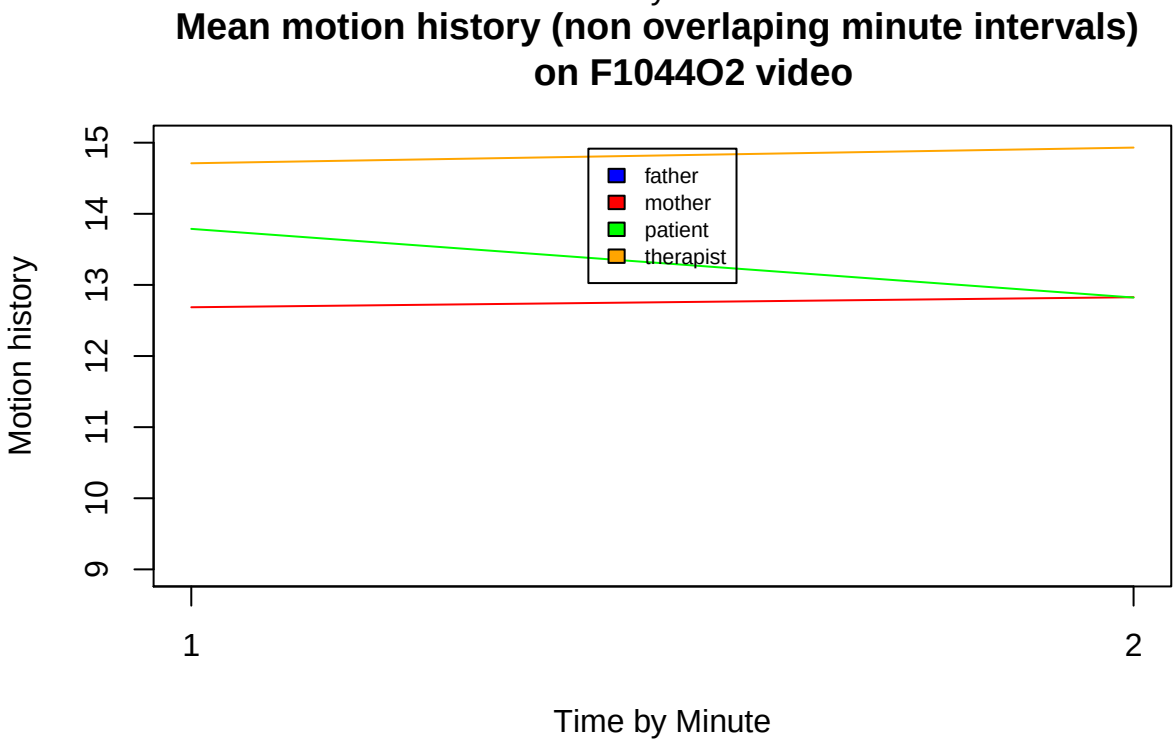

Mean motion history (non overlaping minute intervals)
on F1044L2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
12
Time by Minute

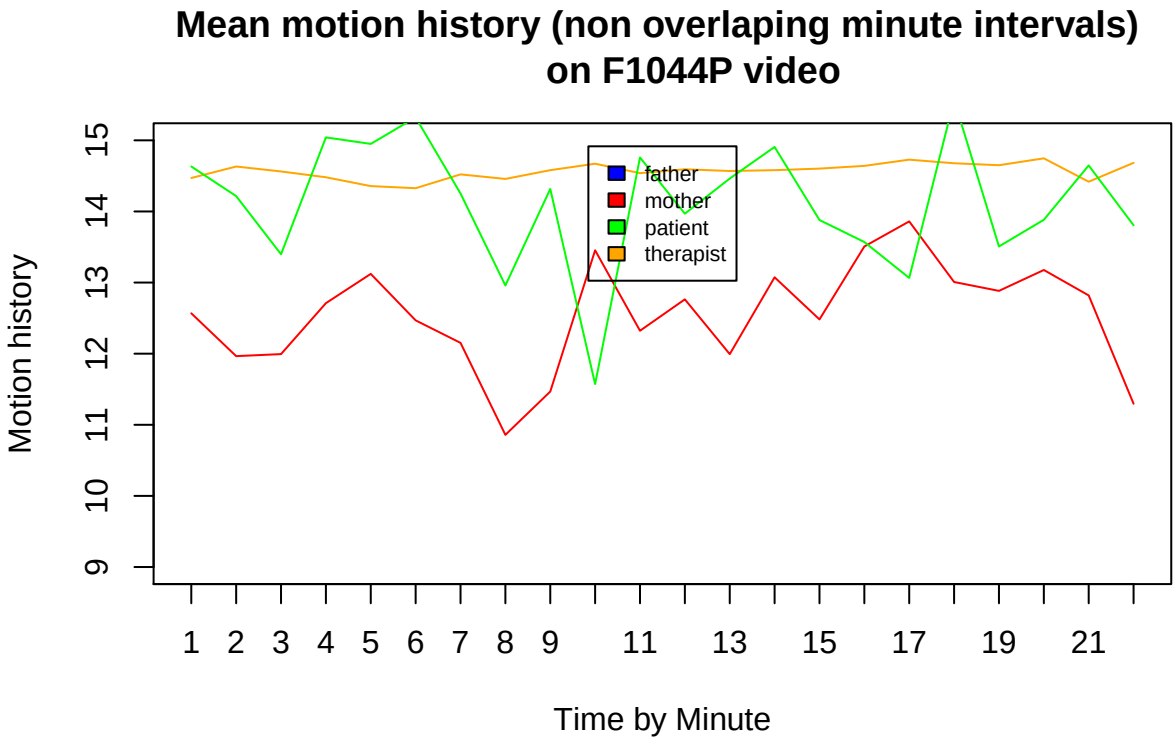

Mean motion history (non overlaping minute intervals)
on F1044M1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute

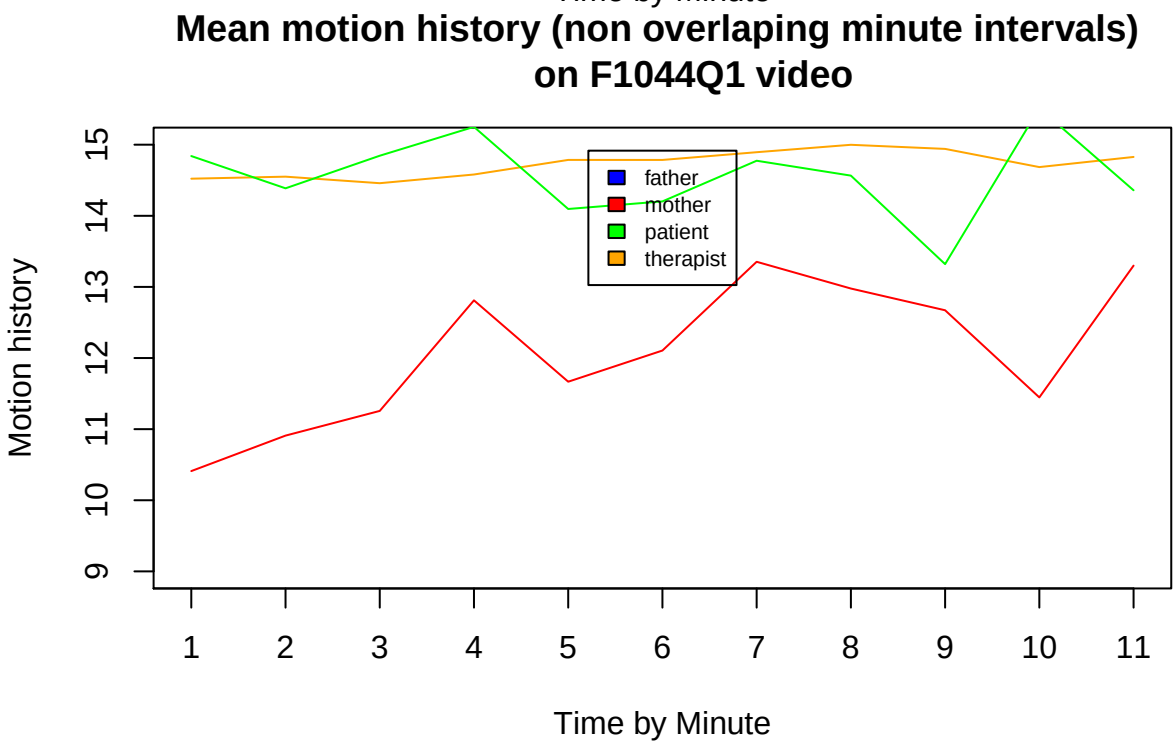

Mean motion history (non overlaping minute intervals)
on F1044M2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
Time by Minute

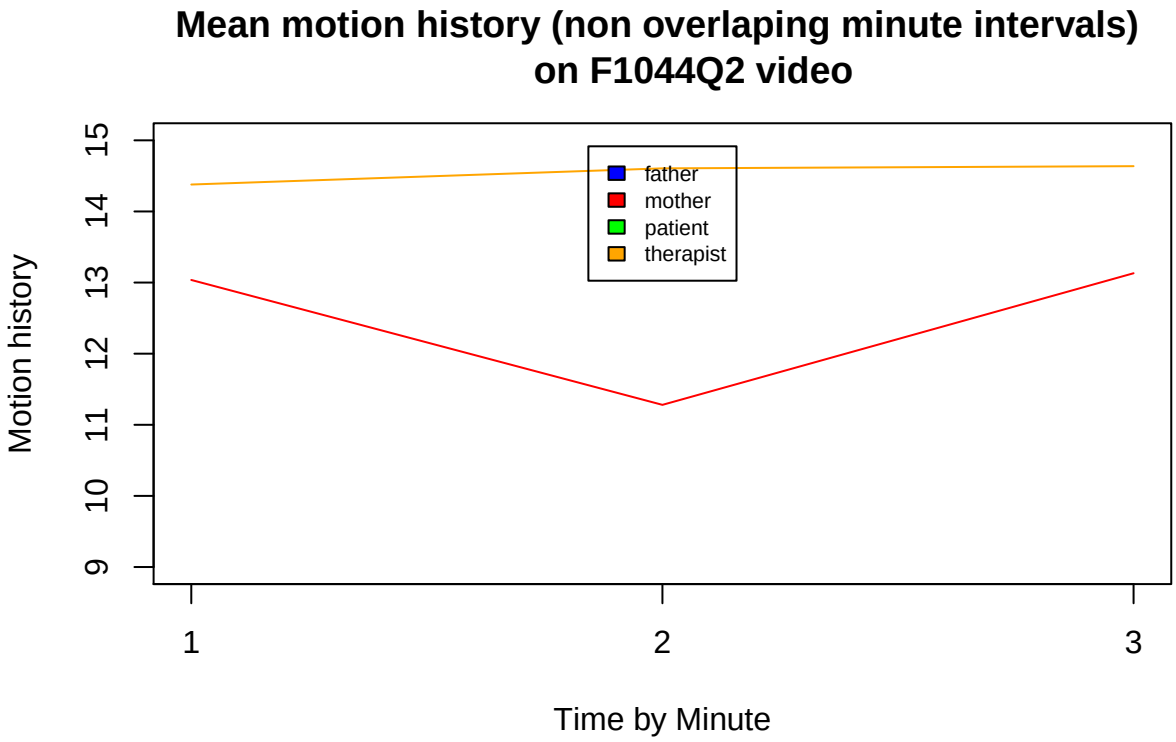

Mean motion history (non overlaping minute intervals)
on F1044N video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute

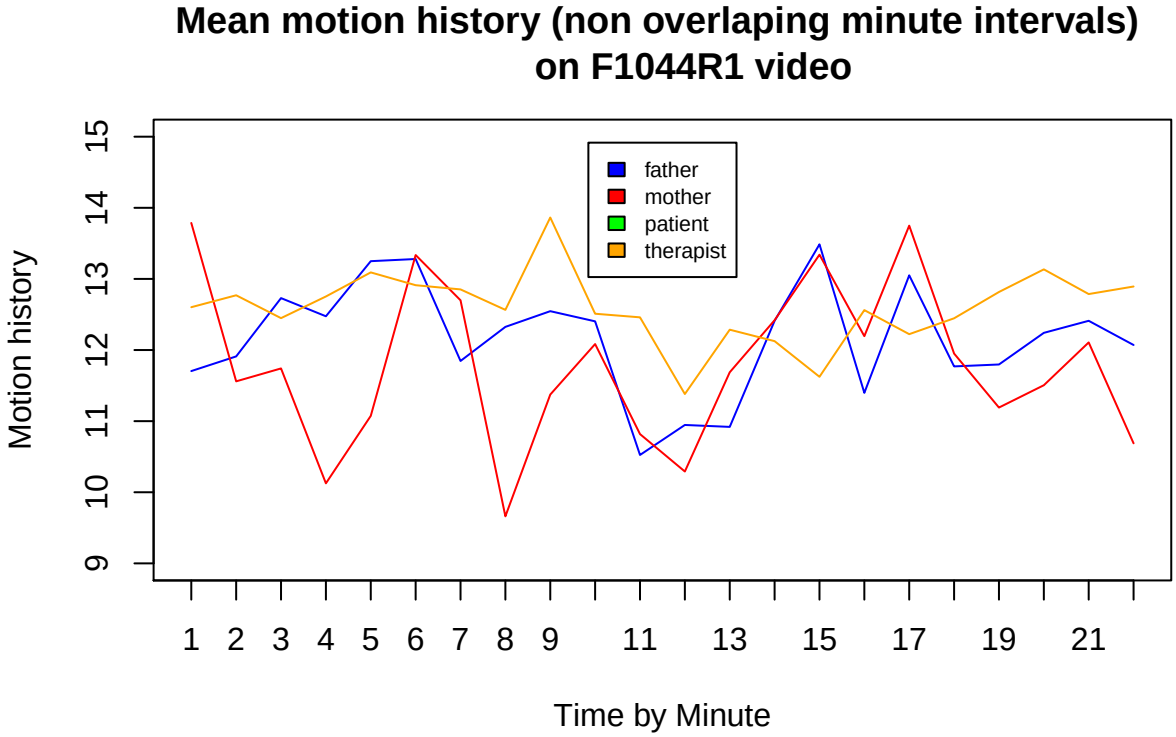

Mean motion history (non overlaping minute intervals)
on F1044O1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Time by Minute

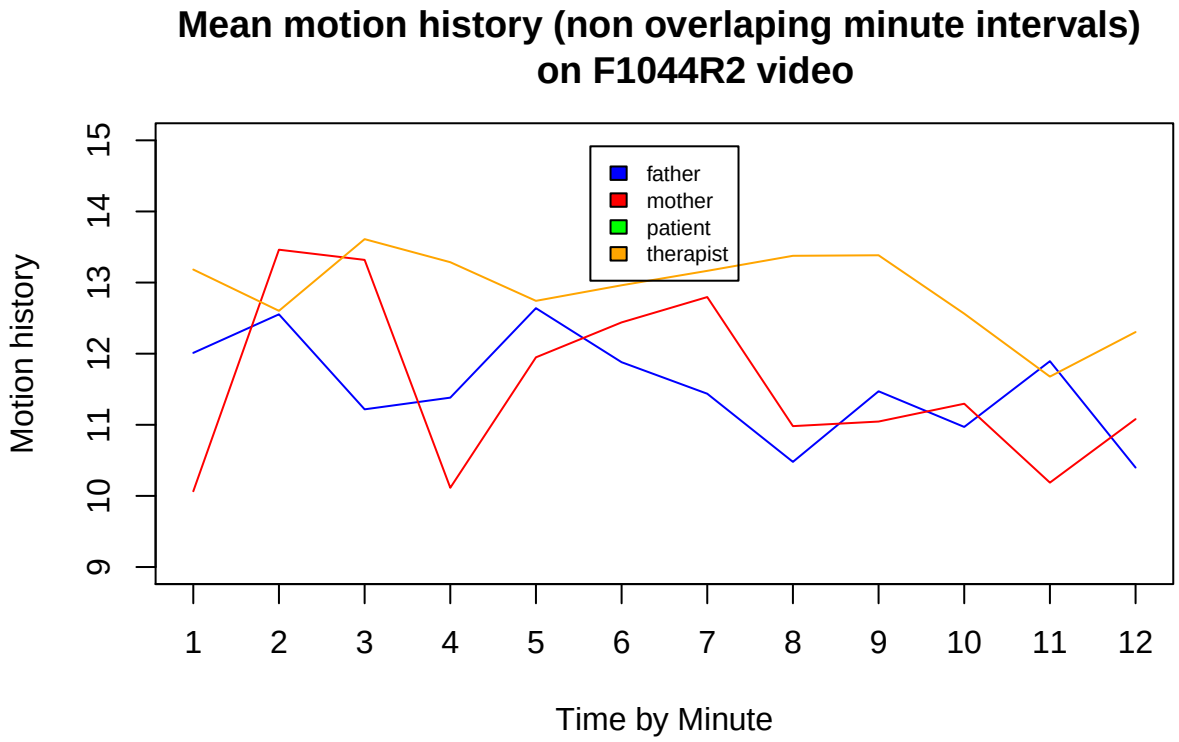

Mean motion history (non overlaping minute intervals)
on F1044O2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044P video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
father
mother
patient
therapist
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044Q1 video
Motion history
9
10
11
12
13
14
15
1
2
3
4
5
6
7
8
9
10
11
father
mother
patient
therapist
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044Q2 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
Time by Minute


Mean motion history (non overlaping minute intervals)
on F1044R1 video
Motion history
9
10
11
12
13
14
15
father
mother
patient
therapist
1
2
3
4
5
6
7
8
9
11
13
15
17
19
21
Time by Minute



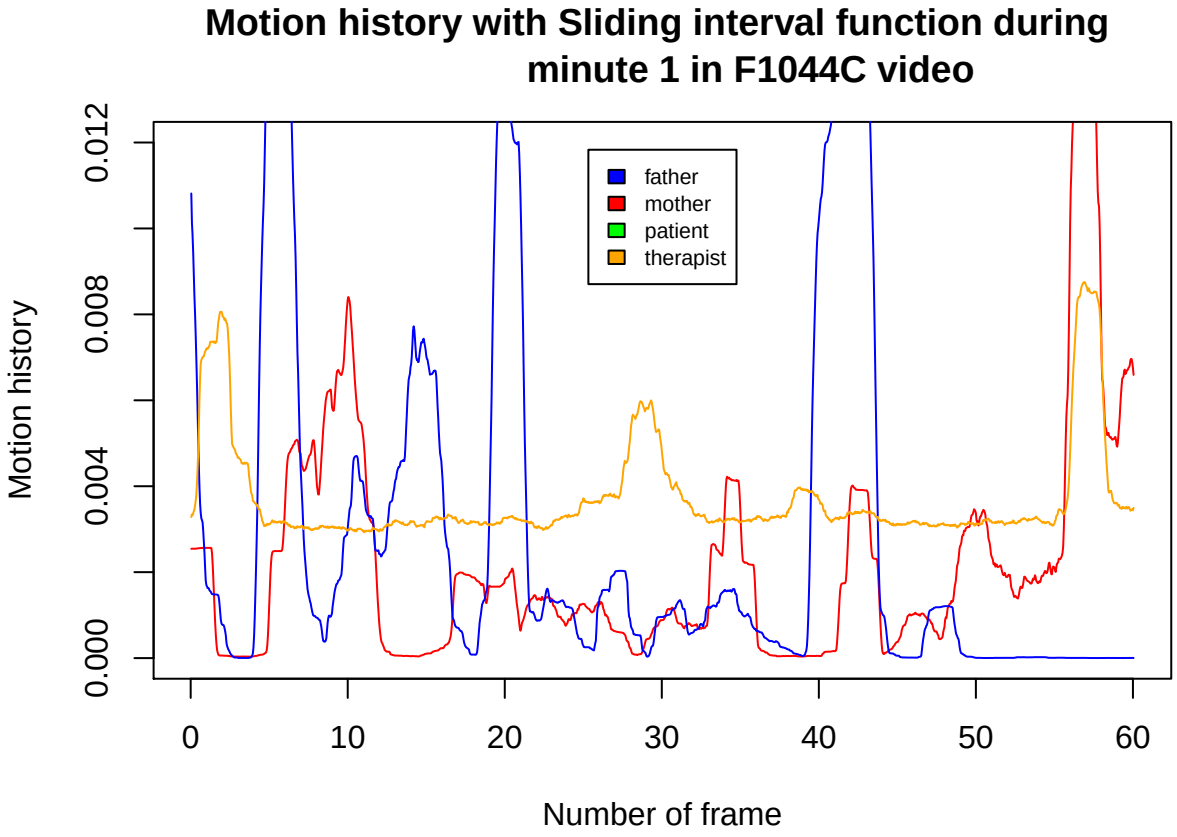
Motion history by minute for the F1044C video

```
slidedFather <- SlidingInterval("father", 1 , 50, data)
slidedMother <- SlidingInterval("mother", 1 , 50, data)
slidedTherapist <- SlidingInterval("therapist", 1 , 50, data)
slidedPatient <- SlidingInterval("patient", 1 , 50, data)
```

