HbO: CI brain development

model codes and ouput

2023.07.09

Anterior Temporal Lobe (ATL)

```
# M1:Random-intercept-with-poly1
ModelT.condition.interp.Times1 <- lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Tchannel + (1|sub_ID),Rawdata_activity,REML = FALSE,control = ctrl,na.actio
n=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelT.condition.slopeinterp.Times1 <-lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Tchannel + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,control =
ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelT.condition.interp.Times2 <- lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Tchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1|sub_I
D),Rawdata_activity,REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelT.condition.slopeinterp.Times2 <- lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDu
r + Hemisphere*TimesDur + Tchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1+Ti
mesDur|sub_ID),Rawdata_activity,REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelT.condition.interp.Times3 <- lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Tchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions
*I(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID),Rawdata_activity,REML = FALSE,control = c
trl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelT.condition.slopeinterp.Times3 <- lmer(TValues ~ Conditions*Hemisphere + Conditions*TimesDu
r + Hemisphere*TimesDur + Tchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Condi
tions*I(TimesDur^3) + Hemisphere*I(TimesDur^3) +  (1+TimesDur|sub_ID),Rawdata_activity,REML = FA
LSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelT.condition.interp.Times1,ModelT.condition.interp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times1:     TimesDur + Tchannel + (1 | sub_ID)
## ModelT.condition.interp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                npar    AIC    BIC  logLik deviance  Chisq
## ModelT.condition.interp.Times1   11 2398.1 2461.5 -1188.0   2376.1
```

```
## ModelT.condition.interp.Times2   14 2398.9 2479.7 -1185.5   2370.9 5.1733
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.interp.Times2  3     0.1595
```

```
anova(ModelT.condition.interp.Times2,ModelT.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelT.condition.interp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelT.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelT.condition.interp.Times2   14 2398.9 2479.7 -1185.5   2370.9
## ModelT.condition.interp.Times3   17 2389.0 2487.1 -1177.5   2355.0 15.906
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times2
## ModelT.condition.interp.Times3  3   0.001186 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.interp.Times1,ModelT.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times1:     TimesDur + Tchannel + (1 | sub_ID)
## ModelT.condition.interp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelT.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelT.condition.interp.Times1   11 2398.1 2461.5 -1188.0   2376.1
## ModelT.condition.interp.Times3   17 2389.0 2487.1 -1177.5   2355.0 21.079
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.interp.Times3  6   0.001776 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.slopeinterp.Times1,ModelT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.slopeinterp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
```

```
r + Hemisphere *
## ModelT.condition.slopeinterp.Times1:     TimesDur + Tchannel + (1 + TimesDur | sub_ID)
## ModelT.condition.slopeinterp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelT.condition.slopeinterp.Times1   13 2395.4 2470.4 -1184.7   2369.4
## ModelT.condition.slopeinterp.Times2   16 2395.8 2488.2 -1181.9   2363.8
##                                      Chisq Df Pr(>Chisq)
## ModelT.condition.slopeinterp.Times1
## ModelT.condition.slopeinterp.Times2 5.5371  3     0.1364
```

```
anova(ModelT.condition.slopeinterp.Times2,ModelT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.slopeinterp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelT.condition.slopeinterp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
ere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelT.condition.slopeinterp.Times2   16 2395.8 2488.2 -1181.9   2363.8
## ModelT.condition.slopeinterp.Times3   19 2385.7 2495.3 -1173.8   2347.7
##                                      Chisq Df Pr(>Chisq)
## ModelT.condition.slopeinterp.Times2
## ModelT.condition.slopeinterp.Times3 16.139  3   0.001062 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.slopeinterp.Times1,ModelT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.slopeinterp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times1:     TimesDur + Tchannel + (1 + TimesDur | sub_ID)
## ModelT.condition.slopeinterp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
ere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelT.condition.slopeinterp.Times1   13 2395.4 2470.4 -1184.7   2369.4
## ModelT.condition.slopeinterp.Times3   19 2385.7 2495.3 -1173.8   2347.7
##                                      Chisq Df Pr(>Chisq)
```

```
## ModelT.condition.slopeinterp.Times1
## ModelT.condition.slopeinterp.Times3 21.676  6   0.001386 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.interp.Times1,ModelT.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times1:     TimesDur + Tchannel + (1 | sub_ID)
## ModelT.condition.slopeinterp.Times1: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times1:     TimesDur + Tchannel + (1 + TimesDur | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelT.condition.interp.Times1       11 2398.1 2461.5 -1188.0   2376.1
## ModelT.condition.slopeinterp.Times1   13 2395.4 2470.4 -1184.7   2369.4
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.slopeinterp.Times1 6.6845  2    0.03536 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.interp.Times2,ModelT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelT.condition.slopeinterp.Times2: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times2:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelT.condition.interp.Times2       14 2398.9 2479.7 -1185.5   2370.9
## ModelT.condition.slopeinterp.Times2   16 2395.8 2488.2 -1181.9   2363.8
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times2
## ModelT.condition.slopeinterp.Times2 7.0483  2    0.02948 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelT.condition.interp.Times3,ModelT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelT.condition.interp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelT.condition.interp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelT.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelT.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
```

```
## ModelT.condition.slopeinterp.Times3: TValues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelT.condition.slopeinterp.Times3:     TimesDur + Tchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
ere *
## ModelT.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelT.condition.interp.Times3        17 2389.0 2487.1 -1177.5   2355.0
## ModelT.condition.slopeinterp.Times3   19 2385.7 2495.3 -1173.8   2347.7
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times3
## ModelT.condition.slopeinterp.Times3 7.281  2    0.02624 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# best fit
ModelT.condition.slopeinterp.Times3.N <- lmer(TValues ~ Tchannel + TimesDur + I(TimesDur^2) + I
(TimesDur^3) + Hemisphere*TimesDur +  Conditions*TimesDur + Conditions*I(TimesDur^2) + Condition
s*I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,control=ctrl,na.action=na.om
it)

summary(ModelT.condition.slopeinterp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: TValues ~ Tchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +
##     Hemisphere * TimesDur + Conditions * TimesDur + Conditions *
##     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 + TimesDur |
##     sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   2380.2   2472.5  -1174.1   2348.2     2351
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.0480 -0.5515 -0.0043  0.5561  3.9121
##
## Random effects:
##  Groups   Name        Variance  Std.Dev. Corr
##  sub_ID   (Intercept) 1.654e-02 0.128608
##           TimesDur    7.254e-05 0.008517 -0.19
##  Residual             1.500e-01 0.387256
## Number of obs: 2367, groups:  sub_ID, 57
##
## Fixed effects:
##                                Estimate Std. Error         df t value
## (Intercept)                  -6.321e-03  2.963e-02  2.210e+02  -0.213
## TchannelCH5                  -1.208e-02  1.920e-02  2.255e+03  -0.629
## TchannelCH8                   3.901e-02  1.971e-02  2.263e+03   1.979
## TimesDur                      2.917e-02  1.049e-02  1.678e+03   2.781
## I(TimesDur^2)                -2.411e-03  9.646e-04  1.585e+03  -2.499
## I(TimesDur^3)                 5.302e-05  2.246e-05  1.410e+03   2.361
## HemisphereR                   9.605e-02  1.979e-02  2.262e+03   4.852
## Conditionsbabble              2.999e-02  2.595e-02  2.251e+03   1.156
```

```
## TimesDur:HemisphereR           -4.020e-03  2.120e-03  2.260e+03  -1.896
## TimesDur:Conditionsbabble      -6.266e-02  1.356e-02  2.251e+03  -4.622
## I(TimesDur^2):Conditionsbabble  5.450e-03  1.250e-03  2.251e+03   4.359
## I(TimesDur^3):Conditionsbabble -1.155e-04  2.877e-05  2.251e+03  -4.015
##                                Pr(>|t|)
## (Intercept)                     0.83124
## TchannelCH5                     0.52935
## TchannelCH8                     0.04798 *
## TimesDur                        0.00548 **
## I(TimesDur^2)                   0.01255 *
## I(TimesDur^3)                   0.01836 *
## HemisphereR                    1.30e-06 ***
## Conditionsbabble                0.24799
## TimesDur:HemisphereR            0.05811 .
## TimesDur:Conditionsbabble      4.02e-06 ***
## I(TimesDur^2):Conditionsbabble 1.36e-05 ***
## I(TimesDur^3):Conditionsbabble 6.15e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8 TimsDr I(TmD^2) I(TmD^3) HmsphR Cndtns
## TchannelCH5 -0.323
## TchannelCH8 -0.288  0.484
## TimesDur    -0.483  0.002 -0.025
## I(TimsDr^2)  0.372 -0.002  0.019 -0.942
## I(TimsDr^3) -0.320  0.002 -0.018  0.869 -0.977
## HemisphereR -0.342  0.003 -0.035  0.076 -0.013    0.012
## Condtnsbbbl -0.436 -0.001 -0.001  0.443 -0.362    0.309    0.001
## TmsDr:HmspR  0.202 -0.004  0.020 -0.108  0.007   -0.008   -0.591 -0.001
## TmsDr:Cndtn  0.301  0.000  0.002 -0.647  0.619   -0.569   -0.002 -0.689
## I(TmsD^2):C -0.245  0.000 -0.002  0.618 -0.649    0.629    0.002  0.561
## I(TmsD^3):C  0.212  0.000  0.002 -0.573  0.636   -0.642   -0.002 -0.485
##             TmD:HR TmsD:C I(TD^2):
## TchannelCH5
## TchannelCH8
## TimesDur
## I(TimsDr^2)
## I(TimsDr^3)
## HemisphereR
## Condtnsbbbl
## TmsDr:HmspR
## TmsDr:Cndtn  0.001
## I(TmsD^2):C -0.001 -0.955
## I(TmsD^3):C  0.001  0.886 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling

anova(ModelT.condition.slopeinterp.Times3.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##                          Sum Sq Mean Sq NumDF   DenDF F value    Pr(>F)
## Tchannel                 1.0799  0.5400     2 2260.19  3.6006   0.02746
## TimesDur                 0.0414  0.0414     1  912.91  0.2764   0.59922
## I(TimesDur^2)            0.0275  0.0275     1  854.22  0.1833   0.66866
## I(TimesDur^3)            0.0113  0.0113     1  724.87  0.0755   0.78358
## Hemisphere               3.5312  3.5312     1 2261.61 23.5467 1.302e-06
```

```
## Conditions                0.2002  0.2002     1 2251.39  1.3353   0.24799
## TimesDur:Hemisphere       0.5390  0.5390     1 2260.43  3.5942   0.05811
## TimesDur:Conditions       3.2035  3.2035     1 2251.41 21.3612 4.019e-06
## I(TimesDur^2):Conditions 2.8496  2.8496     1 2251.30 19.0016 1.365e-05
## I(TimesDur^3):Conditions 2.4170  2.4170     1 2251.25 16.1165 6.151e-05
##
## Tchannel                 *
## TimesDur
## I(TimesDur^2)
## I(TimesDur^3)
## Hemisphere               ***
## Conditions
## TimesDur:Hemisphere      .
## TimesDur:Conditions      ***
## I(TimesDur^2):Conditions ***
## I(TimesDur^3):Conditions ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelT.condition.slopeinterp.Times3.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                           SumSq MeanSq NumDF   DenDF       F      Pr
## Tchannel                 1.0799 0.5400     2 2260.19  3.6006 0.02746
## TimesDur                 0.0414 0.0414     1  912.91  0.2764 0.59922
## I(TimesDur^2)            0.0275 0.0275     1  854.22  0.1833 0.66866
## I(TimesDur^3)            0.0113 0.0113     1  724.87  0.0755 0.78358
## Hemisphere               3.5312 3.5312     1 2261.61 23.5467 0.00000
## Conditions               0.2002 0.2002     1 2251.39  1.3353 0.24799
## TimesDur:Hemisphere      0.5390 0.5390     1 2260.43  3.5942 0.05811
## TimesDur:Conditions      3.2035 3.2035     1 2251.41 21.3612 0.00000
## I(TimesDur^2):Conditions 2.8496 2.8496     1 2251.30 19.0016 0.00001
## I(TimesDur^3):Conditions 2.4170 2.4170     1 2251.25 16.1165 0.00006
##                           eta_partial
## Tchannel                    0.0031760
## TimesDur                    0.0003026
## I(TimesDur^2)               0.0002145
## I(TimesDur^3)               0.0001041
## Hemisphere                  0.0103042
## Conditions                  0.0005927
## TimesDur:Hemisphere         0.0015875
## TimesDur:Conditions         0.0093988
## I(TimesDur^2):Conditions    0.0083696
## I(TimesDur^3):Conditions    0.0071080
```

left-Anterior Temporal Lobe (LH-ATL)

```
# M1:Random-intercept-with-poly1
ModelLT.condition.interp.Times1 <- lmer(LTValues ~ Conditions*TimesDur + LTchannel + (1|sub_ID),
Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelLT.condition.slopeinterp.Times1 <-lmer(LTValues ~ Conditions*TimesDur + LTchannel + (1+Time
```

```
sDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelLT.condition.interp.Times2 <- lmer(LTValues ~ Conditions*TimesDur + LTchannel + Conditions*
I(TimesDur^2) + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelLT.condition.slopeinterp.Times2 <- lmer(LTValues ~ Conditions*TimesDur + LTchannel + Condit
ions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.actio
n=na.omit)

# M5:Random-intercept-with-poly3
ModelLT.condition.interp.Times3 <- lmer(LTValues ~ Conditions*TimesDur + LTchannel + Conditions*
I(TimesDur^2) + Conditions*I(TimesDur^3) +  (1|sub_ID),Rawdata_activity, REML = FALSE,control =
ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelLT.condition.slopeinterp.Times3 <- lmer(LTValues ~ Conditions*TimesDur + LTchannel + Condit
ions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activity, REML = FA
LSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelLT.condition.interp.Times1,ModelLT.condition.interp.Times2)

## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 | sub_ID)
## ModelLT.condition.interp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times2:     (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelLT.condition.interp.Times1    8 1077.2 1117.7 -530.61   1061.2
## ModelLT.condition.interp.Times2   10 1076.3 1127.0 -528.15   1056.3 4.9171
##                                 Df Pr(>Chisq)
## ModelLT.condition.interp.Times1
## ModelLT.condition.interp.Times2  2    0.08556 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(ModelLT.condition.interp.Times2,ModelLT.condition.interp.Times3)

## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times2:     (1 | sub_ID)
## ModelLT.condition.interp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelLT.condition.interp.Times2   10 1076.3 1127.0 -528.15   1056.3
## ModelLT.condition.interp.Times3   12 1066.5 1127.2 -521.23   1042.5 13.857
##                                 Df Pr(>Chisq)
## ModelLT.condition.interp.Times2
## ModelLT.condition.interp.Times3  2  0.0009792 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelLT.condition.interp.Times1,ModelLT.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 | sub_ID)
## ModelLT.condition.interp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelLT.condition.interp.Times1    8 1077.2 1117.7 -530.61   1061.2
## ModelLT.condition.interp.Times3   12 1066.5 1127.2 -521.23   1042.5 18.774
##                                 Df Pr(>Chisq)
## ModelLT.condition.interp.Times1
## ModelLT.condition.interp.Times3  4  0.0008703 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelLT.condition.slopeinterp.Times1,ModelLT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.slopeinterp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 + Tim
esDur |
## ModelLT.condition.slopeinterp.Times1:     sub_ID)
## ModelLT.condition.slopeinterp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelLT.condition.slopeinterp.Times1   10 1106.4 1157.0 -543.20   1086.4
## ModelLT.condition.slopeinterp.Times2   12 1079.8 1140.5 -527.89   1055.8
##                                       Chisq Df Pr(>Chisq)
## ModelLT.condition.slopeinterp.Times1
## ModelLT.condition.slopeinterp.Times2 30.632  2   2.23e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelLT.condition.slopeinterp.Times2,ModelLT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.slopeinterp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
## ModelLT.condition.slopeinterp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                      npar    AIC    BIC  logLik deviance
## ModelLT.condition.slopeinterp.Times2   12 1079.8 1140.5 -527.89   1055.8
## ModelLT.condition.slopeinterp.Times3   14 1069.8 1140.7 -520.90   1041.8
##                                       Chisq Df Pr(>Chisq)
## ModelLT.condition.slopeinterp.Times2
## ModelLT.condition.slopeinterp.Times3 13.978  2   0.000922 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelLT.condition.slopeinterp.Times1,ModelLT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.slopeinterp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 + Tim
esDur |
## ModelLT.condition.slopeinterp.Times1:     sub_ID)
## ModelLT.condition.slopeinterp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                      npar    AIC    BIC logLik deviance
## ModelLT.condition.slopeinterp.Times1   10 1106.4 1157.0 -543.2   1086.4
## ModelLT.condition.slopeinterp.Times3   14 1069.8 1140.7 -520.9   1041.8
##                                     Chisq Df Pr(>Chisq)
## ModelLT.condition.slopeinterp.Times1
## ModelLT.condition.slopeinterp.Times3 44.61  4  4.793e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelLT.condition.interp.Times1,ModelLT.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 | sub_ID)
## ModelLT.condition.slopeinterp.Times1: LTValues ~ Conditions * TimesDur + LTchannel + (1 + Tim
esDur |
## ModelLT.condition.slopeinterp.Times1:     sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelLT.condition.interp.Times1         8 1077.2 1117.7 -530.61   1061.2
## ModelLT.condition.slopeinterp.Times1   10 1106.4 1157.0 -543.20   1086.4
##                                     Chisq Df Pr(>Chisq)
## ModelLT.condition.interp.Times1
## ModelLT.condition.slopeinterp.Times1     0  2          1
```

```
anova(ModelLT.condition.interp.Times2,ModelLT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times2:     (1 | sub_ID)
## ModelLT.condition.slopeinterp.Times2: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelLT.condition.interp.Times2        10 1076.3 1127.0 -528.15   1056.3
## ModelLT.condition.slopeinterp.Times2   12 1079.8 1140.5 -527.89   1055.8
##                                      Chisq Df Pr(>Chisq)
## ModelLT.condition.interp.Times2
## ModelLT.condition.slopeinterp.Times2 0.5397  2     0.7635
```

```
anova(ModelLT.condition.interp.Times3,ModelLT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelLT.condition.interp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditions *
I(TimesDur^2) +
## ModelLT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelLT.condition.slopeinterp.Times3: LTValues ~ Conditions * TimesDur + LTchannel + Conditio
```

```
ns * I(TimesDur^2) +
## ModelLT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelLT.condition.interp.Times3         12 1066.5 1127.2 -521.23   1042.5
## ModelLT.condition.slopeinterp.Times3    14 1069.8 1140.7 -520.90   1041.8
##                                        Chisq Df Pr(>Chisq)
## ModelLT.condition.interp.Times3
## ModelLT.condition.slopeinterp.Times3 0.6602  2     0.7189

# best fit
ModelLT.condition.interp.Times3.N <- lmer(LTValues ~ LTchannel + Conditions*TimesDur + Condition
s*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,control
= ctrl,na.action=na.omit)

summary(ModelLT.condition.interp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula:
## LTValues ~ LTchannel + Conditions * TimesDur + Conditions * I(TimesDur^2) +
##     Conditions * I(TimesDur^3) + (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   1066.5   1127.2   -521.2   1042.5     1157
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.9334 -0.5439  0.0284  0.5781  3.6470
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01051  0.1025
##  Residual             0.13654  0.3695
## Number of obs: 1169, groups:  sub_ID, 57
##
## Fixed effects:
##                                  Estimate Std. Error         df t value
## (Intercept)                    -1.030e-02  3.243e-02  4.418e+02  -0.318
## LTchannelCH5                   -3.354e-02  2.582e-02  1.112e+03  -1.299
## LTchannelCH8                    3.640e-02  2.706e-02  1.124e+03   1.345
## Conditionsbabble                7.627e-02  3.559e-02  1.109e+03   2.143
## TimesDur                        3.630e-02  1.342e-02  1.168e+03   2.705
## I(TimesDur^2)                  -2.771e-03  1.229e-03  1.169e+03  -2.255
## I(TimesDur^3)                   5.736e-05  2.822e-05  1.168e+03   2.033
## Conditionsbabble:TimesDur      -8.341e-02  1.830e-02  1.109e+03  -4.557
## Conditionsbabble:I(TimesDur^2)  6.803e-03  1.685e-03  1.109e+03   4.038
## Conditionsbabble:I(TimesDur^3) -1.423e-04  3.876e-05  1.109e+03  -3.673
##                                Pr(>|t|)
## (Intercept)                    0.750876
## LTchannelCH5                   0.194258
## LTchannelCH8                   0.178815
## Conditionsbabble               0.032307 *
## TimesDur                       0.006922 **
## I(TimesDur^2)                  0.024318 *
```

```
## I(TimesDur^3)                 0.042310 *
## Conditionsbabble:TimesDur     5.75e-06 ***
## Conditionsbabble:I(TimesDur^2) 5.76e-05 ***
## Conditionsbabble:I(TimesDur^3) 0.000251 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) LTcCH5 LTcCH8 Cndtns TimsDr I(TD^2 I(TD^3 Cnd:TD
## LTchannlCH5 -0.400
## LTchannlCH8 -0.353  0.474
## Condtnsbbbl -0.547 -0.002 -0.002
## TimesDur    -0.550  0.009 -0.026  0.472
## I(TimsDr^2)  0.451 -0.008  0.017 -0.386 -0.955
## I(TimsDr^3) -0.392  0.006 -0.012  0.334  0.888 -0.981
## Cndtnsbb:TD  0.380  0.000  0.001 -0.693 -0.682  0.654 -0.608
## Cnd:I(TD^2) -0.309  0.000 -0.001  0.564  0.651 -0.686  0.673 -0.954
## Cnd:I(TD^3)  0.267  0.000  0.001 -0.487 -0.604  0.672 -0.687  0.886
##             C:I(TD^2
## LTchannlCH5
## LTchannlCH8
## Condtnsbbbl
## TimesDur
## I(TimsDr^2)
## I(TimsDr^3)
## Cndtnsbb:TD
## Cnd:I(TD^2)
## Cnd:I(TD^3) -0.980
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
anova(ModelLT.condition.interp.Times3.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                            Sum Sq Mean Sq NumDF  DenDF F value    Pr(>F)
## LTchannel                 0.90727 0.45363     2 1119.7  3.3223 0.0364239
## Conditions                0.62723 0.62723     1 1109.1  4.5937 0.0323067
## TimesDur                  0.04154 0.04154     1 1099.1  0.3042 0.5813431
## I(TimesDur^2)             0.06784 0.06784     1 1132.8  0.4969 0.4810177
## I(TimesDur^3)             0.06185 0.06185     1 1144.3  0.4530 0.5010429
## Conditions:TimesDur       2.83586 2.83586     1 1109.0 20.7694 5.755e-06
## Conditions:I(TimesDur^2) 2.22661 2.22661     1 1109.0 16.3073 5.756e-05
## Conditions:I(TimesDur^3) 1.84191 1.84191     1 1109.0 13.4899 0.0002513
##
## LTchannel                 *
## Conditions                *
## TimesDur
## I(TimesDur^2)
## I(TimesDur^3)
## Conditions:TimesDur       ***
## Conditions:I(TimesDur^2) ***
## Conditions:I(TimesDur^3) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
```

```
ResultsANOV <- anova(ModelLT.condition.interp.Times3.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                            SumSq  MeanSq NumDF  DenDF       F      Pr
## LTchannel                0.90727 0.45363     2 1119.7  3.3223 0.03642
## Conditions               0.62723 0.62723     1 1109.1  4.5937 0.03231
## TimesDur                 0.04154 0.04154     1 1099.1  0.3042 0.58134
## I(TimesDur^2)            0.06784 0.06784     1 1132.8  0.4969 0.48102
## I(TimesDur^3)            0.06185 0.06185     1 1144.3  0.4530 0.50104
## Conditions:TimesDur      2.83586 2.83586     1 1109.0 20.7694 0.00001
## Conditions:I(TimesDur^2) 2.22661 2.22661     1 1109.0 16.3073 0.00006
## Conditions:I(TimesDur^3) 1.84191 1.84191     1 1109.0 13.4899 0.00025
##                          eta_partial
## LTchannel                  0.0058993
## Conditions                 0.0041248
## TimesDur                   0.0002767
## I(TimesDur^2)              0.0004385
## I(TimesDur^3)              0.0003957
## Conditions:TimesDur        0.0183831
## Conditions:I(TimesDur^2)   0.0144914
## Conditions:I(TimesDur^3)   0.0120179
```

right-Anterior Temporal Lobe (RH-ATL)

```
# M1:Random-intercept-with-poly1
ModelRT.condition.interp.Times1 <- lmer(RTValues ~ Conditions*TimesDur + RTchannel + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelRT.condition.slopeinterp.Times1 <-lmer(RTValues ~ Conditions*TimesDur + RTchannel + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelRT.condition.interp.Times2 <- lmer(RTValues ~ Conditions*TimesDur + RTchannel + Conditions*I(TimesDur^2) +  (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelRT.condition.slopeinterp.Times2 <- lmer(RTValues ~ Conditions*TimesDur + RTchannel + Conditions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelRT.condition.interp.Times3 <- lmer(RTValues ~ Conditions*TimesDur + RTchannel + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) +  (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelRT.condition.slopeinterp.Times3 <- lmer(RTValues ~ Conditions*TimesDur + RTchannel + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) +  (1+TimesDur|sub_ID), Rawdata_activity,REML = FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelRT.condition.interp.Times1,ModelRT.condition.interp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 | sub_ID)
## ModelRT.condition.interp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times2:     (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance  Chisq
## ModelRT.condition.interp.Times1    8 1327.0 1367.7 -655.51   1311.0
## ModelRT.condition.interp.Times2   10 1330.1 1381.0 -655.05   1310.1 0.9134
##                                  Df Pr(>Chisq)
## ModelRT.condition.interp.Times1
## ModelRT.condition.interp.Times2  2     0.6334
```

```
anova(ModelRT.condition.interp.Times2,ModelRT.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times2:     (1 | sub_ID)
## ModelRT.condition.interp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance  Chisq
## ModelRT.condition.interp.Times2   10 1330.1 1381.0 -655.05   1310.1
## ModelRT.condition.interp.Times3   12 1329.6 1390.7 -652.80   1305.6 4.4934
##                                  Df Pr(>Chisq)
## ModelRT.condition.interp.Times2
## ModelRT.condition.interp.Times3  2     0.1057
```

```
anova(ModelRT.condition.interp.Times1,ModelRT.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 | sub_ID)
## ModelRT.condition.interp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance  Chisq
## ModelRT.condition.interp.Times1    8 1327.0 1367.7 -655.51   1311.0
## ModelRT.condition.interp.Times3   12 1329.6 1390.7 -652.80   1305.6 5.4068
##                                  Df Pr(>Chisq)
## ModelRT.condition.interp.Times1
## ModelRT.condition.interp.Times3  4      0.248
```

```
anova(ModelRT.condition.slopeinterp.Times1,ModelRT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.slopeinterp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 + Tim
esDur |
## ModelRT.condition.slopeinterp.Times1:     sub_ID)
## ModelRT.condition.slopeinterp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelRT.condition.slopeinterp.Times1   10 1328.9 1379.8 -654.46   1308.9
## ModelRT.condition.slopeinterp.Times2   12 1332.0 1393.1 -654.01   1308.0
```

```
##                                         Chisq Df Pr(>Chisq)
## ModelRT.condition.slopeinterp.Times1
## ModelRT.condition.slopeinterp.Times2 0.9038  2     0.6364
```

```
anova(ModelRT.condition.slopeinterp.Times2,ModelRT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.slopeinterp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
## ModelRT.condition.slopeinterp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                        npar    AIC    BIC  logLik deviance
## ModelRT.condition.slopeinterp.Times2   12 1332.0 1393.1 -654.01   1308.0
## ModelRT.condition.slopeinterp.Times3   14 1331.3 1402.6 -651.67   1303.3
##                                         Chisq Df Pr(>Chisq)
## ModelRT.condition.slopeinterp.Times2
## ModelRT.condition.slopeinterp.Times3 4.6791  2    0.09637 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelRT.condition.slopeinterp.Times1,ModelRT.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.slopeinterp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 + Tim
esDur |
## ModelRT.condition.slopeinterp.Times1:     sub_ID)
## ModelRT.condition.slopeinterp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                        npar    AIC    BIC  logLik deviance
## ModelRT.condition.slopeinterp.Times1   10 1328.9 1379.8 -654.46   1308.9
## ModelRT.condition.slopeinterp.Times3   14 1331.3 1402.6 -651.67   1303.3
##                                         Chisq Df Pr(>Chisq)
## ModelRT.condition.slopeinterp.Times1
## ModelRT.condition.slopeinterp.Times3 5.5829  4     0.2325
```

```
anova(ModelRT.condition.interp.Times1,ModelRT.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 | sub_ID)
## ModelRT.condition.slopeinterp.Times1: RTValues ~ Conditions * TimesDur + RTchannel + (1 + Tim
esDur |
## ModelRT.condition.slopeinterp.Times1:     sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelRT.condition.interp.Times1           8 1327.0 1367.7 -655.51   1311.0
## ModelRT.condition.slopeinterp.Times1   10 1328.9 1379.8 -654.46   1308.9
##                                         Chisq Df Pr(>Chisq)
## ModelRT.condition.interp.Times1
## ModelRT.condition.slopeinterp.Times1 2.0962  2     0.3506
```

```
anova(ModelRT.condition.interp.Times2,ModelRT.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times2:     (1 | sub_ID)
## ModelRT.condition.slopeinterp.Times2: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelRT.condition.interp.Times2        10 1330.1 1381.0 -655.05   1310.1
## ModelRT.condition.slopeinterp.Times2   12 1332.0 1393.1 -654.01   1308.0
##                                       Chisq Df Pr(>Chisq)
## ModelRT.condition.interp.Times2
## ModelRT.condition.slopeinterp.Times2 2.0865  2     0.3523

anova(ModelRT.condition.interp.Times3,ModelRT.condition.slopeinterp.Times3)

## Data: Rawdata_activity
## Models:
## ModelRT.condition.interp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditions *
I(TimesDur^2) +
## ModelRT.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelRT.condition.slopeinterp.Times3: RTValues ~ Conditions * TimesDur + RTchannel + Conditio
ns * I(TimesDur^2) +
## ModelRT.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                      npar    AIC    BIC  logLik deviance
## ModelRT.condition.interp.Times3        12 1329.6 1390.7 -652.80   1305.6
## ModelRT.condition.slopeinterp.Times3   14 1331.3 1402.6 -651.67   1303.3
##                                       Chisq Df Pr(>Chisq)
## ModelRT.condition.interp.Times3
## ModelRT.condition.slopeinterp.Times3 2.2723  2     0.3211

# best fit
ModelRT.condition.interp.Times1.N <- lmer(RTValues ~ Conditions + RTchannel + TimesDur + (1|sub_
ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelRT.condition.interp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: RTValues ~ Conditions + RTchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   1325.7   1361.4   -655.9   1311.7     1191
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.3736 -0.5795 -0.0514  0.5415  3.5599
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02492  0.1579
##  Residual             0.16375  0.4047
## Number of obs: 1198, groups:  sub_ID, 57
```

```
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       1.166e-01  3.266e-02  1.717e+02   3.571 0.000461 ***
## Conditionsbabble -5.263e-02  2.338e-02  1.139e+03  -2.251 0.024593 *
## RTchannelCH5      9.708e-03  2.850e-02  1.140e+03   0.341 0.733455
## RTchannelCH8      4.122e-02  2.875e-02  1.144e+03   1.434 0.151905
## TimesDur         -2.513e-03  1.774e-03  1.153e+03  -1.417 0.156778
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns RTcCH5 RTcCH8
## Condtnsbbbl -0.359
## RTchannlCH5 -0.431  0.000
## RTchannlCH8 -0.427  0.001  0.493
## TimesDur    -0.267 -0.001 -0.008 -0.005
```

```
anova(ModelRT.condition.interp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## Conditions 0.82949 0.82949     1 1139.1  5.0657 0.02459 *
## RTchannel  0.36553 0.18276     2 1142.2  1.1161 0.32790
## TimesDur   0.32874 0.32874     1 1152.7  2.0076 0.15678
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRT.condition.interp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## Conditions 0.82949 0.82949     1 1139.1 5.0657 0.02459   0.0044275
## RTchannel  0.36553 0.18276     2 1142.2 1.1161 0.32790   0.0019506
## TimesDur   0.32874 0.32874     1 1152.7 2.0076 0.15678   0.0017387
```

speech

speech-left-Anterior Temporal Lobe (speech-LH-ATL)

```
# best fit
ModelLT.speech.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(Times
Dur^3) + (1|sub_ID), Rawdata_activity_speech, REML = FALSE,control = ctrl,na.action=na.omit)
summary(ModelLT.speech.interp.Times3.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula:
## LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +
##     (1 | sub_ID)
##    Data: Rawdata_activity_speech
## Control: ctrl
```

```
##
##      AIC      BIC   logLik deviance df.resid
##    481.4    516.4   -232.7    465.4      576
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6469 -0.5371 -0.0148  0.5822  3.8360
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01667  0.1291
##  Residual             0.11939  0.3455
## Number of obs: 584, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -1.264e-02  3.542e-02  2.562e+02  -0.357 0.721499
## LTchannelCH5  -2.357e-02  3.417e-02  5.314e+02  -0.690 0.490681
## LTchannelCH8  -8.292e-03  3.576e-02  5.371e+02  -0.232 0.816722
## TimesDur       4.484e-02  1.294e-02  5.834e+02   3.466 0.000568 ***
## I(TimesDur^2) -3.475e-03  1.180e-03  5.837e+02  -2.944 0.003373 **
## I(TimesDur^3)  7.351e-05  2.707e-05  5.829e+02   2.715 0.006822 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) LTcCH5 LTcCH8 TimsDr I(TD^2
## LTchannlCH5 -0.485
## LTchannlCH8 -0.427  0.472
## TimesDur    -0.482  0.013 -0.036
## I(TimsDr^2)  0.398 -0.011  0.023 -0.955
## I(TimsDr^3) -0.348  0.010 -0.017  0.889 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

speech-left-Anterior Temporal Lobe (speech-RH-ATL)