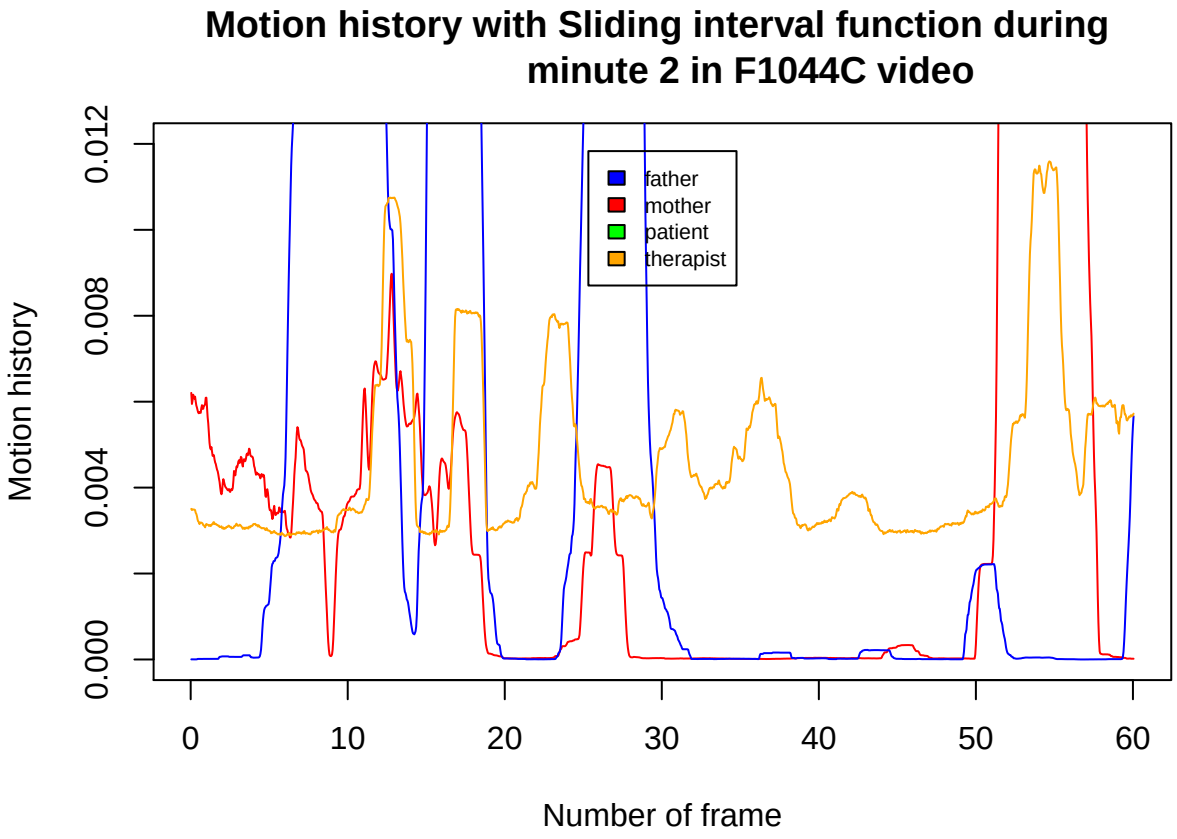
```
framesByMinute <- 60*25
F1044C_Minutes <- ceiling(length(slidedFather)/framesByMinute)
for (i in 1:(F1044C_Minutes-1)){
      par(mar=c(4,4,4,2))
      borneInf <- i+framesByMinute*(i-1)
      borneSup <- i+i*framesByMinute
      slidedFatherMinute<-slidedFather[borneInf:borneSup]
      slidedMotherMinute<-slidedMother[borneInf:borneSup]
      slidedTherapistMinute<-slidedTherapist[borneInf:borneSup]
      slidedPatientMinute<-slidedPatient[borneInf:borneSup]
      slidedVideoDF <- data.frame(slidedFatherMinute, slidedMotherMinute, slidedTherapistMinute, slidedP
      str (slidedVideoDF)
      plot (slidedVideoDF$minute, slidedVideoDF$slidedMotherMinute, type="l", col="red",
      main=paste("Motion history with Sliding interval function during
                 minute ", i, " in F1044C video", sep=""),
      ylab="Motion history", xlab="Number of frame", ylim=c(0, 12E-03))
#     xaxp=c(0, length(slidedFatherMinute), length(slidedFatherMinute)))
      lines(slidedVideoDF$minute, slidedVideoDF$slidedFatherMinute, col="blue")
      lines(slidedVideoDF$minute, slidedVideoDF$slidedTherapistMinute, col="orange")
      lines(slidedVideoDF$minute, slidedVideoDF$slidedPatientMinute, col="green")
```

```
      legend("top", inset=.05, ParticipantsList,
             fill=colOrderList, cex=0.7)}
```