```
# best fit
ModelRT.speech.interp.Times1.N <- lmer(RTValues ~ RTchannel + TimesDur + (1|sub_ID), Rawdata_act
ivity_speech, REML = FALSE,control = ctrl,na.action=na.omit)
summary(ModelRT.speech.interp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: RTValues ~ RTchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activity_speech
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    658.5    684.8   -323.2    646.5      592
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.3773 -0.5794 -0.0572  0.5096  3.4754
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02987  0.1728
```

```
##  Residual             0.15579  0.3947
## Number of obs: 598, groups:  sub_ID, 57
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    0.115528   0.038169 165.129917   3.027  0.00287 **
## RTchannelCH5   0.006374   0.039368 541.403935   0.162  0.87143
## RTchannelCH8   0.046176   0.039667 543.020433   1.164  0.24489
## TimesDur      -0.003690   0.002405 593.563514  -1.534  0.12550
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) RTcCH5 RTcCH8
## RTchannlCH5 -0.510
## RTchannlCH8 -0.505  0.493
## TimesDur    -0.313 -0.008 -0.005
```

noise:

noise-left-Anterior Temporal Lobe (noise-LH-ATL)

```
#best fit
ModelLT.noise.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2)+ I(TimesDu
r^3) + (1|sub_ID), Rawdata_activity_noise, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelLT.noise.interp.Times3.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula:
## LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +
##     (1 | sub_ID)
##    Data: Rawdata_activity_noise
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##      568      603     -276      552      577
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5225 -0.5427  0.0488  0.5429  3.2352
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01772  0.1331
##  Residual             0.13892  0.3727
## Number of obs: 585, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    6.804e-02  3.785e-02  2.447e+02   1.797 0.073522 .
## LTchannelCH5  -4.380e-02  3.681e-02  5.243e+02  -1.190 0.234540
## LTchannelCH8   8.146e-02  3.861e-02  5.314e+02   2.110 0.035345 *
## TimesDur      -5.549e-02  1.390e-02  5.839e+02  -3.992 7.38e-05 ***
## I(TimesDur^2)  4.716e-03  1.270e-03  5.849e+02   3.715 0.000223 ***
```

```
## I(TimesDur^3) -1.009e-04  2.913e-05  5.842e+02  -3.463 0.000573 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) LTcCH5 LTcCH8 TimsDr I(TD^2
## LTchannlCH5 -0.491
## LTchannlCH8 -0.435  0.475
## TimesDur    -0.486  0.011 -0.034
## I(TimsDr^2)  0.401 -0.010  0.021 -0.955
## I(TimsDr^3) -0.351  0.008 -0.016  0.890 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

noise-left-Anterior Temporal Lobe (noise-RH-ATL)

```
#best fit
ModelRT.noise.interp.Times1.N <- lmer(RTValues ~ RTchannel + TimesDur + (1|sub_ID), Rawdata_acti
vity_noise, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelRT.noise.interp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: RTValues ~ RTchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activity_noise
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    665.3    691.7   -326.6    653.3      594
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.2180 -0.5780 -0.0207  0.5351  3.3901
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.03487  0.1867
##  Residual             0.15548  0.3943
## Number of obs: 600, groups:  sub_ID, 57
##
## Fixed effects:
##                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    0.066482   0.039271 151.825674   1.693   0.0925 .
## RTchannelCH5   0.014630   0.039226 542.455643   0.373   0.7093
## RTchannelCH8   0.036235   0.039594 544.642940   0.915   0.3605
## TimesDur      -0.001581   0.002420 598.482674  -0.653   0.5137
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) RTcCH5 RTcCH8
## RTchannlCH5 -0.494
## RTchannlCH8 -0.488  0.492
## TimesDur    -0.306 -0.008 -0.005
```

[SPEECH - NOISE]: left-Anterior Temporal Lobe (LH-ATL-[SP-NO])

```
# best fit
ModelLT.SpBa.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDu
r^3) + (1|sub_ID), Rawdata_activity_SpBa, REML = FALSE,control = ctrl,na.action=na.omit)
summary(ModelLT.SpBa.interp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula:
## LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +
##     (1 | sub_ID)
##    Data: Rawdata_activity_SpBa
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    918.0    952.9   -451.0    902.0      575
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.8483 -0.4999 -0.0212  0.4737  3.8302
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02648  0.1627
##  Residual             0.25680  0.5068
## Number of obs: 583, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -7.470e-02  5.033e-02  2.864e+02  -1.484   0.1389
## LTchannelCH5   1.163e-02  5.017e-02  5.310e+02   0.232   0.8168
## LTchannelCH8  -8.914e-02  5.247e-02  5.375e+02  -1.699   0.0899 .
## TimesDur       9.605e-02  1.881e-02  5.796e+02   5.105 4.50e-07 ***
## I(TimesDur^2) -7.865e-03  1.718e-03  5.828e+02  -4.577 5.76e-06 ***
## I(TimesDur^3)  1.677e-04  3.943e-05  5.830e+02   4.252 2.46e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) LTcCH5 LTcCH8 TimsDr I(TD^2
## LTchannlCH5 -0.504
## LTchannlCH8 -0.445  0.474
## TimesDur    -0.496  0.016 -0.034
## I(TimsDr^2)  0.409 -0.013  0.022 -0.955
## I(TimsDr^3) -0.357  0.011 -0.016  0.889 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

Sylvian parieto-temporal areas (Spt)

```
# M1:Random-intercept-with-poly1
ModelSpt.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Sptchannel + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,
na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
```

```r
ModelSpt.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*Time
sDur + Hemisphere*TimesDur + Sptchannel + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,co
ntrol = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSpt.condition.interp.Times2 <- lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Sptchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1|s
ub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelSpt.condition.slopeinterp.Times2 <- lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*Tim
esDur + Hemisphere*TimesDur + Sptchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +
 (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelSpt.condition.interp.Times3 <- lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Sptchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Cond
itions*I(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,con
trol = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSpt.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions*Hemisphere + Conditions*Tim
esDur + Hemisphere*TimesDur + Sptchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +
 Conditions*I(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML
 = FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelSpt.condition.interp.Times1,ModelSpt.condition.interp.Times2)

## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 | sub_ID)
## ModelSpt.condition.interp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times2:     Hemisphere * I(TimesDur^2) + (1 | sub_ID)
##                                  npar  AIC    BIC  logLik deviance  Chisq
## ModelSpt.condition.interp.Times1   10 1230 1283.8 -604.99     1210
## ModelSpt.condition.interp.Times2   13 1234 1304.0 -604.02     1208 1.9503
##                                  Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.interp.Times2  3     0.5828

anova(ModelSpt.condition.interp.Times2,ModelSpt.condition.interp.Times3)

## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times2:     Hemisphere * I(TimesDur^2) + (1 | sub_ID)
## ModelSpt.condition.interp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
```

```
## ModelSpt.condition.interp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesDur^3)
 +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^3) + (1 | sub_ID)
##                                   npar    AIC    BIC  logLik deviance
## ModelSpt.condition.interp.Times2   13 1234.0 1304.0 -604.02   1208.0
## ModelSpt.condition.interp.Times3   16 1236.5 1322.6 -602.25   1204.5
##                                    Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times2
## ModelSpt.condition.interp.Times3 3.5384  3     0.3158
```

```
anova(ModelSpt.condition.interp.Times1,ModelSpt.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 | sub_ID)
## ModelSpt.condition.interp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesDur^3)
 +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^3) + (1 | sub_ID)
##                                   npar    AIC    BIC  logLik deviance
## ModelSpt.condition.interp.Times1   10 1230.0 1283.8 -604.99   1210.0
## ModelSpt.condition.interp.Times3   16 1236.5 1322.6 -602.25   1204.5
##                                    Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.interp.Times3 5.4887  6     0.4828
```

```
anova(ModelSpt.condition.slopeinterp.Times1,ModelSpt.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.slopeinterp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 + TimesDur
 | sub_ID)
## ModelSpt.condition.slopeinterp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * I(TimesDur^2) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.slopeinterp.Times1   12 1249.9 1314.5 -612.96   1225.9
## ModelSpt.condition.slopeinterp.Times2   15 1229.6 1310.3 -599.81   1199.6
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times1
## ModelSpt.condition.slopeinterp.Times2 26.307  3  8.227e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelSpt.condition.slopeinterp.Times2,ModelSpt.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.slopeinterp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * I(TimesDur^2) + (1 + TimesDur | sub_I
D)
## ModelSpt.condition.slopeinterp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesD
ur^3) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.slopeinterp.Times2   15 1229.6 1310.3 -599.81   1199.6
## ModelSpt.condition.slopeinterp.Times3   18 1232.3 1329.1 -598.13   1196.3
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times2
## ModelSpt.condition.slopeinterp.Times3 3.3556  3       0.34
```

```
anova(ModelSpt.condition.slopeinterp.Times1,ModelSpt.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.slopeinterp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 + TimesDur
 | sub_ID)
## ModelSpt.condition.slopeinterp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesD
ur^3) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.slopeinterp.Times1   12 1249.9 1314.5 -612.96   1225.9
## ModelSpt.condition.slopeinterp.Times3   18 1232.3 1329.1 -598.13   1196.3
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times1
## ModelSpt.condition.slopeinterp.Times3 29.662  6  4.557e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelSpt.condition.interp.Times1,ModelSpt.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 | sub_ID)
## ModelSpt.condition.slopeinterp.Times1: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
```

```
## ModelSpt.condition.slopeinterp.Times1:     Hemisphere * TimesDur + Sptchannel + (1 + TimesDur
 | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.interp.Times1        10 1230.0 1283.8 -604.99   1210.0
## ModelSpt.condition.slopeinterp.Times1   12 1249.9 1314.5 -612.96   1225.9
##                                       Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.slopeinterp.Times1     0  2          1
```

```
anova(ModelSpt.condition.interp.Times2,ModelSpt.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times2:     Hemisphere * I(TimesDur^2) + (1 | sub_ID)
## ModelSpt.condition.slopeinterp.Times2: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times2:     Hemisphere * I(TimesDur^2) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.interp.Times2        13 1234.0 1304.0 -604.02   1208.0
## ModelSpt.condition.slopeinterp.Times2   15 1229.6 1310.3 -599.81   1199.6
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times2
## ModelSpt.condition.slopeinterp.Times2 8.4178  2    0.01486 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelSpt.condition.interp.Times3,ModelSpt.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSpt.condition.interp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSpt.condition.interp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions * I(Tim
esDur^2) +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesDur^3)
 +
## ModelSpt.condition.interp.Times3:     Hemisphere * I(TimesDur^3) + (1 | sub_ID)
## ModelSpt.condition.slopeinterp.Times3: Sptvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Sptchannel + Conditions *
I(TimesDur^2) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^2) + Conditions * I(TimesD
ur^3) +
## ModelSpt.condition.slopeinterp.Times3:     Hemisphere * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelSpt.condition.interp.Times3        16 1236.5 1322.6 -602.25   1204.5
## ModelSpt.condition.slopeinterp.Times3   18 1232.3 1329.1 -598.13   1196.3
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times3
```

```
## ModelSpt.condition.slopeinterp.Times3 8.2349  2    0.01629 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# best fit
ModelSpt.condition.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Conditions + Hemisphere +
 Sptchannel + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSpt.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ TimesDur + Conditions + Hemisphere + Sptchannel +
##     (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   1228.7   1266.4   -607.4   1214.7     1595
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.2491 -0.6002 -0.0159  0.5593  4.5588
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.006465 0.08041
##  Residual             0.121059 0.34794
## Number of obs: 1602, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       1.129e-02  2.151e-02  2.775e+02   0.525   0.6002
## TimesDur          2.381e-03  1.300e-03  1.156e+03   1.832   0.0673 .
## Conditionsbabble  6.647e-03  1.739e-02  1.543e+03   0.382   0.7023
## HemisphereR       7.355e-03  1.741e-02  1.548e+03   0.423   0.6727
## SptchannelCH9    -3.256e-02  1.741e-02  1.548e+03  -1.870   0.0616 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr Cndtns HmsphR
## TimesDur    -0.296
## Condtnsbbbl -0.405  0.000
## HemisphereR -0.402 -0.006  0.003
## SptchnnlCH9 -0.406 -0.008  0.000  0.004

anova(ModelSpt.condition.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## TimesDur   0.40615 0.40615     1 1156.1  3.3550 0.06726 .
## Conditions 0.01769 0.01769     1 1543.4  0.1462 0.70229
## Hemisphere 0.02161 0.02161     1 1547.9  0.1785 0.67268
## Sptchannel 0.42348 0.42348     1 1548.2  3.4981 0.06163 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOVA <- anova(ModelSpt.condition.slopeinterp.Times1.N)
colnames(ResultsANOVA) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOVA %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur   0.40615 0.40615     1 1156.1 3.3550 0.06726  0.00289359
## Conditions 0.01769 0.01769     1 1543.4 0.1462 0.70229  0.00009469
## Hemisphere 0.02161 0.02161     1 1547.9 0.1785 0.67268  0.00011534
## Sptchannel 0.42348 0.42348     1 1548.2 3.4981 0.06163  0.00225433
```

Sylvian parieto-temporal areas (Spt)-LH

```r
Rawdata_activitySptLH <- Rawdata_activity  %>% filter(Hemisphere=='L')
# M1:Random-intercept-with-poly1
ModelSptLH.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + (1|sub
_ID), Rawdata_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelSptLH.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + (1
+TimesDur|sub_ID), Rawdata_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSptLH.condition.interp.Times2 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + Condit
ions*I(TimesDur^2) + (1|sub_ID), Rawdata_activitySptLH, REML = FALSE,control = ctrl,na.action=n
a.omit)

# M4:Random-intercept-slope-with-poly2
ModelSptLH.condition.slopeinterp.Times2 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + C
onditions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activitySptLH, REML = FALSE,control = ctr
l,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelSptLH.condition.interp.Times3 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + Condit
ions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1|sub_ID), Rawdata_activitySptLH, REML = FALSE,
control = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSptLH.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + C
onditions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activitySptLH,
REML = FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelSptLH.condition.interp.Times1,ModelSptLH.condition.interp.Times2)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptLH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSptLH.condition.interp.Times1    7 601.10 633.96 -293.55   587.10
```

```
## ModelSptLH.condition.interp.Times2    9 603.99 646.24 -292.99   585.99
##                                      Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times1
## ModelSptLH.condition.interp.Times2 1.1176  2     0.5719
```

```
anova(ModelSptLH.condition.interp.Times2,ModelSptLH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSptLH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSptLH.condition.interp.Times2    9 603.99 646.24 -292.99   585.99
## ModelSptLH.condition.interp.Times3   11 606.86 658.50 -292.43   584.86
##                                     Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times2
## ModelSptLH.condition.interp.Times3 1.1284  2     0.5688
```

```
anova(ModelSptLH.condition.interp.Times1,ModelSptLH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptLH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSptLH.condition.interp.Times1    7 601.10 633.96 -293.55   587.10
## ModelSptLH.condition.interp.Times3   11 606.86 658.50 -292.43   584.86
##                                    Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times1
## ModelSptLH.condition.interp.Times3 2.246  4     0.6906
```

```
anova(ModelSptLH.condition.slopeinterp.Times1,ModelSptLH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times1:     sub_ID)
## ModelSptLH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptLH.condition.slopeinterp.Times1    9 595.73 637.98 -288.86
## ModelSptLH.condition.slopeinterp.Times2   11 598.94 650.58 -288.47
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.slopeinterp.Times1   577.73
## ModelSptLH.condition.slopeinterp.Times2   576.94 0.7865  2     0.6749
```

```
anova(ModelSptLH.condition.slopeinterp.Times2,ModelSptLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelSptLH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times3:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptLH.condition.slopeinterp.Times2   11 598.94 650.58 -288.47
## ModelSptLH.condition.slopeinterp.Times3   13 601.79 662.82 -287.90
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.slopeinterp.Times2   576.94
## ModelSptLH.condition.slopeinterp.Times3   575.79 1.1468  2     0.5636

anova(ModelSptLH.condition.slopeinterp.Times1,ModelSptLH.condition.slopeinterp.Times3)

## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times1:     sub_ID)
## ModelSptLH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times3:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptLH.condition.slopeinterp.Times1    9 595.73 637.98 -288.86
## ModelSptLH.condition.slopeinterp.Times3   13 601.79 662.82 -287.90
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.slopeinterp.Times1   577.73
## ModelSptLH.condition.slopeinterp.Times3   575.79 1.9334  4      0.748

anova(ModelSptLH.condition.interp.Times1,ModelSptLH.condition.slopeinterp.Times1)

## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptLH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times1:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptLH.condition.interp.Times1         7 601.10 633.96 -293.55
## ModelSptLH.condition.slopeinterp.Times1    9 595.73 637.98 -288.86
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times1        587.10
## ModelSptLH.condition.slopeinterp.Times1   577.73 9.3775  2   0.009198 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

anova(ModelSptLH.condition.interp.Times2,ModelSptLH.condition.slopeinterp.Times2)

## Data: Rawdata_activitySptLH
## Models:
```

```
## ModelSptLH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSptLH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                        npar    AIC    BIC  logLik
## ModelSptLH.condition.interp.Times2        9 603.99 646.24 -292.99
## ModelSptLH.condition.slopeinterp.Times2  11 598.94 650.58 -288.47
##                                        deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times2       585.99
## ModelSptLH.condition.slopeinterp.Times2  576.94 9.0464  2    0.01085 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelSptLH.condition.interp.Times3,ModelSptLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySptLH
## Models:
## ModelSptLH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptLH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
## ModelSptLH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptLH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptLH.condition.slopeinterp.Times3:     sub_ID)
##                                        npar    AIC    BIC  logLik
## ModelSptLH.condition.interp.Times3       11 606.86 658.50 -292.43
## ModelSptLH.condition.slopeinterp.Times3  13 601.79 662.82 -287.90
##                                        deviance  Chisq Df Pr(>Chisq)
## ModelSptLH.condition.interp.Times3       584.86
## ModelSptLH.condition.slopeinterp.Times3  575.79 9.0649  2    0.01075 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Sylvian parieto-temporal areas(Spt)-RH

```
Rawdata_activitySptRH <- Rawdata_activity  %>% filter(Hemisphere=='R')
# M1:Random-intercept-with-poly1
ModelSptRH.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + (1|sub
_ID), Rawdata_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelSptRH.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + (1
+TimesDur|sub_ID), Rawdata_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSptRH.condition.interp.Times2 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + Condit
ions*I(TimesDur^2) + (1|sub_ID), Rawdata_activitySptRH, REML = FALSE,control = ctrl,na.action=n
a.omit)

# M4:Random-intercept-slope-with-poly2
ModelSptRH.condition.slopeinterp.Times2 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + C
onditions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activitySptRH, REML = FALSE,control = ctr
l,na.action=na.omit)
```

```r
# M5:Random-intercept-with-poly3
ModelSptRH.condition.interp.Times3 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + Condit
ions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1|sub_ID), Rawdata_activitySptRH, REML = FALSE,
control = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSptRH.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions*TimesDur + Sptchannel + C
onditions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activitySptRH,
REML = FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelSptRH.condition.interp.Times1,ModelSptRH.condition.interp.Times2)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptRH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSptRH.condition.interp.Times1    7 637.40 670.14 -311.70   623.40
## ModelSptRH.condition.interp.Times2    9 640.08 682.17 -311.04   622.08
##                                    Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times1
## ModelSptRH.condition.interp.Times2 1.327  2      0.515
```

```r
anova(ModelSptRH.condition.interp.Times2,ModelSptRH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSptRH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSptRH.condition.interp.Times2    9 640.08 682.17 -311.04   622.08
## ModelSptRH.condition.interp.Times3   11 639.88 691.33 -308.94   617.88
##                                     Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times2
## ModelSptRH.condition.interp.Times3 4.1942  2     0.1228
```

```r
anova(ModelSptRH.condition.interp.Times1,ModelSptRH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptRH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
##                                    npar    AIC    BIC  logLik deviance
```

```
## ModelSptRH.condition.interp.Times1    7 637.40 670.14 -311.70   623.40
## ModelSptRH.condition.interp.Times3   11 639.88 691.33 -308.94   617.88
##                                      Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times1
## ModelSptRH.condition.interp.Times3 5.5213  4     0.2379
```

```
anova(ModelSptRH.condition.slopeinterp.Times1,ModelSptRH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times1:     sub_ID)
## ModelSptRH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptRH.condition.slopeinterp.Times1    9 640.99 683.08 -311.50
## ModelSptRH.condition.slopeinterp.Times2   11 643.50 694.95 -310.75
##                                         deviance Chisq Df Pr(>Chisq)
## ModelSptRH.condition.slopeinterp.Times1   622.99
## ModelSptRH.condition.slopeinterp.Times2   621.50 1.486  2     0.4757
```

```
anova(ModelSptRH.condition.slopeinterp.Times2,ModelSptRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelSptRH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times3:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptRH.condition.slopeinterp.Times2   11 643.50 694.95 -310.75
## ModelSptRH.condition.slopeinterp.Times3   13 643.82 704.62 -308.91
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptRH.condition.slopeinterp.Times2   621.50
## ModelSptRH.condition.slopeinterp.Times3   617.82 3.6837  2     0.1585
```

```
anova(ModelSptRH.condition.slopeinterp.Times1,ModelSptRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times1:     sub_ID)
## ModelSptRH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times3:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptRH.condition.slopeinterp.Times1    9 640.99 683.08 -311.50
## ModelSptRH.condition.slopeinterp.Times3   13 643.82 704.62 -308.91
##                                         deviance  Chisq Df Pr(>Chisq)
```

```
## ModelSptRH.condition.slopeinterp.Times1   622.99
## ModelSptRH.condition.slopeinterp.Times3   617.82 5.1697  4     0.2703

anova(ModelSptRH.condition.interp.Times1,ModelSptRH.condition.slopeinterp.Times1)

## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1 | sub
_ID)
## ModelSptRH.condition.slopeinterp.Times1: Sptvalues ~ Conditions * TimesDur + Sptchannel + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times1:     sub_ID)
##                                         npar    AIC    BIC logLik deviance
## ModelSptRH.condition.interp.Times1         7 637.40 670.14 -311.7   623.40
## ModelSptRH.condition.slopeinterp.Times1    9 640.99 683.08 -311.5   622.99
##                                          Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times1
## ModelSptRH.condition.slopeinterp.Times1 0.4137  2     0.8131

anova(ModelSptRH.condition.interp.Times2,ModelSptRH.condition.slopeinterp.Times2)

## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSptRH.condition.slopeinterp.Times2: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptRH.condition.interp.Times2         9 640.08 682.17 -311.04
## ModelSptRH.condition.slopeinterp.Times2   11 643.50 694.95 -310.75
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times2         622.08
## ModelSptRH.condition.slopeinterp.Times2   621.50 0.5727  2      0.751

anova(ModelSptRH.condition.interp.Times3,ModelSptRH.condition.slopeinterp.Times3)

## Data: Rawdata_activitySptRH
## Models:
## ModelSptRH.condition.interp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Conditio
ns *
## ModelSptRH.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1 | sub
_ID)
## ModelSptRH.condition.slopeinterp.Times3: Sptvalues ~ Conditions * TimesDur + Sptchannel + Con
ditions *
## ModelSptRH.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + (1
+ TimesDur |
## ModelSptRH.condition.slopeinterp.Times3:     sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSptRH.condition.interp.Times3        11 639.88 691.33 -308.94
## ModelSptRH.condition.slopeinterp.Times3   13 643.82 704.62 -308.91
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSptRH.condition.interp.Times3         617.88
## ModelSptRH.condition.slopeinterp.Times3   617.82 0.0621  2     0.9694
```

Spt-speech-LH

```
# best fit
Rawdata_activitySptSPL <- Rawdata_activity  %>% filter(Conditions=='aspeech',Hemisphere=='L')
ModelSptL.speech.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub_ID), Ra
wdata_activitySptSPL, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSptL.speech.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ TimesDur + Sptchannel + (1 | sub_ID)
##    Data: Rawdata_activitySptSPL
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    260.9    280.9   -125.5    250.9      398
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.6069 -0.5621  0.0258  0.5401  4.0739
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01489  0.1220
##  Residual             0.09870  0.3142
## Number of obs: 403, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    -0.031685   0.030158 149.180992  -1.051   0.2951
## TimesDur        0.005748   0.002307 398.489604   2.491   0.0131 *
## SptchannelCH9  -0.008503   0.031368 350.403322  -0.271   0.7865
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.385
## SptchnnlCH9 -0.528  0.002

anova(ModelSptL.speech.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## TimesDur   0.61251 0.61251     1 398.49  6.2057 0.01314 *
## Sptchannel 0.00725 0.00725     1 350.40  0.0735 0.78649
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSptL.speech.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur   0.61251 0.61251     1 398.49 6.2057 0.01314   0.0153344
## Sptchannel 0.00725 0.00725     1 350.40 0.0735 0.78649   0.0002097
```

Spt-speech-RH

```
# best fit
Rawdata_activitySptSPR <- Rawdata_activity  %>% filter(Conditions=='aspeech',Hemisphere=='R')
ModelSptR.speech.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub_ID), Ra
wdata_activitySptSPR, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSptR.speech.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ TimesDur + Sptchannel + (1 | sub_ID)
##    Data: Rawdata_activitySptSPR
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    345.0    364.9   -167.5    335.0      393
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.9213 -0.5629 -0.0158  0.5303  3.2176
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01505  0.1227
##  Residual             0.12470  0.3531
## Number of obs: 398, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)     0.039246   0.032794 157.435492   1.197    0.233
## TimesDur        0.001236   0.002582 388.838621   0.479    0.632
## SptchannelCH9  -0.039503   0.035461 346.655713  -1.114    0.266
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.393
## SptchnnlCH9 -0.534 -0.016

anova(ModelSptR.speech.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## TimesDur   0.028595 0.028595     1 388.84  0.2293 0.6323
## Sptchannel 0.154748 0.154748     1 346.66  1.2410 0.2661

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSptR.speech.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur   0.028595 0.028595     1 388.84 0.2293 0.63231   0.0005894
## Sptchannel 0.154748 0.154748     1 346.66 1.2410 0.26606   0.0035670
```

Spt-noise-LH

```
# best fit
Rawdata_activitySptNOL <- Rawdata_activity %>% filter(Conditions=='babble',Hemisphere=='L')
ModelSpt.noise.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub_ID), Rawd
ata_activitySptNOL, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSpt.noise.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ TimesDur + Sptchannel + (1 | sub_ID)
##    Data: Rawdata_activitySptNOL
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    322.7    342.7   -156.4    312.7      400
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.7037 -0.6063 -0.0179  0.5912  3.8608
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02262  0.1504
##  Residual             0.11215  0.3349
## Number of obs: 405, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)     0.031204   0.033616 131.738711   0.928    0.355
## TimesDur        0.001562   0.002489 404.401863   0.628    0.531
## SptchannelCH9  -0.020719   0.033335 348.960259  -0.622    0.535
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.368
## SptchnnlCH9 -0.500  0.000

anova(ModelSpt.noise.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##               Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## TimesDur   0.044162 0.044162     1 404.40  0.3938 0.5307
## Sptchannel 0.043322 0.043322     1 348.96  0.3863 0.5347

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSpt.noise.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur   0.044162 0.044162     1 404.40 0.3938 0.53067  0.00097282
## Sptchannel 0.043322 0.043322     1 348.96 0.3863 0.53465  0.00110579
```

Spt-noise-RH

```
# best fit
Rawdata_activitySptNOR <- Rawdata_activity %>% filter(Conditions=='babble',Hemisphere=='R')
ModelSpt.noise.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub_ID), Rawd
ata_activitySptNOR, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSpt.noise.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ TimesDur + Sptchannel + (1 | sub_ID)
##    Data: Rawdata_activitySptNOR
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    287.9    307.8   -138.9    277.9      391
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.2260 -0.5829 -0.0497  0.5886  3.7245
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.009351 0.0967
##  Residual             0.110639 0.3326
## Number of obs: 396, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    3.887e-02  2.974e-02  1.570e+02   1.307   0.1930
## TimesDur       1.042e-04  2.401e-03  3.740e+02   0.043   0.9654
## SptchannelCH9 -6.146e-02  3.348e-02  3.387e+02  -1.836   0.0673 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.405
## SptchnnlCH9 -0.558 -0.017

anova(ModelSpt.noise.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## TimesDur   0.00021 0.00021     1 374.03  0.0019 0.96542
## Sptchannel 0.37288 0.37288     1 338.66  3.3702 0.06726 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSpt.noise.slopeinterp.Times1.N)
```

```r
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur   0.00021 0.00021     1 374.03 0.0019 0.96542   0.0000050
## Sptchannel 0.37288 0.37288     1 338.66 3.3702 0.06726   0.0098536
```

Supramarginal gyrus (SMG)

```r
# M1:Random-intercept-with-poly1
ModelSMG.condition.interp.Times1 <- lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.
omit)

# M2:Random-intercept-and-slope-with-poly1
ModelSMG.condition.slopeinterp.Times1 <-lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*Time
sDur + Hemisphere*TimesDur + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,
na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSMG.condition.interp.Times2 <- lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +  (1|sub_ID), Rawd
ata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelSMG.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*Tim
esDur + Hemisphere*TimesDur + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1+TimesDur|
sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelSMG.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I(Time
sDur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,n
a.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSMG.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions*Hemisphere + Conditions*Tim
esDur + Hemisphere*TimesDur + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I
(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,cont
rol = ctrl,na.action=na.omit)

# model contrast
anova(ModelSMG.condition.interp.Times1,ModelSMG.condition.interp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelSMG.condition.interp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
```

```
##                                   npar    AIC    BIC  logLik deviance
## ModelSMG.condition.interp.Times1    9 640.98 683.23 -311.49   622.98
## ModelSMG.condition.interp.Times2   12 641.18 697.51 -308.59   617.18
##                                    Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.interp.Times2 5.7994  3     0.1218
```

```
anova(ModelSMG.condition.interp.Times2,ModelSMG.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSMG.condition.interp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
 *
## ModelSMG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                   npar    AIC    BIC  logLik deviance Chisq
## ModelSMG.condition.interp.Times2   12 641.18 697.51 -308.59   617.18
## ModelSMG.condition.interp.Times3   15 644.38 714.80 -307.19   614.38 2.794
##                                   Df Pr(>Chisq)
## ModelSMG.condition.interp.Times2
## ModelSMG.condition.interp.Times3  3     0.4245
```

```
anova(ModelSMG.condition.interp.Times1,ModelSMG.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelSMG.condition.interp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
 *
## ModelSMG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                   npar    AIC    BIC  logLik deviance
## ModelSMG.condition.interp.Times1    9 640.98 683.23 -311.49   622.98
## ModelSMG.condition.interp.Times3   15 644.38 714.80 -307.19   614.38
##                                    Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.interp.Times3 8.5934  6     0.1978
```

```
anova(ModelSMG.condition.slopeinterp.Times1,ModelSMG.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.slopeinterp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
```

```
## ModelSMG.condition.slopeinterp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.slopeinterp.Times1   11 640.82 692.46 -309.41   618.82
## ModelSMG.condition.slopeinterp.Times2   14 652.84 718.57 -312.42   624.84
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times1
## ModelSMG.condition.slopeinterp.Times2     0  3          1
```

```
anova(ModelSMG.condition.slopeinterp.Times2,ModelSMG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.slopeinterp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemis
phere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.slopeinterp.Times2   14 652.84 718.57 -312.42   624.84
## ModelSMG.condition.slopeinterp.Times3   17 656.54 736.35 -311.27   622.54
##                                        Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times2
## ModelSMG.condition.slopeinterp.Times3 2.2998  3     0.5126
```

```
anova(ModelSMG.condition.slopeinterp.Times1,ModelSMG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.slopeinterp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemis
phere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.slopeinterp.Times1   11 640.82 692.46 -309.41   618.82
## ModelSMG.condition.slopeinterp.Times3   17 656.54 736.35 -311.27   622.54
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times1
## ModelSMG.condition.slopeinterp.Times3     0  6          1
```

```
anova(ModelSMG.condition.interp.Times1,ModelSMG.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelSMG.condition.slopeinterp.Times1: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.interp.Times1         9 640.98 683.23 -311.49   622.98
## ModelSMG.condition.slopeinterp.Times1   11 640.82 692.46 -309.41   618.82
##                                        Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.slopeinterp.Times1 4.1575  2     0.1251
```

```
anova(ModelSMG.condition.interp.Times2,ModelSMG.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelSMG.condition.slopeinterp.Times2: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.interp.Times2        12 641.18 697.51 -308.59   617.18
## ModelSMG.condition.slopeinterp.Times2   14 652.84 718.57 -312.42   624.84
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times2
## ModelSMG.condition.slopeinterp.Times2     0  2          1
```

```
anova(ModelSMG.condition.interp.Times3,ModelSMG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelSMG.condition.interp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * TimesDur
 +
## ModelSMG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + He
misphere *
## ModelSMG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
 *
## ModelSMG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions * Hemisphere + Conditions * Tim
esDur +
## ModelSMG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
 + Hemisphere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemis
phere *
## ModelSMG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelSMG.condition.interp.Times3        15 644.38 714.80 -307.19   614.38
## ModelSMG.condition.slopeinterp.Times3   17 656.54 736.35 -311.27   622.54
```

```
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times3
## ModelSMG.condition.slopeinterp.Times3     0  2          1
```

```
# best fit
ModelSMG.condition.slopeinterp.Times2.N <- lmer(SMGvalues ~ Conditions + TimesDur + I(TimesDur^
2) + Hemisphere + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSMG.condition.slopeinterp.Times2.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + TimesDur + I(TimesDur^2) + Hemisphere +
##     (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    635.8    668.7   -310.9    621.8      801
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.2101 -0.5986  0.0367  0.5988  4.0943
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.008039 0.08966
##  Residual             0.120739 0.34748
## Number of obs: 808, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -3.445e-03  2.747e-02  2.541e+02  -0.125   0.9003
## Conditionsbabble  1.538e-02  2.445e-02  7.449e+02   0.629   0.5295
## TimesDur         -1.077e-02  5.040e-03  7.963e+02  -2.136   0.0330 *
## I(TimesDur^2)     4.120e-04  1.969e-04  8.069e+02   2.093   0.0367 *
## HemisphereR       3.636e-02  2.448e-02  7.490e+02   1.485   0.1379
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns TimsDr I(TD^2
## Condtnsbbbl -0.448
## TimesDur    -0.411  0.001
## I(TimsDr^2)  0.316 -0.001 -0.934
## HemisphereR -0.441  0.003 -0.001 -0.004
```

```
anova(ModelSMG.condition.slopeinterp.Times2.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## Conditions    0.04779 0.04779     1 744.86  0.3958 0.52947
## TimesDur      0.55103 0.55103     1 796.32  4.5638 0.03296 *
## I(TimesDur^2) 0.52874 0.52874     1 806.88  4.3792 0.03669 *
## Hemisphere    0.26634 0.26634     1 748.99  2.2059 0.13791
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSMG.condition.slopeinterp.Times2.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                 SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## Conditions    0.04779 0.04779     1 744.86 0.3958 0.52947   0.0005311
## TimesDur      0.55103 0.55103     1 796.32 4.5638 0.03296   0.0056985
## I(TimesDur^2) 0.52874 0.52874     1 806.88 4.3792 0.03669   0.0053980
## Hemisphere    0.26634 0.26634     1 748.99 2.2059 0.13791   0.0029365
```