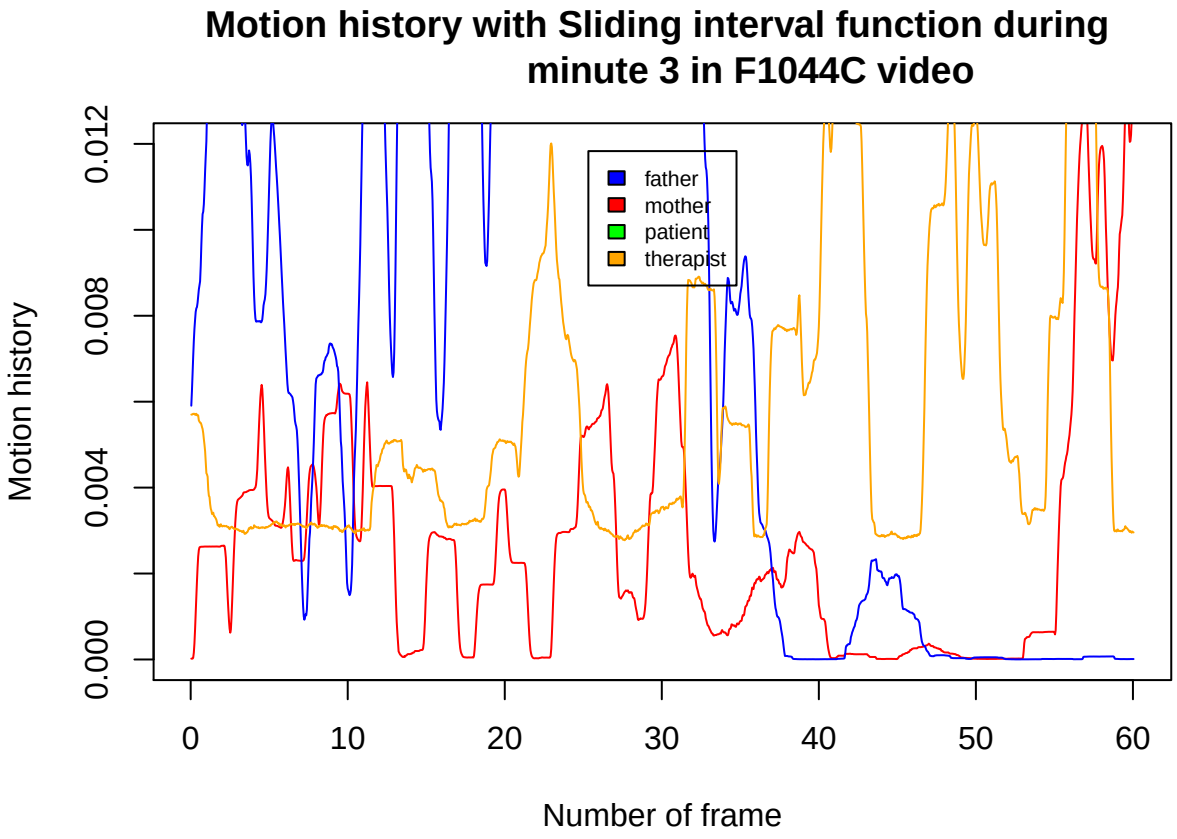
```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.01081 0.01014 0.00985 0.00945 0.00891 ...
##  $ slidedMotherMinute   : num  0.00254 0.00255 0.00255 0.00255 0.00255 ...
##  $ slidedTherapistMinute: num  0.00328 0.00334 0.00333 0.00337 0.00342 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



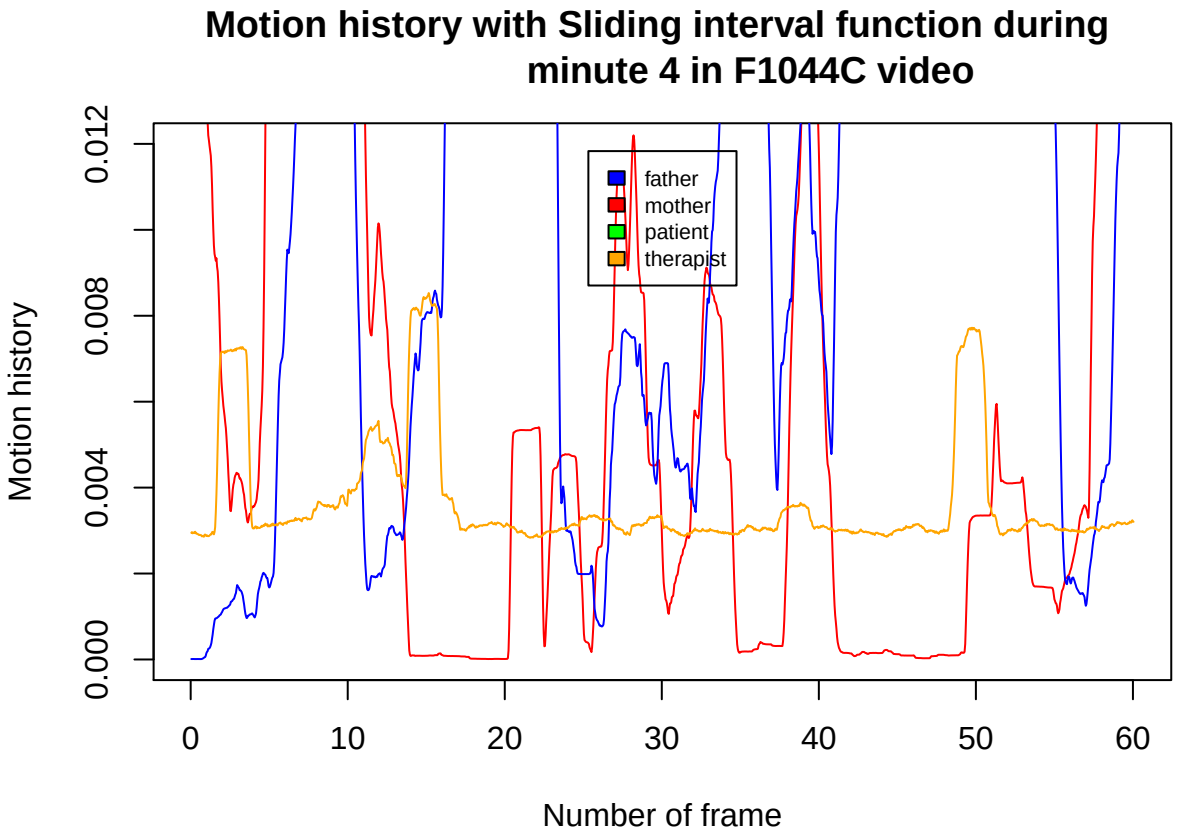

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  2.91e-06 2.91e-06 2.91e-06 2.91e-06 2.50e-06 ...
##  $ slidedMotherMinute   : num  0.0062 0.00595 0.00603 0.00616 0.00611 ...
##  $ slidedTherapistMinute: num  0.00351 0.00348 0.00349 0.00349 0.00349 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



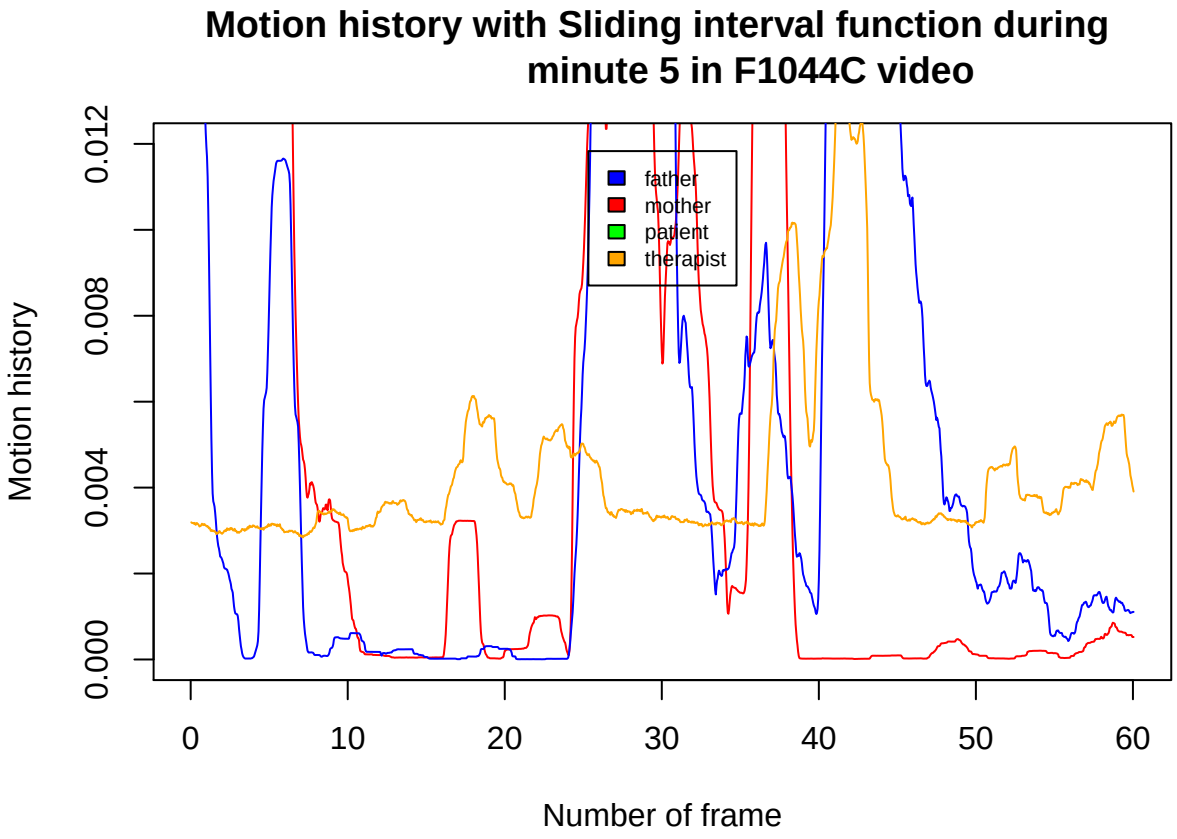

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00591 0.00625 0.00663 0.00704 0.00741 ...
##  $ slidedMotherMinute   : num  1.96e-05 1.96e-05 1.87e-05 3.92e-05 1.58e-04 ...
##  $ slidedTherapistMinute: num  0.0057 0.0057 0.00571 0.00572 0.00572 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



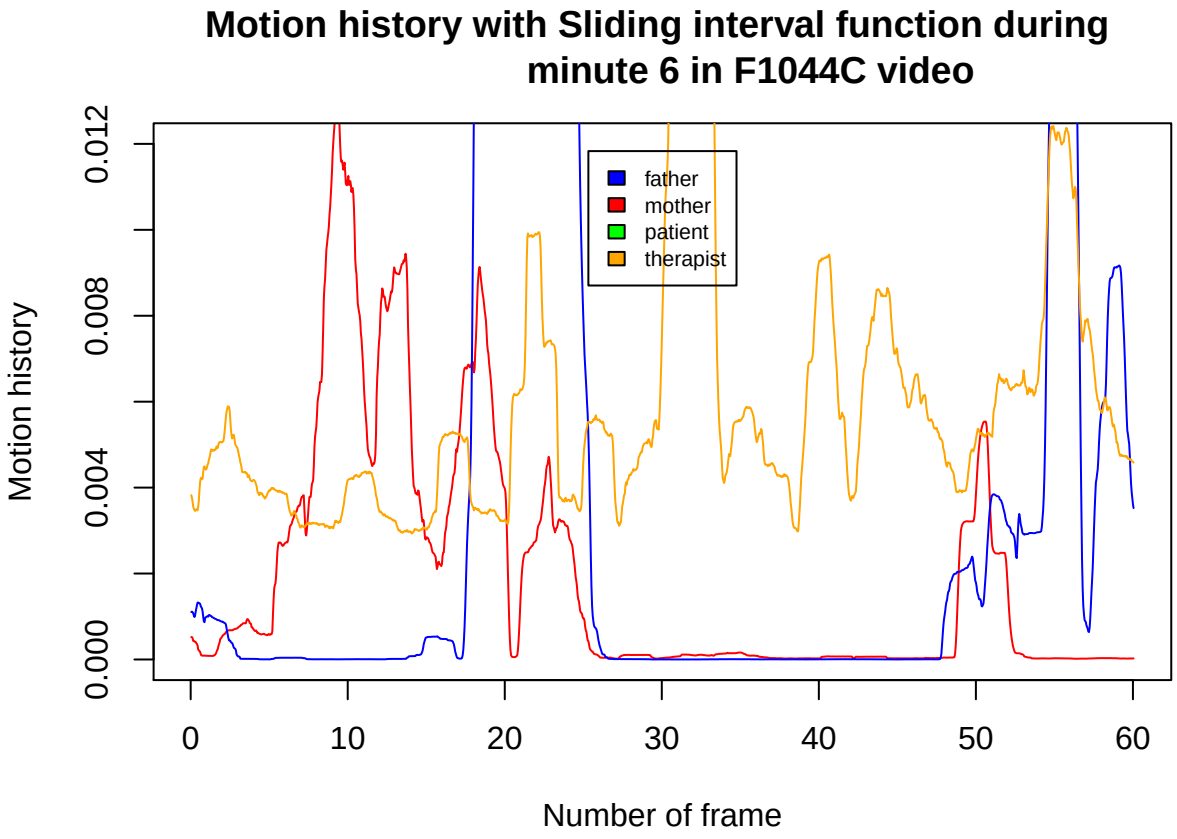

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  1.04e-05 1.04e-05 1.04e-05 1.08e-05 1.08e-05 ...
##  $ slidedMotherMinute   : num  0.0135 0.0136 0.0137 0.0137 0.0138 ...
##  $ slidedTherapistMinute: num  0.00295 0.00296 0.00294 0.00295 0.00296 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



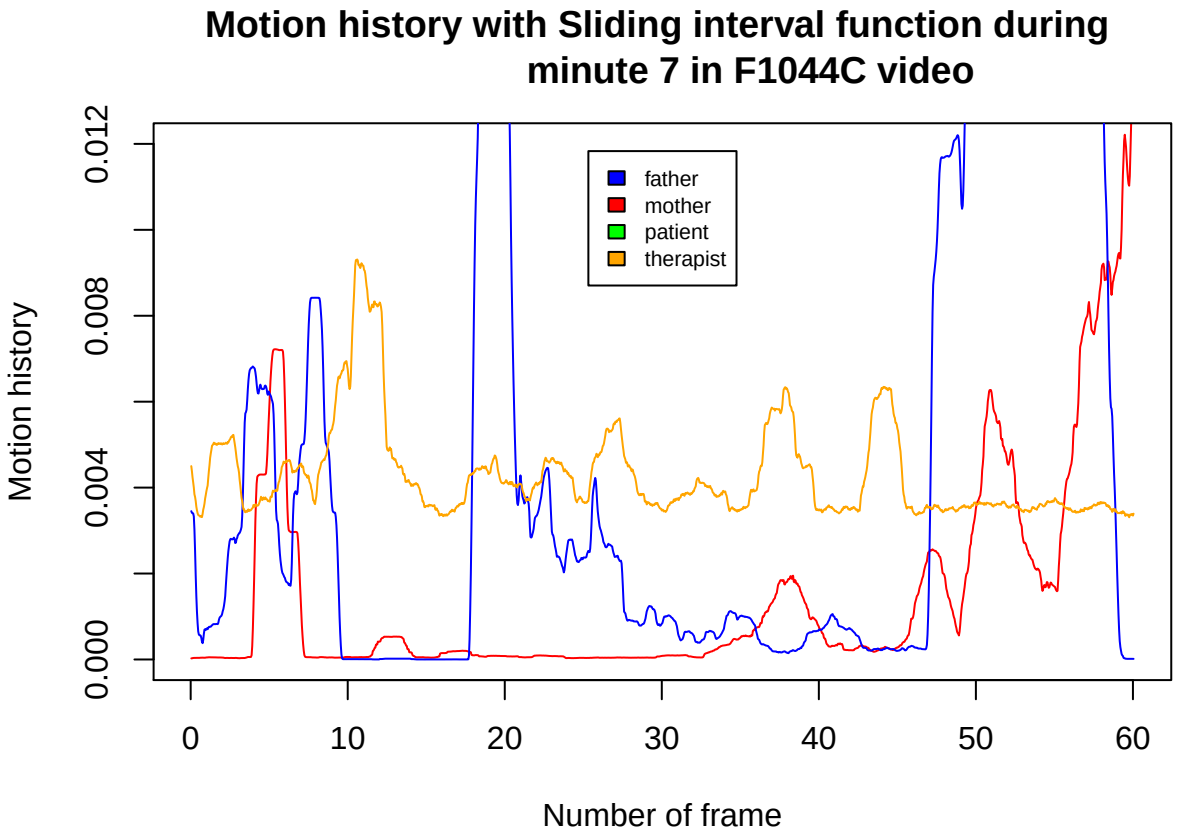

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.0189 0.0188 0.0188 0.0187 0.0187 ...