Supramarginal gyrus (SMG)-LH

```r
Rawdata_activitySMGLH <- Rawdata_activity %>% filter(Hemisphere=='L')
# M1:Random-intercept-with-poly1
ModelSMGLH.condition.interp.Times1 <- lmer(SMGvalues ~ Conditions*TimesDur + (1|sub_ID), Rawdata_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelSMGLH.condition.slopeinterp.Times1 <-lmer(SMGvalues ~ Conditions*TimesDur + (1+TimesDur|sub_ID), Rawdata_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSMGLH.condition.interp.Times2 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesDur^2) + (1|sub_ID), Rawdata_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelSMGLH.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelSMGLH.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1|sub_ID), Rawdata_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSMGLH.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activitySMGLH,REML = FALSE, control = ctrl,na.action=na.omit)

# model contrast
anova(ModelSMGLH.condition.interp.Times1,ModelSMGLH.condition.interp.Times2)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGLH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesDur^2) +
## ModelSMGLH.condition.interp.Times2:     (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGLH.condition.interp.Times1    6 253.36 277.40 -120.68   241.36
## ModelSMGLH.condition.interp.Times2    8 256.77 288.82 -120.38   240.77
##                                     Chisq Df Pr(>Chisq)
```

```
## ModelSMGLH.condition.interp.Times1
## ModelSMGLH.condition.interp.Times2 0.5929  2     0.7434
```

```
anova(ModelSMGLH.condition.interp.Times2,ModelSMGLH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGLH.condition.interp.Times2:     (1 | sub_ID)
## ModelSMGLH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGLH.condition.interp.Times2    8 256.77 288.82 -120.38   240.77
## ModelSMGLH.condition.interp.Times3   10 257.16 297.22 -118.58   237.16
##                                     Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.interp.Times2
## ModelSMGLH.condition.interp.Times3 3.6066  2     0.1648
```

```
anova(ModelSMGLH.condition.interp.Times1,ModelSMGLH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGLH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGLH.condition.interp.Times1    6 253.36 277.40 -120.68   241.36
## ModelSMGLH.condition.interp.Times3   10 257.16 297.22 -118.58   237.16
##                                     Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.interp.Times1
## ModelSMGLH.condition.interp.Times3 4.1995  4     0.3797
```

```
anova(ModelSMGLH.condition.slopeinterp.Times1,ModelSMGLH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
## ModelSMGLH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGLH.condition.slopeinterp.Times1    8 256.23 288.28 -120.11
## ModelSMGLH.condition.slopeinterp.Times2   10 259.87 299.94 -119.94
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.slopeinterp.Times1   240.23
## ModelSMGLH.condition.slopeinterp.Times2   239.87 0.3538  2     0.8379
```

```
anova(ModelSMGLH.condition.slopeinterp.Times2,ModelSMGLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
```

```
## ModelSMGLH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGLH.condition.slopeinterp.Times2   10 259.87 299.94 -119.94
## ModelSMGLH.condition.slopeinterp.Times3   12 259.81 307.88 -117.90
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.slopeinterp.Times2   239.87
## ModelSMGLH.condition.slopeinterp.Times3   235.81 4.0659  2     0.1309
```

```
anova(ModelSMGLH.condition.slopeinterp.Times1,ModelSMGLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
## ModelSMGLH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGLH.condition.slopeinterp.Times1    8 256.23 288.28 -120.11
## ModelSMGLH.condition.slopeinterp.Times3   12 259.81 307.88 -117.90
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.slopeinterp.Times1   240.23
## ModelSMGLH.condition.slopeinterp.Times3   235.81 4.4197  4     0.3522
```

```
anova(ModelSMGLH.condition.interp.Times1,ModelSMGLH.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGLH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGLH.condition.interp.Times1         6 253.36 277.40 -120.68
## ModelSMGLH.condition.slopeinterp.Times1    8 256.23 288.28 -120.11
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.interp.Times1        241.36
## ModelSMGLH.condition.slopeinterp.Times1   240.23 1.1312  2      0.568
```

```
anova(ModelSMGLH.condition.interp.Times2,ModelSMGLH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGLH.condition.interp.Times2:     (1 | sub_ID)
## ModelSMGLH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGLH.condition.interp.Times2         8 256.77 288.82 -120.38
## ModelSMGLH.condition.slopeinterp.Times2   10 259.87 299.94 -119.94
##                                         deviance Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.interp.Times2        240.77
## ModelSMGLH.condition.slopeinterp.Times2   239.87 0.892  2     0.6402
```

```
anova(ModelSMGLH.condition.interp.Times3,ModelSMGLH.condition.slopeinterp.Times3)

## Data: Rawdata_activitySMGLH
## Models:
## ModelSMGLH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelSMGLH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                        npar    AIC    BIC  logLik
## ModelSMGLH.condition.interp.Times3       10 257.16 297.22 -118.58
## ModelSMGLH.condition.slopeinterp.Times3  12 259.81 307.88 -117.90
##                                        deviance  Chisq Df Pr(>Chisq)
## ModelSMGLH.condition.interp.Times3       237.16
## ModelSMGLH.condition.slopeinterp.Times3  235.81 1.3514  2     0.5088
```

Supramarginal gyrus (SMG)-RH

```
Rawdata_activitySMGRH <- Rawdata_activity %>% filter(Hemisphere=='R')
# M1:Random-intercept-with-poly1
ModelSMGRH.condition.interp.Times1 <- lmer(SMGvalues ~ Conditions*TimesDur + (1|sub_ID), Rawdata
_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelSMGRH.condition.slopeinterp.Times1 <-lmer(SMGvalues ~ Conditions*TimesDur + (1+TimesDur|sub
_ID), Rawdata_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelSMGRH.condition.interp.Times2 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesD
ur^2) + (1|sub_ID), Rawdata_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelSMGRH.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(T
imesDur^2) + (1+TimesDur|sub_ID), Rawdata_activitySMGRH, REML = FALSE,control = ctrl,na.action=n
a.omit)

# M5:Random-intercept-with-poly3
ModelSMGRH.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(TimesD
ur^2) + Conditions*I(TimesDur^3) + (1|sub_ID), Rawdata_activitySMGRH, REML = FALSE,control = ctr
l,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelSMGRH.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions*TimesDur + Conditions*I(T
imesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activitySMGRH,REML = FALSE,
control = ctrl,na.action=na.omit)

# model contrast
anova(ModelSMGRH.condition.interp.Times1,ModelSMGRH.condition.interp.Times2)

## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGRH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times2:     (1 | sub_ID)
```

```
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGRH.condition.interp.Times1    6 387.44 411.42 -187.72   375.44
## ModelSMGRH.condition.interp.Times2    8 386.84 418.81 -185.42   370.84
##                                    Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times1
## ModelSMGRH.condition.interp.Times2 4.5939  2     0.1006
```

```
anova(ModelSMGRH.condition.interp.Times2,ModelSMGRH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times2:     (1 | sub_ID)
## ModelSMGRH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGRH.condition.interp.Times2    8 386.84 418.81 -185.42   370.84
## ModelSMGRH.condition.interp.Times3   10 390.40 430.36 -185.20   370.40
##                                    Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times2
## ModelSMGRH.condition.interp.Times3 0.4422  2     0.8016
```

```
anova(ModelSMGRH.condition.interp.Times1,ModelSMGRH.condition.interp.Times3)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGRH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelSMGRH.condition.interp.Times1    6 387.44 411.42 -187.72   375.44
## ModelSMGRH.condition.interp.Times3   10 390.40 430.36 -185.20   370.40
##                                    Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times1
## ModelSMGRH.condition.interp.Times3 5.0362  4     0.2836
```

```
anova(ModelSMGRH.condition.slopeinterp.Times1,ModelSMGRH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
## ModelSMGRH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGRH.condition.slopeinterp.Times1    8 390.86 422.83 -187.43
## ModelSMGRH.condition.slopeinterp.Times2   10 390.65 430.61 -185.32
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.slopeinterp.Times1   374.86
## ModelSMGRH.condition.slopeinterp.Times2   370.65 4.2107  2     0.1218
```

```
anova(ModelSMGRH.condition.slopeinterp.Times2,ModelSMGRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
## ModelSMGRH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGRH.condition.slopeinterp.Times2   10 390.65 430.61 -185.32
## ModelSMGRH.condition.slopeinterp.Times3   12 394.13 442.09 -185.07
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.slopeinterp.Times2   370.65
## ModelSMGRH.condition.slopeinterp.Times3   370.13 0.5135  2     0.7736
```

```
anova(ModelSMGRH.condition.slopeinterp.Times1,ModelSMGRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
## ModelSMGRH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGRH.condition.slopeinterp.Times1    8 390.86 422.83 -187.43
## ModelSMGRH.condition.slopeinterp.Times3   12 394.13 442.09 -185.07
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.slopeinterp.Times1   374.86
## ModelSMGRH.condition.slopeinterp.Times3   370.13 4.7242  4     0.3168
```

```
anova(ModelSMGRH.condition.interp.Times1,ModelSMGRH.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times1: SMGvalues ~ Conditions * TimesDur + (1 | sub_ID)
## ModelSMGRH.condition.slopeinterp.Times1: SMGvalues ~ Conditions * TimesDur + (1 + TimesDur |
sub_ID)
##                                         npar    AIC    BIC  logLik
## ModelSMGRH.condition.interp.Times1         6 387.44 411.42 -187.72
## ModelSMGRH.condition.slopeinterp.Times1    8 390.86 422.83 -187.43
##                                         deviance  Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times1        375.44
## ModelSMGRH.condition.slopeinterp.Times1   374.86 0.5782  2     0.7489
```

```
anova(ModelSMGRH.condition.interp.Times2,ModelSMGRH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times2:     (1 | sub_ID)
## ModelSMGRH.condition.slopeinterp.Times2: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                         npar    AIC    BIC  logLik
```

```
## ModelSMGRH.condition.interp.Times2         8 386.84 418.81 -185.42
## ModelSMGRH.condition.slopeinterp.Times2   10 390.65 430.61 -185.32
##                                          deviance Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times2          370.84
## ModelSMGRH.condition.slopeinterp.Times2     370.65 0.195  2     0.9071
```

```
anova(ModelSMGRH.condition.interp.Times3,ModelSMGRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activitySMGRH
## Models:
## ModelSMGRH.condition.interp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(TimesD
ur^2) +
## ModelSMGRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelSMGRH.condition.slopeinterp.Times3: SMGvalues ~ Conditions * TimesDur + Conditions * I(T
imesDur^2) +
## ModelSMGRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub
_ID)
##                                          npar    AIC    BIC  logLik
## ModelSMGRH.condition.interp.Times3          10 390.40 430.36 -185.20
## ModelSMGRH.condition.slopeinterp.Times3     12 394.13 442.09 -185.07
##                                          deviance  Chisq Df Pr(>Chisq)
## ModelSMGRH.condition.interp.Times3          370.40
## ModelSMGRH.condition.slopeinterp.Times3     370.13 0.2662  2     0.8754
```

Supramarginal gyrus (SMG)–speech-LH

```
# best fit
Rawdata_activitySMGSPL <- Rawdata_activity  %>% filter(Conditions=='aspeech',Hemisphere=='L')
ModelSMGL.speech.slopeinterp.Times1.N <- lmer(SMGvalues ~ TimesDur + (1|sub_ID), Rawdata_activit
ySMGSPL, REML = FALSE,control = ctrl,na.action=na.omit)
```

```
summary(ModelSMGL.speech.slopeinterp.Times1.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ TimesDur + (1 | sub_ID)
##    Data: Rawdata_activitySMGSPL
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##     74.8     88.0    -33.4     66.8      198
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.30879 -0.62438 -0.01973  0.65532  2.86889
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002587 0.05086
##  Residual             0.079019 0.28110
## Number of obs: 202, groups:  sub_ID, 57
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept) -1.565e-02  2.546e-02  1.109e+02  -0.615    0.540
## TimesDur     8.319e-04  2.769e-03  2.020e+02   0.300    0.764
##
## Correlation of Fixed Effects:
```

```
##          (Intr)
## TimesDur -0.564

anova(ModelSMGL.speech.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq   Mean Sq NumDF  DenDF F value Pr(>F)
## TimesDur 0.0071329 0.0071329     1 201.98  0.0903 0.7641

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSMGL.speech.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq    MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur 0.0071329 0.0071329     1 201.98 0.0903 0.76415  0.00044672
```

Supramarginal gyrus (SMG)–speech-RH

```
# best fit
Rawdata_activitySMGSPR <- Rawdata_activity  %>% filter(Conditions=='aspeech',Hemisphere=='R')
ModelSMGR.speech.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + I(TimesDur^2) + (1|sub_ID),
 Rawdata_activitySMGSPR, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSMGR.speech.slopeinterp.Times2.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ TimesDur + I(TimesDur^2) + (1 | sub_ID)
##    Data: Rawdata_activitySMGSPR
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    197.0    213.5    -93.5    187.0      196
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.3145 -0.6702  0.0373  0.5544  3.3579
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002478 0.04978
##  Residual             0.146017 0.38212
## Number of obs: 201, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -5.441e-03  3.872e-02  1.314e+02  -0.141    0.888
## TimesDur      -1.603e-03  1.067e-02  1.885e+02  -0.150    0.881
## I(TimesDur^2)  1.081e-04  4.190e-04  1.850e+02   0.258    0.797
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.620
## I(TimsDr^2)  0.477 -0.941
```

```r
anova(ModelSMGR.speech.slopeinterp.Times2.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                  Sum Sq   Mean Sq NumDF  DenDF F value Pr(>F)
## TimesDur      0.0032987 0.0032987     1 188.46  0.0226 0.8807
## I(TimesDur^2) 0.0097283 0.0097283     1 184.96  0.0666 0.7966
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSMGR.speech.slopeinterp.Times2.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                  SumSq    MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur      0.0032987 0.0032987     1 188.46 0.0226 0.88069  0.00011986
## I(TimesDur^2) 0.0097283 0.0097283     1 184.96 0.0666 0.79660  0.00036009
```

Supramarginal gyrus (SMG)–noise-LH

```r
# best fit
Rawdata_activitySMGNOL <- Rawdata_activity  %>% filter(Conditions=='babble',Hemisphere=='L')
ModelSMGL.noise.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + (1|sub_ID), Rawdata_activity
SMGNOL, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSMGL.noise.slopeinterp.Times2.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ TimesDur + (1 | sub_ID)
##    Data: Rawdata_activitySMGNOL
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    172.4    185.7    -82.2    164.4      200
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.7009 -0.5401  0.0104  0.5106  4.2042
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.001603 0.04004
##  Residual             0.129498 0.35986
## Number of obs: 204, groups:  sub_ID, 57
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.016734   0.031521  90.534525  -0.531    0.597
## TimesDur     -0.001310   0.003503 203.342660  -0.374    0.709
##
## Correlation of Fixed Effects:
##          (Intr)
## TimesDur -0.574
```

```r
anova(ModelSMGL.noise.slopeinterp.Times2.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##            Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## TimesDur 0.018098 0.018098     1 203.34  0.1398 0.7089
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSMGL.noise.slopeinterp.Times2.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## TimesDur 0.018098 0.018098     1 203.34 0.1398 0.70891  0.00068683
```

Supramarginal gyrus (SMG)–noise-RH

```
# best fit
Rawdata_activitySMGNOR <- Rawdata_activity  %>% filter(Conditions=='babble',Hemisphere=='R')
ModelSMGR.noise.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + I(TimesDur^2) + (1|sub_ID),
Rawdata_activitySMGNOR, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelSMGR.noise.slopeinterp.Times2.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ TimesDur + I(TimesDur^2) + (1 | sub_ID)
##    Data: Rawdata_activitySMGNOR
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    196.4    213.0    -93.2    186.4      196
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.90003 -0.60609  0.06369  0.59832  3.09122
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.006437 0.08023
##  Residual             0.141991 0.37682
## Number of obs: 201, groups:  sub_ID, 57
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    1.040e-01  3.928e-02  1.278e+02   2.647  0.00914 **
## TimesDur      -2.578e-02  1.059e-02  1.862e+02  -2.434  0.01587 *
## I(TimesDur^2)  8.734e-04  4.157e-04  1.820e+02   2.101  0.03700 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr
## TimesDur    -0.606
## I(TimsDr^2)  0.465 -0.940
```

```
anova(ModelSMGR.noise.slopeinterp.Times2.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## TimesDur      0.84136 0.84136     1 186.16  5.9254 0.01587 *
## I(TimesDur^2) 0.62688 0.62688     1 182.03  4.4149 0.03700 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOVA <- anova(ModelSMGR.noise.slopeinterp.Times2.N)
colnames(ResultsANOVA) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOVA %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                 SumSq  MeanSq NumDF  DenDF      F       Pr eta_partial
## TimesDur      0.84136 0.84136     1 186.16 5.9254 0.015868    0.030848
## I(TimesDur^2) 0.62688 0.62688     1 182.03 4.4149 0.037003    0.023680
```