##  $ slidedMotherMinute   : num  0.0181 0.0185 0.0188 0.0191 0.0193 ...
##  $ slidedTherapistMinute: num  0.00319 0.00318 0.00318 0.00318 0.00316 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



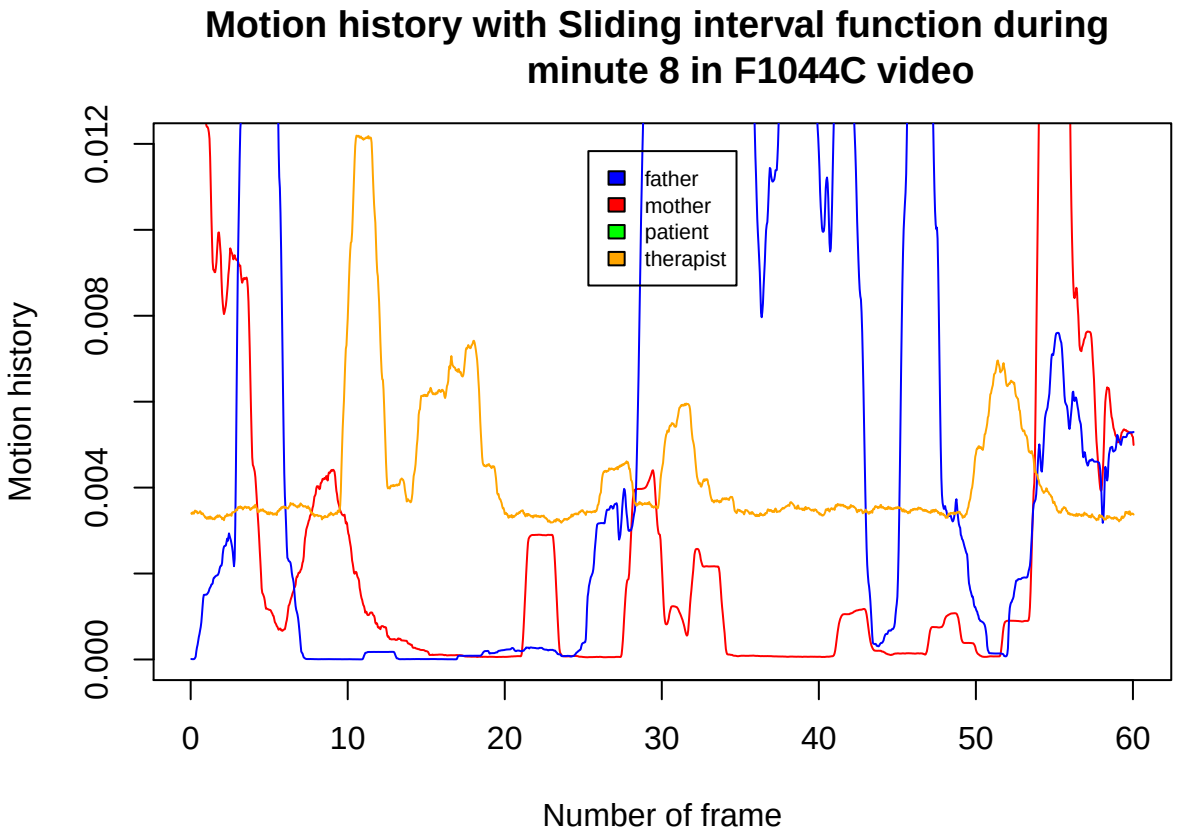

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.0011 0.00111 0.0011 0.00108 0.00103 ...
##  $ slidedMotherMinute   : num  0.000522 0.000521 0.000497 0.000433 0.000432 ...
##  $ slidedTherapistMinute: num  0.00383 0.00377 0.00368 0.00356 0.00351 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



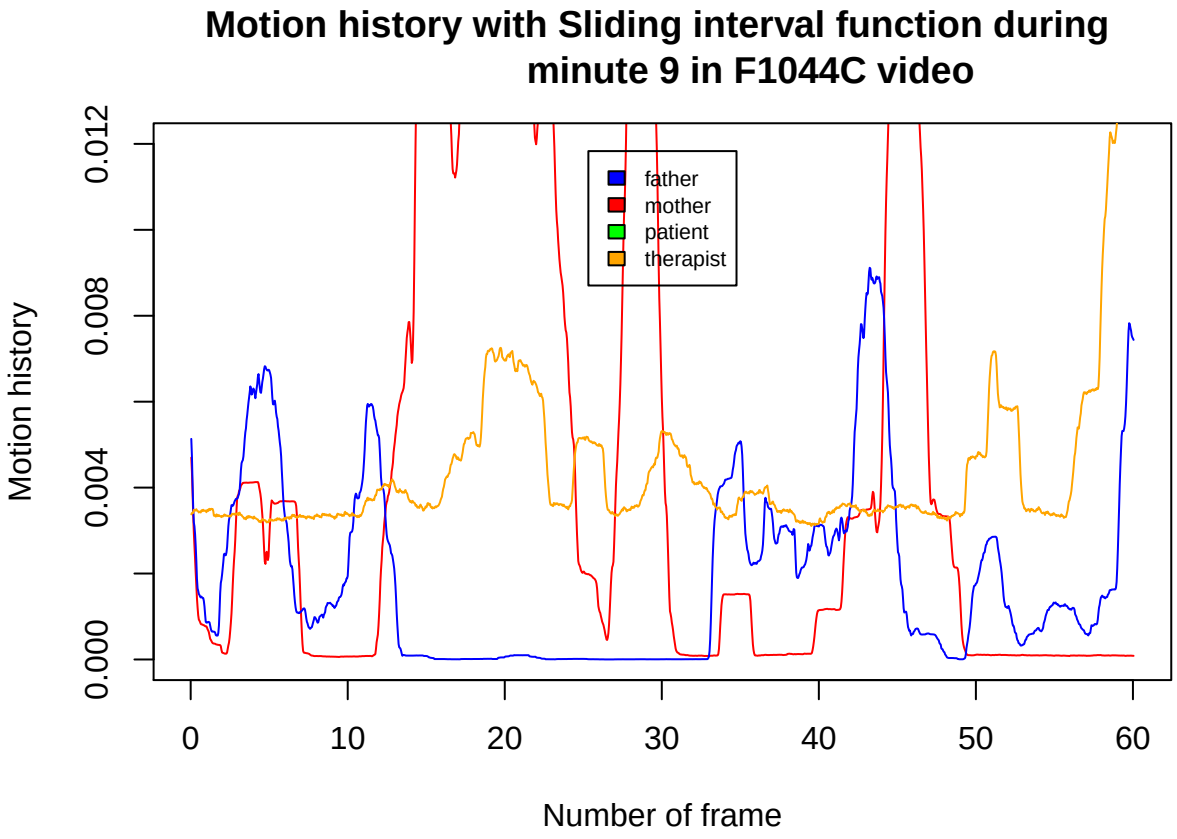

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00345 0.00341 0.00341 0.0034 0.00333 ...
##  $ slidedMotherMinute   : num  2.60e-05 2.65e-05 3.15e-05 3.42e-05 3.60e-05 ...
##  $ slidedTherapistMinute: num  0.0045 0.00438 0.00424 0.00412 0.004 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



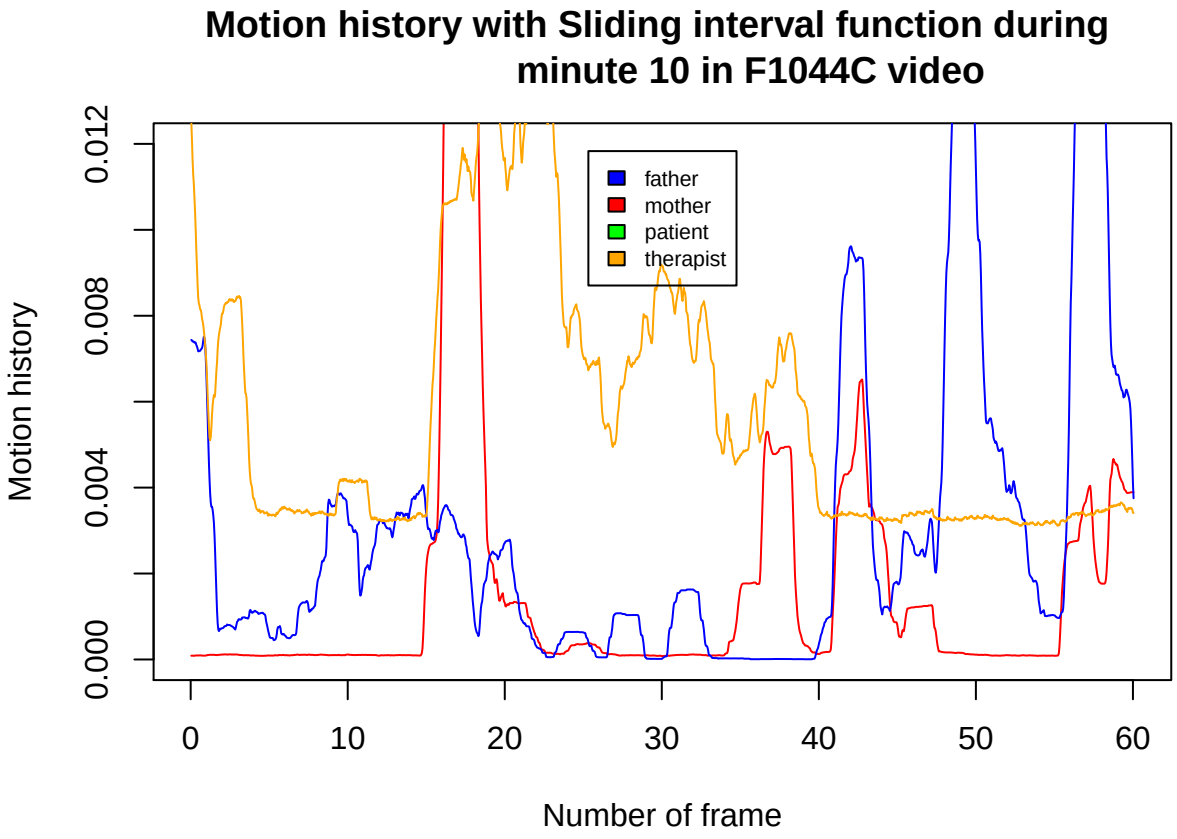

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  1.12e-05 8.32e-06 7.49e-06 7.07e-06 7.07e-06 ...
##  $ slidedMotherMinute   : num  0.0143 0.0144 0.0146 0.0147 0.0146 ...
##  $ slidedTherapistMinute: num  0.0034 0.00338 0.00342 0.00342 0.00339 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



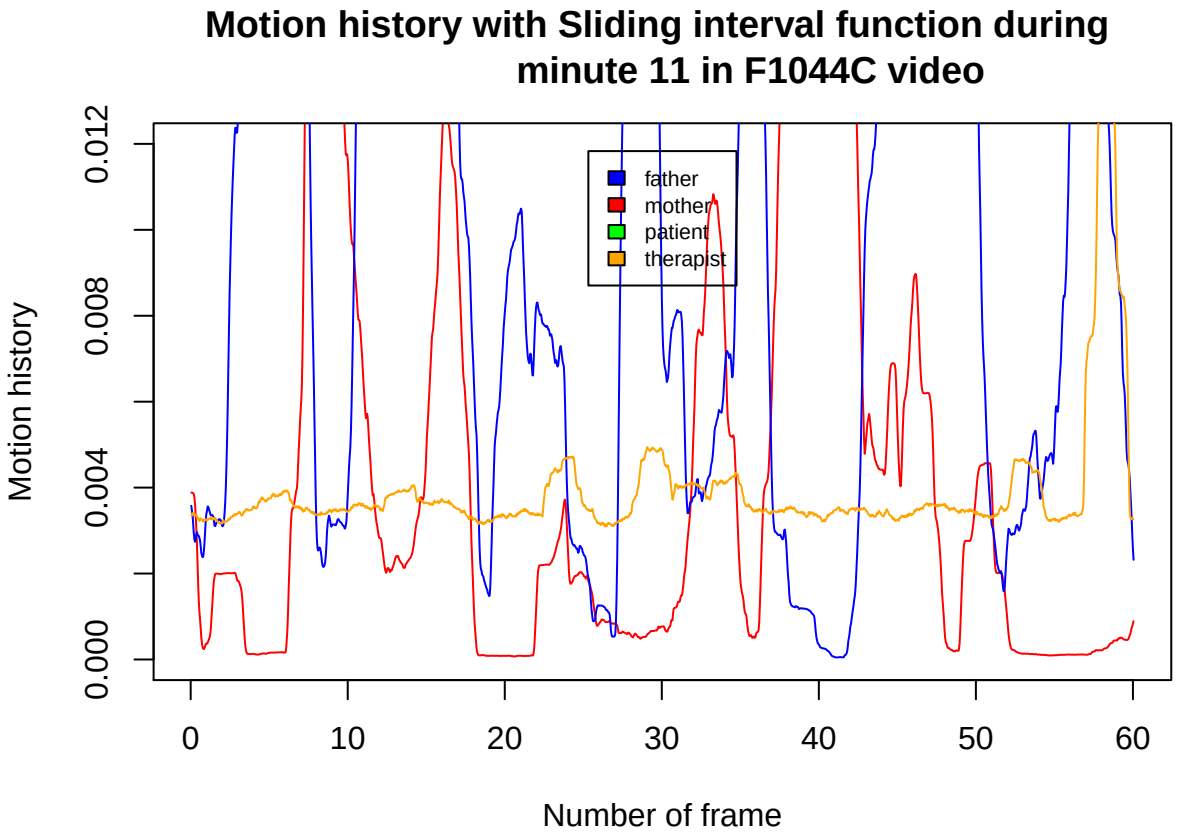

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00513 0.00473 0.00412 0.00355 0.00319 ...
##  $ slidedMotherMinute   : num  0.0047 0.00437 0.0039 0.00338 0.00296 ...
##  $ slidedTherapistMinute: num  0.00338 0.00341 0.00342 0.00341 0.00348 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



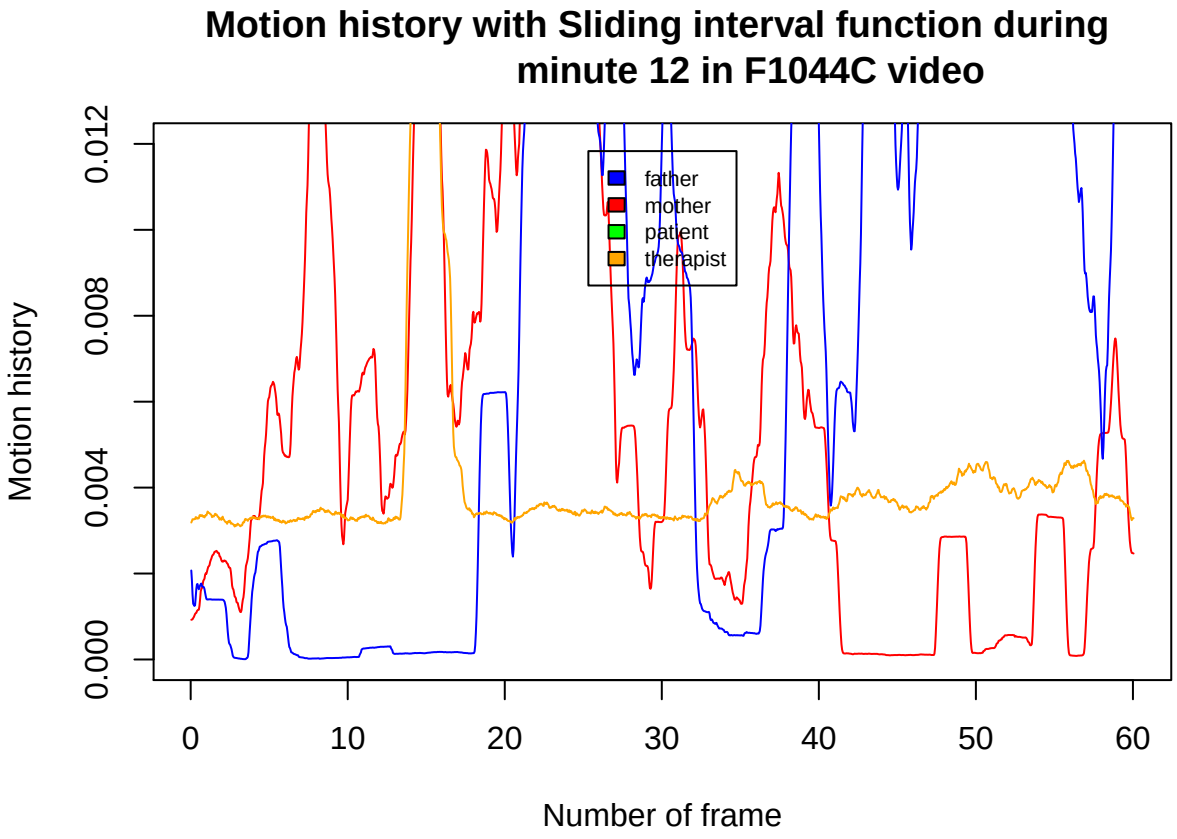