Inferior Frontal Gyrus (IFG)

```
# M1:Random-intercept-with-poly1
ModelF.condition.interp.Times1 <- lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Fchannel + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.act
ion=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelF.condition.slopeinterp.Times1 <-lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDur
 + Hemisphere*TimesDur + Fchannel + (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control
= ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelF.condition.interp.Times2 <- lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1|sub_I
D), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelF.condition.slopeinterp.Times2 <- lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDu
r + Hemisphere*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1+Ti
mesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelF.condition.interp.Times3 <- lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDur + H
emisphere*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +  Condition
s*I(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,control
= ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelF.condition.slopeinterp.Times3 <- lmer(Fvalues ~ Conditions*Hemisphere + Conditions*TimesDu
r + Hemisphere*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Condi
tions*I(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activity, REML = F
ALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelF.condition.interp.Times1,ModelF.condition.interp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times1:     TimesDur + Fchannel + (1 | sub_ID)
## ModelF.condition.interp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelF.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                npar  AIC    BIC  logLik deviance  Chisq Df
## ModelF.condition.interp.Times1   10 1613 1666.4 -796.50     1593
## ModelF.condition.interp.Times2   13 1617 1686.5 -795.53     1591 1.9521  3
##                                Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.interp.Times2     0.5824
```

```
anova(ModelF.condition.interp.Times2,ModelF.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelF.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelF.condition.interp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelF.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelF.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                npar    AIC    BIC  logLik deviance  Chisq
## ModelF.condition.interp.Times2   13 1617.0 1686.5 -795.53   1591.0
## ModelF.condition.interp.Times3   16 1620.5 1706.0 -794.27   1588.5 2.5131
##                                Df Pr(>Chisq)
## ModelF.condition.interp.Times2
## ModelF.condition.interp.Times3  3     0.4729
```

```
anova(ModelF.condition.interp.Times1,ModelF.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times1:     TimesDur + Fchannel + (1 | sub_ID)
## ModelF.condition.interp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelF.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelF.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                npar    AIC    BIC  logLik deviance  Chisq
## ModelF.condition.interp.Times1   10 1613.0 1666.4 -796.50   1593.0
## ModelF.condition.interp.Times3   16 1620.5 1706.0 -794.27   1588.5 4.4652
```

```
##                                Df Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.interp.Times3  6      0.614
```

```
anova(ModelF.condition.slopeinterp.Times1,ModelF.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.slopeinterp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times1:     TimesDur + Fchannel + (1 + TimesDur | sub_ID)
## ModelF.condition.slopeinterp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelF.condition.slopeinterp.Times1   12 1610.0 1674.2 -793.02   1586.0
## ModelF.condition.slopeinterp.Times2   15 1613.6 1693.8 -791.82   1583.6
##                                     Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times1
## ModelF.condition.slopeinterp.Times2 2.4143  3      0.491
```

```
anova(ModelF.condition.slopeinterp.Times2,ModelF.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.slopeinterp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
ere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                    npar    AIC    BIC  logLik deviance
## ModelF.condition.slopeinterp.Times2   15 1613.6 1693.8 -791.82   1583.6
## ModelF.condition.slopeinterp.Times3   18 1616.6 1712.8 -790.32   1580.6
##                                     Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times2
## ModelF.condition.slopeinterp.Times3 2.9886  3     0.3934
```

```
anova(ModelF.condition.slopeinterp.Times1,ModelF.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.slopeinterp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times1:     TimesDur + Fchannel + (1 + TimesDur | sub_ID)
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
```

```
ere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelF.condition.slopeinterp.Times1   12 1610.0 1674.2 -793.02   1586.0
## ModelF.condition.slopeinterp.Times3   18 1616.6 1712.8 -790.32   1580.6
##                                     Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times1
## ModelF.condition.slopeinterp.Times3 5.403  6     0.4933
```

```
anova(ModelF.condition.interp.Times1,ModelF.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times1:     TimesDur + Fchannel + (1 | sub_ID)
## ModelF.condition.slopeinterp.Times1: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times1:     TimesDur + Fchannel + (1 + TimesDur | sub_ID)
##                                     npar  AIC    BIC  logLik deviance
## ModelF.condition.interp.Times1        10 1613 1666.4 -796.50     1593
## ModelF.condition.slopeinterp.Times1   12 1610 1674.2 -793.02     1586
##                                      Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.slopeinterp.Times1 6.9597  2    0.03081 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelF.condition.interp.Times2,ModelF.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
here *
## ModelF.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelF.condition.slopeinterp.Times2: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times2:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelF.condition.interp.Times2        13 1617.0 1686.5 -795.53   1591.0
## ModelF.condition.slopeinterp.Times2   15 1613.6 1693.8 -791.82   1583.6
##                                      Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times2
## ModelF.condition.slopeinterp.Times2 7.4219  2    0.02445 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelF.condition.interp.Times3,ModelF.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelF.condition.interp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDur + H
emisphere *
## ModelF.condition.interp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + Hemisp
```

```
here *
## ModelF.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere *

## ModelF.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions * Hemisphere + Conditions * TimesDu
r + Hemisphere *
## ModelF.condition.slopeinterp.Times3:     TimesDur + Fchannel + Conditions * I(TimesDur^2) + H
emisphere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisph
ere *
## ModelF.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                     npar    AIC    BIC  logLik deviance
## ModelF.condition.interp.Times3        16 1620.5 1706.0 -794.27   1588.5
## ModelF.condition.slopeinterp.Times3   18 1616.6 1712.8 -790.32   1580.6
##                                      Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times3
## ModelF.condition.slopeinterp.Times3 7.8974  2    0.01928 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# best fit
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Hemisphere + Fchannel + Conditions * Tim
esDur + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelF.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Hemisphere + Fchannel + Conditions * TimesDur + (1 |
##     sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   1612.6   1655.4   -798.3   1596.6     1537
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.4853 -0.5812  0.0171  0.5731  4.0926
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01477  0.1215
##  Residual             0.15723  0.3965
## Number of obs: 1545, groups:  sub_ID, 57
##
## Fixed effects:
##                              Estimate Std. Error         df t value
## (Intercept)                -3.996e-02  2.837e-02  2.252e+02  -1.408
## HemisphereR                 2.709e-02  2.027e-02  1.491e+03   1.337
## FchannelCH4                 1.461e-02  2.020e-02  1.485e+03   0.724
## Conditionsbabble            6.178e-03  2.496e-02  1.482e+03   0.248
## TimesDur                    3.385e-03  2.031e-03  1.496e+03   1.666
## Conditionsbabble:TimesDur -4.885e-03  2.668e-03  1.482e+03  -1.831
##                            Pr(>|t|)
## (Intercept)                  0.1604
## HemisphereR                  0.1815
```

```
## FchannelCH4                0.4695
## Conditionsbabble           0.8045
## TimesDur                   0.0959 .
## Conditionsbabble:TimesDur  0.0674 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) HmsphR FchCH4 Cndtns TimsDr
## HemisphereR -0.384
## FchannelCH4 -0.352  0.003
## Condtnsbbbl -0.438 -0.003 -0.003
## TimesDur    -0.388  0.029 -0.005  0.387
## Cndtnsbb:TD  0.258  0.000  0.002 -0.589 -0.658
```

```
anova(ModelF.condition.slopeinterp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                       Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## Hemisphere           0.28096 0.28096     1 1491.1  1.7869 0.18150
## Fchannel             0.08231 0.08231     1 1485.4  0.5235 0.46947
## Conditions           0.00964 0.00964     1 1482.2  0.0613 0.80452
## TimesDur             0.05973 0.05973     1 1263.6  0.3799 0.53778
## Conditions:TimesDur 0.52690 0.52690     1 1482.2  3.3512 0.06736 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                        SumSq  MeanSq NumDF  DenDF      F      Pr
## Hemisphere           0.28096 0.28096     1 1491.1 1.7869 0.18150
## Fchannel             0.08231 0.08231     1 1485.4 0.5235 0.46947
## Conditions           0.00964 0.00964     1 1482.2 0.0613 0.80452
## TimesDur             0.05973 0.05973     1 1263.6 0.3799 0.53778
## Conditions:TimesDur 0.52690 0.52690     1 1482.2 3.3512 0.06736
##                       eta_partial
## Hemisphere           0.00119700
## Fchannel             0.00035231
## Conditions           0.00004134
## TimesDur             0.00030055
## Conditions:TimesDur  0.00225586
```

Inferior Frontal Gyrus (IFG)-LH

```
Rawdata_activityIFGLH <- Rawdata_activity %>% filter(Hemisphere=='L')
# M1:Random-intercept-with-poly1
ModelFLH.condition.interp.Times1 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + (1|sub_ID),
Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelFLH.condition.slopeinterp.Times1 <-lmer(Fvalues ~ Conditions*TimesDur + Fchannel + (1+Times
Dur|sub_ID), Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)
```

```r
# M3:Random-intercept-with-poly2
ModelFLH.condition.interp.Times2 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I(TimesDur^2) + (1|sub_ID), Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelFLH.condition.slopeinterp.Times2 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelFLH.condition.interp.Times3 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) +  (1|sub_ID), Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelFLH.condition.slopeinterp.Times3 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelFLH.condition.interp.Times1,ModelFLH.condition.interp.Times2)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFLH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times2:     (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times1    7 839.23 871.44 -412.61   825.23
## ModelFLH.condition.interp.Times2    9 842.71 884.12 -412.36   824.71
##                                   Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times1
## ModelFLH.condition.interp.Times2 0.5144  2     0.7732
```

```r
anova(ModelFLH.condition.interp.Times2,ModelFLH.condition.interp.Times3)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times2:     (1 | sub_ID)
## ModelFLH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times2    9 842.71 884.12 -412.36   824.71
## ModelFLH.condition.interp.Times3   11 846.20 896.81 -412.10   824.20
##                                   Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times2
## ModelFLH.condition.interp.Times3 0.5154  2     0.7728
```

```r
anova(ModelFLH.condition.interp.Times1,ModelFLH.condition.interp.Times3)
```

```
## Data: Rawdata_activityIFGLH
## Models:
```

```
## ModelFLH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFLH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times1    7 839.23 871.44 -412.61   825.23
## ModelFLH.condition.interp.Times3   11 846.20 896.81 -412.10   824.20
##                                   Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times1
## ModelFLH.condition.interp.Times3 1.0297  4     0.9053
```

```
anova(ModelFLH.condition.slopeinterp.Times1,ModelFLH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFLH.condition.slopeinterp.Times1:     sub_ID)
## ModelFLH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelFLH.condition.slopeinterp.Times1    9 839.51 880.92 -410.75   821.51
## ModelFLH.condition.slopeinterp.Times2   11 843.50 894.11 -410.75   821.50
##                                        Chisq Df Pr(>Chisq)
## ModelFLH.condition.slopeinterp.Times1
## ModelFLH.condition.slopeinterp.Times2 0.0087  2     0.9957
```

```
anova(ModelFLH.condition.slopeinterp.Times2,ModelFLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelFLH.condition.slopeinterp.Times2   11 843.50 894.11 -410.75   821.50
## ModelFLH.condition.slopeinterp.Times3   13 846.13 905.95 -410.07   820.13
##                                        Chisq Df Pr(>Chisq)
## ModelFLH.condition.slopeinterp.Times2
## ModelFLH.condition.slopeinterp.Times3 1.3649  2     0.5054
```

```
anova(ModelFLH.condition.slopeinterp.Times1,ModelFLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFLH.condition.slopeinterp.Times1:     sub_ID)
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
```

```
## ModelFLH.condition.slopeinterp.Times1    9 839.51 880.92 -410.75   821.51
## ModelFLH.condition.slopeinterp.Times3   13 846.13 905.95 -410.07   820.13
##                                         Chisq Df Pr(>Chisq)
## ModelFLH.condition.slopeinterp.Times1
## ModelFLH.condition.slopeinterp.Times3 1.3736  4     0.8488
```

```
anova(ModelFLH.condition.interp.Times1,ModelFLH.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFLH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFLH.condition.slopeinterp.Times1:     sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times1          7 839.23 871.44 -412.61   825.23
## ModelFLH.condition.slopeinterp.Times1     9 839.51 880.92 -410.75   821.51
##                                         Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times1
## ModelFLH.condition.slopeinterp.Times1 3.7215  2     0.1556
```

```
anova(ModelFLH.condition.interp.Times2,ModelFLH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times2:     (1 | sub_ID)
## ModelFLH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times2          9 842.71 884.12 -412.36   824.71
## ModelFLH.condition.slopeinterp.Times2    11 843.50 894.11 -410.75   821.50
##                                         Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times2
## ModelFLH.condition.slopeinterp.Times2 3.2158  2     0.2003
```

```
anova(ModelFLH.condition.interp.Times3,ModelFLH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGLH
## Models:
## ModelFLH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFLH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFLH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                        npar    AIC    BIC  logLik deviance
## ModelFLH.condition.interp.Times3         11 846.20 896.81 -412.10   824.20
## ModelFLH.condition.slopeinterp.Times3    13 846.13 905.95 -410.07   820.13
##                                         Chisq Df Pr(>Chisq)
## ModelFLH.condition.interp.Times3
## ModelFLH.condition.slopeinterp.Times3 4.0653  2      0.131
```

Inferior Frontal Gyrus (IFG)-RH

```
Rawdata_activityIFGRH <- Rawdata_activity %>% filter(Hemisphere=='R')
# M1:Random-intercept-with-poly1
ModelFRH.condition.interp.Times1 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + (1|sub_ID),
Rawdata_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M2:Random-intercept-and-slope-with-poly1
ModelFRH.condition.slopeinterp.Times1 <-lmer(Fvalues ~ Conditions*TimesDur + Fchannel + (1+Times
Dur|sub_ID), Rawdata_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M3:Random-intercept-with-poly2
ModelFRH.condition.interp.Times2 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I
(TimesDur^2) + (1|sub_ID), Rawdata_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelFRH.condition.slopeinterp.Times2 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditi
ons*I(TimesDur^2) + (1+TimesDur|sub_ID), Rawdata_activityIFGRH, REML = FALSE,control = ctrl,na.a
ction=na.omit)

# M5:Random-intercept-with-poly3
ModelFRH.condition.interp.Times3 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditions*I
(TimesDur^2) + Conditions*I(TimesDur^3) +  (1|sub_ID), Rawdata_activityIFGRH, REML = FALSE,contr
ol = ctrl,na.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelFRH.condition.slopeinterp.Times3 <- lmer(Fvalues ~ Conditions*TimesDur + Fchannel + Conditi
ons*I(TimesDur^2) + Conditions*I(TimesDur^3) + (1+TimesDur|sub_ID), Rawdata_activityIFGRH, REML
= FALSE,control = ctrl,na.action=na.omit)

# model contrast
anova(ModelFRH.condition.interp.Times1,ModelFRH.condition.interp.Times2)

## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFRH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times2:     (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
## ModelFRH.condition.interp.Times1    7 795.48 828.35 -390.74   781.48
## ModelFRH.condition.interp.Times2    9 798.49 840.75 -390.25   780.49
##                                   Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times1
## ModelFRH.condition.interp.Times2 0.9904  2     0.6094

anova(ModelFRH.condition.interp.Times2,ModelFRH.condition.interp.Times3)

## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times2:     (1 | sub_ID)
## ModelFRH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
```

```
## ModelFRH.condition.interp.Times2    9 798.49 840.75 -390.25   780.49
## ModelFRH.condition.interp.Times3   11 795.18 846.83 -386.59   773.18
##                                   Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times2
## ModelFRH.condition.interp.Times3 7.3169  2    0.02577 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelFRH.condition.interp.Times1,ModelFRH.condition.interp.Times3)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFRH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
##                                  npar    AIC    BIC  logLik deviance
## ModelFRH.condition.interp.Times1    7 795.48 828.35 -390.74   781.48
## ModelFRH.condition.interp.Times3   11 795.18 846.83 -386.59   773.18
##                                   Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times1
## ModelFRH.condition.interp.Times3 8.3073  4    0.08095 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelFRH.condition.slopeinterp.Times1,ModelFRH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFRH.condition.slopeinterp.Times1:     sub_ID)
## ModelFRH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelFRH.condition.slopeinterp.Times1    9 798.12 840.39 -390.06   780.12
## ModelFRH.condition.slopeinterp.Times2   11 802.02 853.68 -390.01   780.02
##                                        Chisq Df Pr(>Chisq)
## ModelFRH.condition.slopeinterp.Times1
## ModelFRH.condition.slopeinterp.Times2 0.1009  2     0.9508
```

```
anova(ModelFRH.condition.slopeinterp.Times2,ModelFRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelFRH.condition.slopeinterp.Times2   11 802.02 853.68 -390.01   780.02
## ModelFRH.condition.slopeinterp.Times3   13 799.07 860.12 -386.54   773.07
##                                        Chisq Df Pr(>Chisq)
## ModelFRH.condition.slopeinterp.Times2
```

```
## ModelFRH.condition.slopeinterp.Times3 6.9522  2    0.03093 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(ModelFRH.condition.slopeinterp.Times1,ModelFRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFRH.condition.slopeinterp.Times1:     sub_ID)
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                       npar    AIC    BIC  logLik deviance
## ModelFRH.condition.slopeinterp.Times1    9 798.12 840.39 -390.06   780.12
## ModelFRH.condition.slopeinterp.Times3   13 799.07 860.12 -386.54   773.07
##                                        Chisq Df Pr(>Chisq)
## ModelFRH.condition.slopeinterp.Times1
## ModelFRH.condition.slopeinterp.Times3 7.0531  4     0.1331
```

```
anova(ModelFRH.condition.interp.Times1,ModelFRH.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.interp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 | sub_ID)
## ModelFRH.condition.slopeinterp.Times1: Fvalues ~ Conditions * TimesDur + Fchannel + (1 + Time
sDur |
## ModelFRH.condition.slopeinterp.Times1:     sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelFRH.condition.interp.Times1         7 795.48 828.35 -390.74   781.48
## ModelFRH.condition.slopeinterp.Times1    9 798.12 840.39 -390.06   780.12
##                                        Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times1
## ModelFRH.condition.slopeinterp.Times1 1.3581  2     0.5071
```

```
anova(ModelFRH.condition.interp.Times2,ModelFRH.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activityIFGRH
## Models:
## ModelFRH.condition.interp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times2:     (1 | sub_ID)
## ModelFRH.condition.slopeinterp.Times2: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times2:     (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelFRH.condition.interp.Times2         9 798.49 840.75 -390.25   780.49
## ModelFRH.condition.slopeinterp.Times2   11 802.02 853.68 -390.01   780.02
##                                        Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times2
## ModelFRH.condition.slopeinterp.Times2 0.4687  2     0.7911
```

```
anova(ModelFRH.condition.interp.Times3,ModelFRH.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activityIFGRH
## Models:
```

```
## ModelFRH.condition.interp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Conditions * I
(TimesDur^2) +
## ModelFRH.condition.interp.Times3:     Conditions * I(TimesDur^3) + (1 | sub_ID)
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions * TimesDur + Fchannel + Condition
s * I(TimesDur^2) +
## ModelFRH.condition.slopeinterp.Times3:     Conditions * I(TimesDur^3) + (1 + TimesDur | sub_I
D)
##                                        npar    AIC    BIC  logLik deviance
## ModelFRH.condition.interp.Times3         11 795.18 846.83 -386.59   773.18
## ModelFRH.condition.slopeinterp.Times3    13 799.07 860.12 -386.54   773.07
##                                         Chisq Df Pr(>Chisq)
## ModelFRH.condition.interp.Times3
## ModelFRH.condition.slopeinterp.Times3 0.1039  2     0.9494
```