```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00744 0.00743 0.0074 0.0074 0.0074 ...
##  $ slidedMotherMinute   : num  8.71e-05 8.81e-05 8.90e-05 8.76e-05 8.53e-05 ...
##  $ slidedTherapistMinute: num  0.0125 0.0121 0.0117 0.0113 0.0111 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```




```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00358 0.00346 0.00336 0.00316 0.00293 ...
##  $ slidedMotherMinute   : num  0.00388 0.00388 0.00388 0.00387 0.00385 ...
##  $ slidedTherapistMinute: num  0.00338 0.00335 0.00339 0.00341 0.00339 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```




```
## 'data.frame':    1501 obs. of  6 variables:
##  $ slidedFatherMinute   : num  0.00207 0.00183 0.00151 0.0013 0.00127 ...
##  $ slidedMotherMinute   : num  0.000923 0.000929 0.000934 0.000964 0.000987 ...
##  $ slidedTherapistMinute: num  0.00319 0.00322 0.00326 0.00326 0.00326 ...
##  $ slidedPatientMinute  : num  NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN ...
##  $ frames               : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ minute               : num  0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 ...
```



Export no log filtered data in text files

```
## REMINDER:
#SlidingInterval <- function(subject, indexOfvideos=1:NumberOfvideos, interval, data) with :
# subject : subject studied (patient, mother, father or therapist)
# indexOfvideos : list of videos studied (element eg. 3 or list eg 1:3 or c(1,2,4))
# interval : number of frames in the studied interval
# data : data frame where there is data

#index de la vid?eo de 1ere a la length de indexvideo

videoIndex <- 1
# videoName est le nom de la video actuelle
for (videoName in indexList){
# Compute slinding interval for each participant
      print(paste("Computing slidedFather", videoName))
      slidedFather <- SlidingInterval("father", videoIndex, 5, data)
      logSlidedFather <- SlidingInterval("norm.logFather", videoIndex, 5, data)

      print(paste("Computing slidedMother", videoName))
      slidedMother <- SlidingInterval("mother", videoIndex, 5, data)
      logSlidedMother <- SlidingInterval("norm.logMother", videoIndex, 5, data)

      print(paste("Computing slidedPatient", videoName))
      slidedPatient <- SlidingInterval("patient", videoIndex, 5, data)
```

```
      logSlidedPatient <- SlidingInterval("norm.logPatient", videoIndex, 5, data)

      print(paste("Computing slidedTherapist", videoName))
      slidedTherapist <- SlidingInterval("therapist", videoIndex, 5, data)
      logSlidedTherapist <- SlidingInterval("norm.logTherapist", videoIndex, 5, data)

# create a data frame to store temporarily this data with NA
      slidedVideo <- data.frame(
        slidedFather, slidedMother, slidedPatient, slidedTherapist)

      dataFrame <- FALSE
      dfSliding <- data.frame()
      for (participant in 1:4){
# If the colum is not empty, takes its length and begin a data frame with it
          if (dataFrame == FALSE & (length(slidedVideo[participant][!is.na(slidedVideo[participant])]) >
                dfSliding <- data.frame(
                  "video"=rep(indexList[videoIndex], length(slidedVideo[participant])),
                  frame_index = (1:dim(slidedVideo[1])[1]),
                  slidedVideo[participant])
                  dataFrame <- TRUE}
          else if (dataFrame == FALSE){}
          else{
            dfSliding <- cbind(dfSliding, slidedVideo[participant])}
      }
      write.csv(dfSliding, paste("/Users/Ofix/Documents/Fac/internat/Recherche/projets/synchro/synchroDa
      videoIndex <-(videoIndex+1)
}
```

```
## [1] "Computing slidedFather F1044C1"
## [1] "Computing slidedMother F1044C1"
## [1] "Computing slidedPatient F1044C1"
## [1] "Computing slidedTherapist F1044C1"
## [1] "Computing slidedFather F1044C2"
## [1] "Computing slidedMother F1044C2"
## [1] "Computing slidedPatient F1044C2"
## [1] "Computing slidedTherapist F1044C2"
## [1] "Computing slidedFather F1044D1"
## [1] "Computing slidedMother F1044D1"
## [1] "Computing slidedPatient F1044D1"
## [1] "Computing slidedTherapist F1044D1"
## [1] "Computing slidedFather F1044D2"
## [1] "Computing slidedMother F1044D2"
## [1] "Computing slidedPatient F1044D2"
## [1] "Computing slidedTherapist F1044D2"
## [1] "Computing slidedFather F1044E1"
## [1] "Computing slidedMother F1044E1"
## [1] "Computing slidedPatient F1044E1"
## [1] "Computing slidedTherapist F1044E1"
## [1] "Computing slidedFather F1044E2"
## [1] "Computing slidedMother F1044E2"
## [1] "Computing slidedPatient F1044E2"
## [1] "Computing slidedTherapist F1044E2"
## [1] "Computing slidedFather F1044F1"
```

```
## [1] "Computing slidedMother F1044F1"
## [1] "Computing slidedPatient F1044F1"
## [1] "Computing slidedTherapist F1044F1"
## [1] "Computing slidedFather F1044F2"
## [1] "Computing slidedMother F1044F2"
## [1] "Computing slidedPatient F1044F2"
## [1] "Computing slidedTherapist F1044F2"
## [1] "Computing slidedFather F1044G"
## [1] "Computing slidedMother F1044G"
## [1] "Computing slidedPatient F1044G"
## [1] "Computing slidedTherapist F1044G"
## [1] "Computing slidedFather F1044H1"
## [1] "Computing slidedMother F1044H1"
## [1] "Computing slidedPatient F1044H1"
## [1] "Computing slidedTherapist F1044H1"
## [1] "Computing slidedFather F1044H2"
## [1] "Computing slidedMother F1044H2"
## [1] "Computing slidedPatient F1044H2"
## [1] "Computing slidedTherapist F1044H2"
## [1] "Computing slidedFather F1044I1"
## [1] "Computing slidedMother F1044I1"
## [1] "Computing slidedPatient F1044I1"
## [1] "Computing slidedTherapist F1044I1"
## [1] "Computing slidedFather F1044I2"
## [1] "Computing slidedMother F1044I2"
## [1] "Computing slidedPatient F1044I2"
## [1] "Computing slidedTherapist F1044I2"
## [1] "Computing slidedFather F1044L1"
## [1] "Computing slidedMother F1044L1"
## [1] "Computing slidedPatient F1044L1"
## [1] "Computing slidedTherapist F1044L1"
## [1] "Computing slidedFather F1044L2"
## [1] "Computing slidedMother F1044L2"
## [1] "Computing slidedPatient F1044L2"
## [1] "Computing slidedTherapist F1044L2"
## [1] "Computing slidedFather F1044M1"
## [1] "Computing slidedMother F1044M1"
## [1] "Computing slidedPatient F1044M1"
## [1] "Computing slidedTherapist F1044M1"
## [1] "Computing slidedFather F1044M2"
## [1] "Computing slidedMother F1044M2"
## [1] "Computing slidedPatient F1044M2"
## [1] "Computing slidedTherapist F1044M2"
## [1] "Computing slidedFather F1044N"
## [1] "Computing slidedMother F1044N"
## [1] "Computing slidedPatient F1044N"
## [1] "Computing slidedTherapist F1044N"
## [1] "Computing slidedFather F1044O1"
## [1] "Computing slidedMother F1044O1"
## [1] "Computing slidedPatient F1044O1"
## [1] "Computing slidedTherapist F1044O1"
## [1] "Computing slidedFather F1044O2"
## [1] "Computing slidedMother F1044O2"
## [1] "Computing slidedPatient F1044O2"
```

```
## [1] "Computing slidedTherapist F1044O2"
## [1] "Computing slidedFather F1044P"
## [1] "Computing slidedMother F1044P"
## [1] "Computing slidedPatient F1044P"
## [1] "Computing slidedTherapist F1044P"
## [1] "Computing slidedFather F1044Q1"
## [1] "Computing slidedMother F1044Q1"
## [1] "Computing slidedPatient F1044Q1"
## [1] "Computing slidedTherapist F1044Q1"
## [1] "Computing slidedFather F1044Q2"
## [1] "Computing slidedMother F1044Q2"
## [1] "Computing slidedPatient F1044Q2"
## [1] "Computing slidedTherapist F1044Q2"
## [1] "Computing slidedFather F1044R1"
## [1] "Computing slidedMother F1044R1"
## [1] "Computing slidedPatient F1044R1"
## [1] "Computing slidedTherapist F1044R1"
## [1] "Computing slidedFather F1044R2"
## [1] "Computing slidedMother F1044R2"
## [1] "Computing slidedPatient F1044R2"
## [1] "Computing slidedTherapist F1044R2"
```

Export log filtere data in text files

```
videoIndex <- 1
# videoName est le nom de la video actuelle
for (videoName in indexList){
# Compute slinding interval for each participant
      print(paste("Computing slidedFather", videoName))
      slidedFather <- SlidingInterval("norm.logFather", videoIndex, 5, data)

      print(paste("Computing slidedMother", videoName))
      slidedMother <- SlidingInterval("norm.logMother", videoIndex, 5, data)

      print(paste("Computing slidedPatient", videoName))
      slidedPatient <- SlidingInterval("norm.logPatient", videoIndex, 5, data)

      print(paste("Computing slidedTherapist", videoName))
      slidedTherapist <- SlidingInterval("norm.logTherapist", videoIndex, 5, data)

# create a data frame to store temporarily this data with NA
      slidedVideo <- data.frame(
        slidedFather, slidedMother, slidedPatient, slidedTherapist)

      dataFrame <- FALSE
      dfSliding <- data.frame()
      for (participant in 1:4){
# If the colum is not empty, takes its length and begin a data frame with it
          if (dataFrame == FALSE & (length(slidedVideo[participant][!is.na(slidedVideo[participant])]) >
                dfSliding <- data.frame(
                  "video"=rep(indexList[videoIndex], length(slidedVideo[participant])),
```

```
                  frame_index = (1:dim(slidedVideo[1])[1]),
                  slidedVideo[participant])
                  dataFrame <- TRUE}
          else if (dataFrame == FALSE){}
          else{
            dfSliding <- cbind(dfSliding, slidedVideo[participant])}
      }

      write.csv(dfSliding, paste("/Users/Ofix/Documents/Fac/internat/Recherche/projets/synchro/synchroDa
      videoIndex <-(videoIndex+1)
}
```

```
## [1] "Computing slidedFather F1044C1"
## [1] "Computing slidedMother F1044C1"
## [1] "Computing slidedPatient F1044C1"
## [1] "Computing slidedTherapist F1044C1"
## [1] "Computing slidedFather F1044C2"
## [1] "Computing slidedMother F1044C2"
## [1] "Computing slidedPatient F1044C2"
## [1] "Computing slidedTherapist F1044C2"
## [1] "Computing slidedFather F1044D1"
## [1] "Computing slidedMother F1044D1"
## [1] "Computing slidedPatient F1044D1"
## [1] "Computing slidedTherapist F1044D1"
## [1] "Computing slidedFather F1044D2"
## [1] "Computing slidedMother F1044D2"
## [1] "Computing slidedPatient F1044D2"
## [1] "Computing slidedTherapist F1044D2"
## [1] "Computing slidedFather F1044E1"
## [1] "Computing slidedMother F1044E1"
## [1] "Computing slidedPatient F1044E1"
## [1] "Computing slidedTherapist F1044E1"
## [1] "Computing slidedFather F1044E2"
## [1] "Computing slidedMother F1044E2"
## [1] "Computing slidedPatient F1044E2"
## [1] "Computing slidedTherapist F1044E2"
## [1] "Computing slidedFather F1044F1"
## [1] "Computing slidedMother F1044F1"
## [1] "Computing slidedPatient F1044F1"
## [1] "Computing slidedTherapist F1044F1"
## [1] "Computing slidedFather F1044F2"
## [1] "Computing slidedMother F1044F2"
## [1] "Computing slidedPatient F1044F2"
## [1] "Computing slidedTherapist F1044F2"
## [1] "Computing slidedFather F1044G"
## [1] "Computing slidedMother F1044G"
## [1] "Computing slidedPatient F1044G"
## [1] "Computing slidedTherapist F1044G"
## [1] "Computing slidedFather F1044H1"
## [1] "Computing slidedMother F1044H1"
## [1] "Computing slidedPatient F1044H1"
## [1] "Computing slidedTherapist F1044H1"
## [1] "Computing slidedFather F1044H2"
```

```
## [1] "Computing slidedMother F1044H2"
## [1] "Computing slidedPatient F1044H2"
## [1] "Computing slidedTherapist F1044H2"
## [1] "Computing slidedFather F1044I1"
## [1] "Computing slidedMother F1044I1"
## [1] "Computing slidedPatient F1044I1"
## [1] "Computing slidedTherapist F1044I1"
## [1] "Computing slidedFather F1044I2"
## [1] "Computing slidedMother F1044I2"
## [1] "Computing slidedPatient F1044I2"
## [1] "Computing slidedTherapist F1044I2"
## [1] "Computing slidedFather F1044L1"
## [1] "Computing slidedMother F1044L1"
## [1] "Computing slidedPatient F1044L1"
## [1] "Computing slidedTherapist F1044L1"
## [1] "Computing slidedFather F1044L2"
## [1] "Computing slidedMother F1044L2"
## [1] "Computing slidedPatient F1044L2"
## [1] "Computing slidedTherapist F1044L2"
## [1] "Computing slidedFather F1044M1"
## [1] "Computing slidedMother F1044M1"
## [1] "Computing slidedPatient F1044M1"
## [1] "Computing slidedTherapist F1044M1"
## [1] "Computing slidedFather F1044M2"
## [1] "Computing slidedMother F1044M2"
## [1] "Computing slidedPatient F1044M2"
## [1] "Computing slidedTherapist F1044M2"
## [1] "Computing slidedFather F1044N"
## [1] "Computing slidedMother F1044N"
## [1] "Computing slidedPatient F1044N"
## [1] "Computing slidedTherapist F1044N"
## [1] "Computing slidedFather F1044O1"
## [1] "Computing slidedMother F1044O1"
## [1] "Computing slidedPatient F1044O1"
## [1] "Computing slidedTherapist F1044O1"
## [1] "Computing slidedFather F1044O2"
## [1] "Computing slidedMother F1044O2"
## [1] "Computing slidedPatient F1044O2"
## [1] "Computing slidedTherapist F1044O2"
## [1] "Computing slidedFather F1044P"
## [1] "Computing slidedMother F1044P"
## [1] "Computing slidedPatient F1044P"
## [1] "Computing slidedTherapist F1044P"
## [1] "Computing slidedFather F1044Q1"
## [1] "Computing slidedMother F1044Q1"
## [1] "Computing slidedPatient F1044Q1"
## [1] "Computing slidedTherapist F1044Q1"
## [1] "Computing slidedFather F1044Q2"
## [1] "Computing slidedMother F1044Q2"
## [1] "Computing slidedPatient F1044Q2"
## [1] "Computing slidedTherapist F1044Q2"
## [1] "Computing slidedFather F1044R1"
## [1] "Computing slidedMother F1044R1"
## [1] "Computing slidedPatient F1044R1"
```