speech-LH

```
# best fit
Rawdata_activitySPLH <- Rawdata_activity %>% filter(Conditions=='aspeech', Hemisphere == 'L')
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub_ID), Rawdat
a_activitySPLH, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelF.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activitySPLH
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    411.6    431.2   -200.8    401.6      364
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1753 -0.5196  0.0488  0.5531  3.7361
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01863  0.1365
##  Residual             0.15967  0.3996
## Number of obs: 369, groups:  sub_ID, 57
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.044049   0.038505 156.986836  -1.144    0.254
## FchannelCH4   0.011972   0.041676 316.160317   0.287    0.774
## TimesDur      0.001559   0.002934 343.411229   0.531    0.596
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.544
## TimesDur    -0.427  0.014

anova(ModelF.condition.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##            Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
```

```
## Fchannel 0.013176 0.013176     1 316.16  0.0825 0.7741
## TimesDur 0.045081 0.045081     1 343.41  0.2823 0.5955

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##             SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## Fchannel 0.013176 0.013176     1 316.16 0.0825 0.77410  0.00026094
## TimesDur 0.045081 0.045081     1 343.41 0.2823 0.59552  0.00082148
```

speech-RH

```
# best fit
Rawdata_activitySPRH <- Rawdata_activity %>% filter(Conditions=='aspeech', Hemisphere == 'R' )
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub_ID), Rawdat
a_activitySPRH, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelF.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activitySPRH
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##      354      374     -172      344      398
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.2319 -0.5399 -0.0227  0.4978  3.6771
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01484  0.1218
##  Residual             0.12645  0.3556
## Number of obs: 403, groups:  sub_ID, 57
##
## Fixed effects:
##              Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.008654   0.032575 154.318497  -0.266    0.791
## FchannelCH4  -0.004658   0.035503 350.149843  -0.131    0.896
## TimesDur      0.006469   0.002594 392.293020   2.494    0.013 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.527
## TimesDur    -0.390 -0.030

anova(ModelF.condition.slopeinterp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## Fchannel 0.00218 0.00218     1 350.15  0.0172 0.89569
## TimesDur 0.78664 0.78664     1 392.29  6.2207 0.01304 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##            SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## Fchannel 0.00218 0.00218     1 350.15 0.0172 0.89569   0.0000492
## TimesDur 0.78664 0.78664     1 392.29 6.2207 0.01304   0.0156099
```

noise-LH

```
# best fit
Rawdata_activityNOLH <- Rawdata_activity %>% filter(Conditions=='babble', Hemisphere == 'L' )
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub_ID), Rawdat
a_activityNOLH, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelF.condition.slopeinterp.Times1.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activityNOLH
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    422.5    442.0   -206.2    412.5      362
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.1286 -0.5705  0.1005  0.5709  2.8468
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02925  0.1710
##  Residual             0.16009  0.4001
## Number of obs: 367, groups:  sub_ID, 57
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.021268   0.041280 138.089883  -0.515    0.607
## FchannelCH4   0.047554   0.041878 311.586278   1.136    0.257
## TimesDur     -0.003636   0.003015 356.522655  -1.206    0.229
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.515
## TimesDur    -0.410  0.017
```

```r
anova(ModelF.condition.slopeinterp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##           Sum Sq Mean Sq NumDF  DenDF F value Pr(>F)
## Fchannel 0.20643 0.20643     1 311.59  1.2894 0.2570
## TimesDur 0.23286 0.23286     1 356.52  1.4546 0.2286
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##            SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## Fchannel 0.20643 0.20643     1 311.59 1.2894 0.25702   0.0041213
## TimesDur 0.23286 0.23286     1 356.52 1.4546 0.22859   0.0040633
```

noise-RH

```r
# best fit
Rawdata_activityNORH <- Rawdata_activity %>% filter(Conditions=='babble', Hemisphere == 'R' )
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub_ID), Rawdat
a_activityNORH, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelF.condition.slopeinterp.Times1.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activityNORH
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    431.5    451.6   -210.8    421.5      401
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6401 -0.5569  0.0104  0.5616  3.9613
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.03019  0.1737
##  Residual             0.14608  0.3822
## Number of obs: 406, groups:  sub_ID, 57
##
## Fixed effects:
##               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)  -0.017790   0.038252 119.148654  -0.465    0.643
## FchannelCH4   0.004025   0.038011 344.641897   0.106    0.916
## TimesDur     -0.002129   0.002837 405.932380  -0.750    0.453
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.484
## TimesDur    -0.362 -0.021
```

```r
anova(ModelF.condition.slopeinterp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##            Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## Fchannel 0.001638 0.001638     1 344.64  0.0112 0.9157
## TimesDur 0.082272 0.082272     1 405.93  0.5632 0.4534
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## Fchannel 0.001638 0.001638     1 344.64 0.0112 0.91573  0.00003253
## TimesDur 0.082272 0.082272     1 405.93 0.5632 0.45341  0.00138549
```

AG

```r
# M1:Random-intercept-with-poly1
ModelAG.condition.interp.Times1 <- lmer(AGvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
 Hemisphere*TimesDur + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.om
it)

# M2:Random-intercept-and-slope-with-poly1
ModelAG.condition.slopeinterp.Times1 <-lmer(AGvalues ~ Conditions*Hemisphere + Conditions*TimesD
ur + Hemisphere*TimesDur +  (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,n
a.action=na.omit)

# M3:Random-intercept-with-poly2
ModelAG.condition.interp.Times2 <- lmer(AGvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
  Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +  (1|sub_ID), Rawd
ata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelAG.condition.slopeinterp.Times2 <- lmer(AGvalues ~ Conditions*Hemisphere + Conditions*Times
Dur +  Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1+TimesDur|
sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelAG.condition.interp.Times3 <- lmer(AGvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
 Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I(Times
Dur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,n
a.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelAG.condition.slopeinterp.Times3 <- lmer(AGvalues ~ Conditions*Hemisphere + Conditions*Times
Dur + Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I
(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,cont
rol = ctrl,na.action=na.omit)

# model contrast
anova(ModelAG.condition.interp.Times1,ModelAG.condition.interp.Times2)
```

```
## Data: Rawdata_activity
## Models:
```

```
## ModelAG.condition.interp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelAG.condition.interp.Times1    9 716.45 759.08 -349.23   698.45
## ModelAG.condition.interp.Times2   12 719.89 776.72 -347.95   695.89 2.5593
##                                 Df Pr(>Chisq)
## ModelAG.condition.interp.Times1
## ModelAG.condition.interp.Times2  3     0.4647
```

```
anova(ModelAG.condition.interp.Times2,ModelAG.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelAG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelAG.condition.interp.Times2   12 719.89 776.72 -347.95   695.89
## ModelAG.condition.interp.Times3   15 723.50 794.54 -346.75   693.50 2.3949
##                                 Df Pr(>Chisq)
## ModelAG.condition.interp.Times2
## ModelAG.condition.interp.Times3  3     0.4946
```

```
anova(ModelAG.condition.interp.Times1,ModelAG.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.interp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelAG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelAG.condition.interp.Times1    9 716.45 759.08 -349.23   698.45
## ModelAG.condition.interp.Times3   15 723.50 794.54 -346.75   693.50 4.9542
##                                 Df Pr(>Chisq)
```

```
## ModelAG.condition.interp.Times1
## ModelAG.condition.interp.Times3  6     0.5497
```

```
anova(ModelAG.condition.slopeinterp.Times1,ModelAG.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.slopeinterp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
## ModelAG.condition.slopeinterp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelAG.condition.slopeinterp.Times1   11 720.26 772.35 -349.13   698.26
## ModelAG.condition.slopeinterp.Times2   14 723.76 790.07 -347.88   695.76
##                                        Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times1
## ModelAG.condition.slopeinterp.Times2 2.4969  3     0.4759
```

```
anova(ModelAG.condition.slopeinterp.Times2,ModelAG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.slopeinterp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelAG.condition.slopeinterp.Times2   14 723.76 790.07 -347.88   695.76
## ModelAG.condition.slopeinterp.Times3   17 727.21 807.72 -346.61   693.21
##                                       Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times2
## ModelAG.condition.slopeinterp.Times3 2.552  3      0.466
```

```
anova(ModelAG.condition.slopeinterp.Times1,ModelAG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.slopeinterp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
```

```
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelAG.condition.slopeinterp.Times1    11 720.26 772.35 -349.13   698.26
## ModelAG.condition.slopeinterp.Times3    17 727.21 807.72 -346.61   693.21
##                                         Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times1
## ModelAG.condition.slopeinterp.Times3 5.0489  6     0.5376
```

```
anova(ModelAG.condition.interp.Times1,ModelAG.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.interp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelAG.condition.slopeinterp.Times1: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelAG.condition.interp.Times1         9 716.45 759.08 -349.23   698.45
## ModelAG.condition.slopeinterp.Times1   11 720.26 772.35 -349.13   698.26
##                                         Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times1
## ModelAG.condition.slopeinterp.Times1 0.1925  2     0.9083
```

```
anova(ModelAG.condition.interp.Times2,ModelAG.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelAG.condition.slopeinterp.Times2: AGvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelAG.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                        npar    AIC    BIC  logLik deviance
## ModelAG.condition.interp.Times2         12 719.89 776.72 -347.95   695.89
## ModelAG.condition.slopeinterp.Times2    14 723.76 790.07 -347.88   695.76
##                                         Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times2
## ModelAG.condition.slopeinterp.Times2 0.1301  2      0.937
```

```
anova(ModelAG.condition.interp.Times3,ModelAG.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelAG.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelAG.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelAG.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions * Hemisphere + Conditions * Times
```

```
Dur +
## ModelAG.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
## ModelAG.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelAG.condition.interp.Times3         15 723.50 794.54 -346.75   693.50
## ModelAG.condition.slopeinterp.Times3    17 727.21 807.72 -346.61   693.21
##                                        Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times3
## ModelAG.condition.slopeinterp.Times3 0.2872  2     0.8662

# best fit
ModelAG.condition.slopeinterp.Times1.N <- lmer(AGvalues ~ Hemisphere + Conditions + TimesDur +
(1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelAG.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: AGvalues ~ Hemisphere + Conditions + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    712.1    740.5   -350.1    700.1      836
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.7194 -0.5824  0.0117  0.5561  3.7831
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.005541 0.07443
##  Residual             0.130184 0.36081
## Number of obs: 842, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -5.900e-03  2.556e-02  2.924e+02  -0.231    0.818
## HemisphereR       2.080e-02  2.487e-02  7.891e+02   0.836    0.403
## Conditionsbabble  2.947e-04  2.487e-02  7.891e+02   0.012    0.991
## TimesDur         -1.891e-04  1.791e-03  6.531e+02  -0.106    0.916
##
## Correlation of Fixed Effects:
##             (Intr) HmsphR Cndtns
## HemisphereR -0.486
## Condtnsbbbl -0.487  0.000
## TimesDur    -0.359 -0.002 -0.001

anova(ModelAG.condition.slopeinterp.Times1.N)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## Hemisphere 0.091080 0.091080     1 789.13  0.6996 0.4032
```

```
## Conditions 0.000018 0.000018     1 789.12  0.0001 0.9905
## TimesDur   0.001452 0.001452     1 653.06  0.0112 0.9159

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelAG.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## Hemisphere 0.091080 0.091080     1 789.13 0.6996 0.40316  0.00088579
## Conditions 0.000018 0.000018     1 789.12 0.0001 0.99055  0.00000018
## TimesDur   0.001452 0.001452     1 653.06 0.0112 0.91592  0.00001708
```