```
## [1] "Computing slidedTherapist F1044R1"
## [1] "Computing slidedFather F1044R2"
## [1] "Computing slidedMother F1044R2"
## [1] "Computing slidedPatient F1044R2"
## [1] "Computing slidedTherapist F1044R2"
```

SyncPy utilisation for creating synchrony dataframe

After extracting filtered motion motion history with mean on sliding interval (overlapping interval) of 5 frames

And after puting this data on a CSV file slideddata.csv

We import this data on python Script with panda module Call_S_Estimator.py

This script will compute the synchrony between each dyad of the interaction and of the whole group

It will return a csv file for each video SSIXXXX.csv with XXXX the name of the video (F1044C, F1044D1, etc) that we can import with R with

this following function

getwd()

Description of SSI data frame

```
str(SSIdataFrame)
```

Synchrony scores for each dyad, triad and for the whole group

In legend, mean for all the video.

```
for (i in unique(SSIdataFrame$video))
      {par(mar=c(4,4,4,3), mfrow=c(1,1))
      plot(SSIdataFrame[which(SSIdataFrame$video==i),]$Time_min,
           SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_mo,
           type="l", ylim=c(0, 0.3), col=rainbow(4)[1],
           main=paste("Synchrony scores for each dyad and for \n the whole group in", i, "video"),
           xlab = "Time (minute)", ylab="Synchrony score", lwd=2,
xaxp=c(0,length(SSIdataFrame$Time_min), length(SSIdataFrame$Time_min)))
      abline(h=mean(SSIdataFrame$SSI_fa_mo, na.rm=TRUE), col=rainbow(11)[1], lwd=2, lty=2)

      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_mo_pa, col=rainbow(11)[2], lwd=2)
      abline(h= mean(SSIdataFrame$SSI_fa_mo_pa, na.rm=TRUE), col=rainbow(11)[2], lwd=2, lty=2)

#      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_mo_pa_th, col=rainbow(11)[3], lwd=2)
#      abline(h= mean(SSIdataFrame$SSI_fa_mo_pa_th, na.rm=TRUE), col=rainbow(11)[3], lwd=2, lty=2)
```

```
      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_mo_th, col=rainbow(11)[4], lwd=2)
      abline(h= mean(SSIdataFrame$SSI_fa_mo_th, na.rm=TRUE), col=rainbow(11)[4], lwd=2, lty=2)

      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_pa, col=rainbow(11)[5], lwd=2)
      abline(h= mean(SSIdataFrame$SSI_fa_pa, na.rm=TRUE), col=rainbow(11)[5], lwd=2, lty=2)

#      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_pa_th, col=rainbow(11)[6], lwd=2)
#      abline(h= mean(SSIdataFrame$SSI_fa_pa_th, na.rm=TRUE), col=rainbow(11)[6], lwd=2, lty=2)

lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_th, col=rainbow(11)[7], lwd=2)
abline(h= mean(SSIdataFrame$SSI_fa_th, na.rm=TRUE), col=rainbow(11)[7], lwd=2, lty=2)

lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_mo_pa, col=rainbow(11)[8], lwd=2)
abline(h= mean(SSIdataFrame$SSI_mo_pa, na.rm=TRUE), col=rainbow(11)[8], lwd=2, lty=2)

lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_mo_pa_th, col=rainbow(11)[9], lwd=2)
abline(h= mean(SSIdataFrame$SSI_mo_pa_th, na.rm=TRUE), col=rainbow(11)[9], lwd=2, lty=2)
lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_mo_th, col=rainbow(11)[10], lwd=2)
abline(h= mean(SSIdataFrame$SSI_mo_th, na.rm=TRUE), col=rainbow(11)[10], lwd=2, lty=2)

      lines(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_pa_th, col=rainbow(11)[11], lwd=2)
      abline(h= mean(SSIdataFrame$SSI_pa_th, na.rm=TRUE), col=rainbow(11)[11], lwd=2, lty=2)

legend("topleft", inset=.05, c("fa_mo", "fa_mo_pa", "fa_mo_pa_th",
"fa_mo_th", "fa_pa", "fa_pa_th", "fa_th",
"mo_pa", "mo_pa_th", "mo_th", "pa_th"),
col=rainbow(11), cex=0.6, lwd=2)

legend("topright", inset=.05, c(paste ("Mean fa_mo :",
                                       round(mean(SSIdataFrame$SSI_fa_mo, na.rm=TRUE),3)),
      paste ("Mean fa_mo_pa :", round(mean(SSIdataFrame$SSI_fa_mo_pa,na.rm=TRUE),3)),
#      paste ("Mean fa_mo_pa_th :", #round(mean(SSIdataFrame$SSI_fa_mo_pa_th),3)),
      paste ("Mean fa_mo_th :", round(mean(SSIdataFrame$SSI_fa_mo_th,na.rm=TRUE),3)),
      paste ("Mean fa_pa :", round(mean(SSIdataFrame$SSI_fa_pa, na.rm=TRUE),3)),
#      paste ("Mean fa_pa_th :", round(mean(SSIdataFrame$SSI_fa_pa_th,na.rm=TRUE),3)),
      paste ("Mean fa_th :", round(mean(SSIdataFrame$SSI_fa_th,na.rm=TRUE),3)),
      paste ("Mean mo_pa :", round(mean(SSIdataFrame$SSI_mo_pa,na.rm=TRUE),3)),
      paste ("Mean mo_pa_th :", round(mean(SSIdataFrame$SSI_mo_pa_th,na.rm=TRUE),3)),
      paste ("Mean mo_th :", round(mean(SSIdataFrame$SSI_mo_th,na.rm=TRUE),3)),
      paste ("Mean pa_th :", round(mean(SSIdataFrame$SSI_pa_th,na.rm=TRUE),3))),
col=rainbow(11), cex=0.5, lty=2, lwd=1)}
```

Evolution of synchrony through time, raw each second

```
par(mar=c(4,4,4,4))
    col <- 1
for (i in 6:length(SSIdataFrame)){
    plot(1:length(SSIdataFrame[,i]), SSIdataFrame[,i], type="l",
    col=rainbow(11)[col], main = names(SSIdataFrame)[i])
    col <- col+1}
```

Evolution of synchrony through time, mean by minute

```
par(mar=c(4,4,4,4))
    col = 1
for (indexSSI in 6:length(SSIdataFrame)){
    IntervalNumbersVideo <- ceiling(length(SSIdataFrame[,indexSSI])/6)
    SSIColumn <- SSIdataFrame[,indexSSI]
    SSIdataFrameMinute <- c()
    for (i in 1:IntervalNumbersVideo){
          borneInf <- 1+(i-1)*6
          borneSup <- i * 6
          SSIVectorInterval <- SSIColumn[borneInf:borneSup]
          mean <- mean(SSIVectorInterval, na.rm=TRUE)
          SSIdataFrameMinute <- c(SSIdataFrameMinute, mean)}
    plot(1:length(SSIdataFrameMinute), SSIdataFrameMinute, type="l", col=rainbow(11)[col], main = names
    col <- col+1}
```

Evolution of synchrony through time, mean by 10 minutes

```
par(mar=c(4,4,4,4))
    col = 1
for (indexSSI in 6:length(SSIdataFrame)){
    IntervalNumbersVideo <- ceiling(length(SSIdataFrame[,indexSSI])/60)
    SSIColumn <- SSIdataFrame[,indexSSI]
    SSIdataFrameTenMinute <- c()
    for (i in 1:IntervalNumbersVideo){
          borneInf <- 1+(i-1)*60
          borneSup <- i * 60
          SSIVectorInterval <- SSIColumn[borneInf:borneSup]
          mean <- mean(SSIVectorInterval, na.rm=TRUE)
          SSIdataFrameTenMinute <- c(SSIdataFrameTenMinute, mean)}
    plot(1:length(SSIdataFrameTenMinute), SSIdataFrameTenMinute, type="l", col=rainbow(11)[col], main =
    col <- col+1}
```

Models of synchrony

```
SSI_fa_th_lme <- lmer(SSI_fa_th ~ Time_min + (1|video), data=SSIdataFrame)
summary(SSI_fa_th_lme)
#plot(SSI_fa_th_lme)
res <- residuals(SSI_fa_th_lme)
hist(SSIdataFrame$SSI_fa_th)
qqnorm(res)
SSI_fa_th_List <- c()
for (i in indexList){
  SSI_fa_th_List <- c(SSI_fa_th_List, mean(SSIdataFrame[which(SSIdataFrame$video==i),]$SSI_fa_th, na.rm
}
print(SSI_fa_th_List)
#plot(SSI_fa_th_List, type="b")
```

```r
# log of the data
log_SSI_fa_th <- hist(log(SSIdataFrame$SSI_fa_th))
SSI_fa_th_log_lme <- lmer(log(SSI_fa_th) ~ Time_min + (1|video), data=SSIdataFrame)
res_log <- residuals(SSI_fa_th_log_lme)
qqnorm(res_log)
summary(SSI_fa_th_log_lme)
```

```r
# root square of the data
sq_SSI_fa_th <- hist(sqrt(SSIdataFrame$SSI_fa_th))
SSI_fa_th_sq_lme <- lmer(sqrt(SSI_fa_th) ~ Time_min + (1|video), data=SSIdataFrame)
res_sq <- residuals(SSI_fa_th_sq_lme)
qqnorm(res_sq)
summary(SSI_fa_th_sq_lme)
```