FA

```
# M1:Random-intercept-with-poly1
ModelFA.condition.interp.Times1 <- lmer(FAvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
 Hemisphere*TimesDur + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.om
it)

# M2:Random-intercept-and-slope-with-poly1
ModelFA.condition.slopeinterp.Times1 <-lmer(FAvalues ~ Conditions*Hemisphere + Conditions*TimesD
ur + Hemisphere*TimesDur +  (1+TimesDur|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,n
a.action=na.omit)

# M3:Random-intercept-with-poly2
ModelFA.condition.interp.Times2 <- lmer(FAvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
  Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) +  (1|sub_ID), Rawd
ata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M4:Random-intercept-slope-with-poly2
ModelFA.condition.slopeinterp.Times2 <- lmer(FAvalues ~ Conditions*Hemisphere + Conditions*Times
Dur +  Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + (1+TimesDur|
sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

# M5:Random-intercept-with-poly3
ModelFA.condition.interp.Times3 <- lmer(FAvalues ~ Conditions*Hemisphere + Conditions*TimesDur +
 Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I(Times
Dur^3) + Hemisphere*I(TimesDur^3) + (1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,n
a.action=na.omit)

# M6:Random-intercept-and-slope-with-poly3
ModelFA.condition.slopeinterp.Times3 <- lmer(FAvalues ~ Conditions*Hemisphere + Conditions*Times
Dur + Hemisphere*TimesDur +  Conditions*I(TimesDur^2) + Hemisphere*I(TimesDur^2) + Conditions*I
(TimesDur^3) + Hemisphere*I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,cont
rol = ctrl,na.action=na.omit)

# model contrast
anova(ModelFA.condition.interp.Times1,ModelFA.condition.interp.Times2)

## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +
```

```
## ModelFA.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelFA.condition.interp.Times1    9 928.86 971.49 -455.43   910.86
## ModelFA.condition.interp.Times2   12 933.86 990.70 -454.93   909.86 1.0003
##                                 Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.interp.Times2  3     0.8012
```

```
anova(ModelFA.condition.interp.Times2,ModelFA.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelFA.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC    BIC  logLik deviance  Chisq
## ModelFA.condition.interp.Times2   12 933.86  990.7 -454.93   909.86
## ModelFA.condition.interp.Times3   15 937.87 1008.9 -453.94   907.87 1.9856
##                                 Df Pr(>Chisq)
## ModelFA.condition.interp.Times2
## ModelFA.condition.interp.Times3  3     0.5754
```

```
anova(ModelFA.condition.interp.Times1,ModelFA.condition.interp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelFA.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
##                                 npar    AIC     BIC  logLik deviance
## ModelFA.condition.interp.Times1    9 928.86  971.49 -455.43   910.86
## ModelFA.condition.interp.Times3   15 937.87 1008.93 -453.94   907.87
##                                  Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.interp.Times3 2.9859  6     0.8106
```

```
anova(ModelFA.condition.slopeinterp.Times1,ModelFA.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.slopeinterp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
## ModelFA.condition.slopeinterp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelFA.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                       npar    AIC     BIC  logLik deviance
## ModelFA.condition.slopeinterp.Times1   11 932.84  984.95 -455.42   910.84
## ModelFA.condition.slopeinterp.Times2   14 937.85 1004.16 -454.92   909.85
##                                        Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times1
## ModelFA.condition.slopeinterp.Times2 0.9965  3     0.8021
```

```
anova(ModelFA.condition.slopeinterp.Times2,ModelFA.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.slopeinterp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelFA.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC    BIC  logLik deviance
## ModelFA.condition.slopeinterp.Times2   14 937.85 1004.2 -454.92   909.85
## ModelFA.condition.slopeinterp.Times3   17 941.76 1022.3 -453.88   907.76
##                                        Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times2
## ModelFA.condition.slopeinterp.Times3 2.0903  3     0.5539
```

```
anova(ModelFA.condition.slopeinterp.Times1,ModelFA.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.slopeinterp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                       npar    AIC     BIC  logLik deviance
## ModelFA.condition.slopeinterp.Times1   11 932.84  984.95 -455.42   910.84
```

```
## ModelFA.condition.slopeinterp.Times3   17 941.76 1022.29 -453.88   907.76
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times1
## ModelFA.condition.slopeinterp.Times3 3.0868  6     0.7979
```

```
anova(ModelFA.condition.interp.Times1,ModelFA.condition.slopeinterp.Times1)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times1:     Hemisphere * TimesDur + (1 | sub_ID)
## ModelFA.condition.slopeinterp.Times1: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times1:     Hemisphere * TimesDur + (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelFA.condition.interp.Times1         9 928.86 971.49 -455.43   910.86
## ModelFA.condition.slopeinterp.Times1   11 932.84 984.95 -455.42   910.84
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.slopeinterp.Times1 0.0165  2     0.9918
```

```
anova(ModelFA.condition.interp.Times2,ModelFA.condition.slopeinterp.Times2)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times2:     I(TimesDur^2) + (1 | sub_ID)
## ModelFA.condition.slopeinterp.Times2: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times2:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
## ModelFA.condition.slopeinterp.Times2:     I(TimesDur^2) + (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelFA.condition.interp.Times2        12 933.86  990.7 -454.93   909.86
## ModelFA.condition.slopeinterp.Times2   14 937.85 1004.2 -454.92   909.85
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times2
## ModelFA.condition.slopeinterp.Times2 0.0127  2     0.9937
```

```
anova(ModelFA.condition.interp.Times3,ModelFA.condition.slopeinterp.Times3)
```

```
## Data: Rawdata_activity
## Models:
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * TimesDur +

## ModelFA.condition.interp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2) + Hem
isphere *
## ModelFA.condition.interp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisphere
*
## ModelFA.condition.interp.Times3:     I(TimesDur^3) + (1 | sub_ID)
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions * Hemisphere + Conditions * Times
Dur +
## ModelFA.condition.slopeinterp.Times3:     Hemisphere * TimesDur + Conditions * I(TimesDur^2)
+ Hemisphere *
```

```
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^2) + Conditions * I(TimesDur^3) + Hemisp
here *
## ModelFA.condition.slopeinterp.Times3:     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##                                      npar    AIC    BIC  logLik deviance
## ModelFA.condition.interp.Times3        15 937.87 1008.9 -453.94   907.87
## ModelFA.condition.slopeinterp.Times3   17 941.76 1022.3 -453.88   907.76
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times3
## ModelFA.condition.slopeinterp.Times3 0.1174  2      0.943
```

```
# best fit
ModelFA.condition.slopeinterp.Times1.N <- lmer(FAvalues ~ Hemisphere + Conditions + TimesDur +
(1|sub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

summary(ModelFA.condition.slopeinterp.Times1.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: FAvalues ~ Hemisphere + Conditions + TimesDur + (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    923.3    951.7   -455.7    911.3      837
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1860 -0.5803 -0.0180  0.5963  3.4165
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01281  0.1132
##  Residual             0.16405  0.4050
## Number of obs: 843, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       2.250e-02  3.050e-02  2.230e+02   0.738    0.461
## HemisphereR      -3.084e-02  2.790e-02  7.858e+02  -1.105    0.269
## Conditionsbabble  9.438e-03  2.790e-02  7.858e+02   0.338    0.735
## TimesDur         -2.064e-04  2.063e-03  7.357e+02  -0.100    0.920
##
## Correlation of Fixed Effects:
##             (Intr) HmsphR Cndtns
## HemisphereR -0.458
## Condtnsbbbl -0.458  0.001
## TimesDur    -0.340 -0.002 -0.002
```

```
anova(ModelFA.condition.slopeinterp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## Hemisphere 0.200473 0.200473     1 785.77  1.2220 0.2693
## Conditions 0.018773 0.018773     1 785.77  0.1144 0.7352
## TimesDur   0.001642 0.001642     1 735.65  0.0100 0.9203
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
```

```
ResultsANOV <- anova(ModelFA.condition.slopeinterp.Times1.N)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## Hemisphere 0.200473 0.200473     1 785.77 1.2220 0.26930  0.00155276
## Conditions 0.018773 0.018773     1 785.77 0.1144 0.73525  0.00014561
## TimesDur   0.001642 0.001642     1 735.65 0.0100 0.92033  0.00001361
```

NH Adults vs. CI children (average times)

ATL-LH

```
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_LH <- Rawdata_NHCI %>% filter(Hemisphere=='L')
ModelLT.condition.interp.Times <- lmer(Tvalues ~ Tchannel + GROUP*Conditions + (1|sub_ID),Rawdat
a_NHCI_LH,REML = FALSE,na.action=na.omit)
summary(ModelLT.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_LH
##
##      AIC      BIC   logLik deviance df.resid
##   -141.0   -106.5     78.5   -157.0      542
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.2288 -0.4809  0.0259  0.5590  3.2545
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01354  0.1164
##  Residual             0.03616  0.1901
## Number of obs: 550, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error        df t value
## (Intercept)                      0.06324    0.02410 239.90893   2.624
## TchannelCH5                     -0.04567    0.01982 458.15550  -2.304
## TchannelCH8                      0.03153    0.01990 459.01718   1.585
## GROUPNH_adult                   -0.09291    0.03438 154.56784  -2.703
## Conditionsbabble                -0.05188    0.02062 458.15550  -2.515
## GROUPNH_adult:Conditionsbabble   0.14027    0.03338 458.15550   4.202
##                                Pr(>|t|)
## (Intercept)                     0.00924 **
## TchannelCH5                     0.02168 *
## TchannelCH8                     0.11366
## GROUPNH_adult                   0.00765 **
## Conditionsbabble                0.01224 *
## GROUPNH_adult:Conditionsbabble 3.18e-05 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8 GROUPNH_d Cndtns
## TchannelCH5 -0.411
## TchannelCH8 -0.409  0.498
## GROUPNH_dlt -0.543  0.000 -0.002
## Condtnsbbbl -0.428  0.000  0.000  0.300
## GROUPNH_d:C  0.264  0.000  0.000 -0.485    -0.618
```

```
anova(ModelLT.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                   Sum Sq Mean Sq NumDF  DenDF F value    Pr(>F)
## Tchannel         0.55106 0.27553     2 458.73  7.6205  0.000555 ***
## GROUP            0.02076 0.02076     1  92.03  0.5742  0.450528
## Conditions       0.04328 0.04328     1 458.16  1.1969  0.274514
## GROUP:Conditions 0.63855 0.63855     1 458.16 17.6606 3.175e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOVA <- anova(ModelLT.condition.interp.Times)
colnames(ResultsANOVA) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOVA %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                    SumSq  MeanSq NumDF  DenDF       F      Pr eta_partial
## Tchannel         0.55106 0.27553     2 458.73  7.6205 0.00055    0.032156
## GROUP            0.02076 0.02076     1  92.03  0.5742 0.45053    0.006200
## Conditions       0.04328 0.04328     1 458.16  1.1969 0.27451    0.002606
## GROUP:Conditions 0.63855 0.63855     1 458.16 17.6606 0.00003    0.037116
```

CI children(averaged)-ATL-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLT.condition.interp.Times_CI <- lmer(Tvalues ~ Tchannel + Conditions +  (1|sub_ID),Rawdata_
NHCI_CI_LT,REML = FALSE,na.action=na.omit)
summary(ModelLT.condition.interp.Times_CI)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_LT
##
##      AIC      BIC   logLik deviance df.resid
##    -46.4    -23.5     29.2    -58.4      334
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.97146 -0.60111  0.02644  0.53921  3.07069
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
```

```
##  sub_ID   (Intercept) 0.01365  0.1168
##  Residual             0.04105  0.2026
## Number of obs: 340, groups:  sub_ID, 57
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)        0.05914    0.02684 189.90709   2.204   0.0288 *
## TchannelCH5       -0.03774    0.02684 283.17171  -1.406   0.1607
## TchannelCH8        0.03597    0.02699 284.08909   1.333   0.1837
## Conditionsbabble  -0.05188    0.02198 283.17171  -2.361   0.0189 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8
## TchannelCH5 -0.500
## TchannelCH8 -0.497  0.497
## Condtnsbbbl -0.409  0.000  0.000
```

```
anova(ModelLT.condition.interp.Times_CI)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value  Pr(>F)
## Tchannel   0.30636 0.15318     2 283.78  3.7315 0.02514 *
## Conditions 0.22875 0.22875     1 283.17  5.5722 0.01893 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLT.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F       Pr eta_partial
## Tchannel   0.30636 0.15318     2 283.78 3.7315 0.025141    0.025624
## Conditions 0.22875 0.22875     1 283.17 5.5722 0.018926    0.019298
```

NH adult-ATL-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLT.condition.interp.Times_NH <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub_ID),Rawdata_N
HCI_NH_LT,REML = FALSE,na.action=na.omit)
summary(ModelLT.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_LT
##
##      AIC      BIC   logLik deviance df.resid
##    -94.4    -74.3     53.2   -106.4      204
##
## Scaled residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -3.5871 -0.4214 -0.0190  0.5744  3.3895
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01337  0.1156
##  Residual             0.02818  0.1679
## Number of obs: 210, groups:  sub_ID, 35
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)       -0.02298    0.03031  98.84390  -0.758 0.450139
## TchannelCH5       -0.05858    0.02838 175.00000  -2.064 0.040470 *
## TchannelCH8        0.02440    0.02838 175.00000   0.860 0.391134
## Conditionsbabble   0.08839    0.02317 175.00000   3.815 0.000189 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8
## TchannelCH5 -0.468
## TchannelCH8 -0.468  0.500
## Condtnsbbbl -0.382  0.000  0.000
```

```r
anova(ModelLT.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)
## Tchannel   0.25458 0.12729     2   175  4.5165 0.0122303 *
## Conditions 0.41019 0.41019     1   175 14.5543 0.0001886 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLT.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF DenDF       F        Pr eta_partial
## Tchannel   0.25458 0.12729     2   175  4.5165 0.0122303    0.049084
## Conditions 0.41019 0.41019     1   175 14.5543 0.0001886    0.076782
```

ATL-RH

```r
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_RH <- Rawdata_NHCI %>% filter(Hemisphere=='R')
ModelRT.condition.interp.Times <- lmer(Tvalues ~ Tchannel + GROUP*Conditions + (1|sub_ID),Rawdat
a_NHCI_RH,REML = FALSE,na.action=na.omit)
summary(ModelRT.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_RH
```

```
##
##      AIC      BIC   logLik deviance df.resid
##    -31.6      2.9     23.8    -47.6      543
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.8805 -0.5231 -0.0016  0.5117  5.1267
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01990  0.1411
##  Residual             0.04303  0.2074
## Number of obs: 551, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error        df t value
## (Intercept)                      0.08632    0.02751 218.06761   3.138
## TchannelCH5                      0.03623    0.02163 459.03533   1.675
## TchannelCH8                      0.03733    0.02166 459.17781   1.723
## GROUPNH_adult                   -0.07371    0.03974 145.06008  -1.855
## Conditionsbabble                -0.03459    0.02247 459.18860  -1.539
## GROUPNH_adult:Conditionsbabble   0.12360    0.03639 459.09377   3.396
##                                Pr(>|t|)
## (Intercept)                    0.001937 **
## TchannelCH5                    0.094593 .
## TchannelCH8                    0.085499 .
## GROUPNH_adult                  0.065654 .
## Conditionsbabble               0.124454
## GROUPNH_adult:Conditionsbabble 0.000743 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8 GROUPNH_d Cndtns
## TchannelCH5 -0.393
## TchannelCH8 -0.393  0.499
## GROUPNH_dlt -0.550  0.000  0.000
## Condtnsbbbl -0.408  0.000  0.003  0.282
## GROUPNH_d:C  0.252  0.000 -0.002 -0.457    -0.617
```

```
anova(ModelRT.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                   Sum Sq Mean Sq NumDF  DenDF F value   Pr(>F)
## Tchannel         0.16585 0.08292     2 459.13  1.9271 0.146747
## GROUP            0.00489 0.00489     1  91.99  0.1135 0.736922
## Conditions       0.09622 0.09622     1 459.09  2.2362 0.135497
## GROUP:Conditions 0.49628 0.49628     1 459.09 11.5332 0.000743 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRT.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                    SumSq  MeanSq NumDF  DenDF       F      Pr eta_partial
## Tchannel         0.16585 0.08292     2 459.13  1.9271 0.14675   0.0083246
## GROUP            0.00489 0.00489     1  91.99  0.1135 0.73692   0.0012326
## Conditions       0.09622 0.09622     1 459.09  2.2362 0.13550   0.0048473
## GROUP:Conditions 0.49628 0.49628     1 459.09 11.5332 0.00074   0.0245061
```

CI children(averaged)-ATL-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRT.condition.interp.Times_CI <- lmer(Tvalues ~ Tchannel + Conditions +  (1|sub_ID),Rawdata_
NHCI_CI_RT,REML = FALSE,na.action=na.omit)
summary(ModelRT.condition.interp.Times_CI)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_RT
##
##      AIC      BIC   logLik deviance df.resid
##     59.4     82.4    -23.7     47.4      335
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.4815 -0.5120 -0.0232  0.5013  4.5756
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.02521  0.1588
##  Residual             0.05383  0.2320
## Number of obs: 341, groups:  sub_ID, 57
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)        0.08788    0.03275 161.91936   2.683  0.00805 **
## TchannelCH5        0.03114    0.03073 284.04810   1.013  0.31178
## TchannelCH8        0.03776    0.03081 284.18962   1.226  0.22140
## Conditionsbabble  -0.03458    0.02513 284.14261  -1.376  0.17000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8
## TchannelCH5 -0.469
## TchannelCH8 -0.470  0.499
## Condtnsbbbl -0.384  0.000  0.004

anova(ModelRT.condition.interp.Times_CI)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## Tchannel   0.092427 0.046213     2 284.14  0.8585 0.4249
## Conditions 0.101873 0.101873     1 284.14  1.8926 0.1700

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
```

```r
ResultsANOV <- anova(ModelRT.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq   MeanSq NumDF  DenDF      F      Pr eta_partial
## Tchannel   0.092427 0.046213     2 284.14 0.8585 0.42488   0.0060067
## Conditions 0.101873 0.101873     1 284.14 1.8926 0.17000   0.0066165
```

NH adult-ATL-RH

```r
# best fit
# M1:Random-intercept-with-poly1
ModelRT.condition.interp.Times_NH <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub_ID),Rawdata_N
HCI_NH_RT,REML = FALSE,na.action=na.omit)
summary(ModelRT.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_RT
##
##      AIC      BIC   logLik deviance df.resid
##   -117.5    -97.4     64.7   -129.5      204
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.74988 -0.59168  0.04882  0.53634  2.92216
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01125  0.1061
##  Residual             0.02547  0.1596
## Number of obs: 210, groups:  sub_ID, 35
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)        0.01008    0.02840 102.35949   0.355    0.723
## TchannelCH5        0.04451    0.02698 175.00000   1.650    0.101
## TchannelCH8        0.03666    0.02698 175.00000   1.359    0.176
## Conditionsbabble   0.08901    0.02203 175.00000   4.041 7.96e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8
## TchannelCH5 -0.475
## TchannelCH8 -0.475  0.500
## Condtnsbbbl -0.388  0.000  0.000
```

```r
anova(ModelRT.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF DenDF F value    Pr(>F)
## Tchannel   0.07904 0.03952     2   175  1.5514    0.2149
## Conditions 0.41597 0.41597     1   175 16.3301 7.958e-05 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRT.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF DenDF       F      Pr eta_partial
## Tchannel   0.07904 0.03952     2   175  1.5514 0.21485    0.017421
## Conditions 0.41597 0.41597     1   175 16.3301 0.00008    0.085350
```

Spt-LH

```
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_LH <- Rawdata_NHCI %>% filter(Hemisphere=='L')
ModelSptLH.condition.interp.Times <- lmer(Sptvalues ~ Sptchannel + GROUP*Conditions + (1|sub_I
D),Rawdata_NHCI_LH,REML = FALSE,na.action=na.omit)
summary(ModelSptLH.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_LH
##
##      AIC      BIC   logLik deviance df.resid
##   -224.9   -197.6    119.5   -238.9      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4035 -0.5378 -0.0232  0.5342  3.6715
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.009503 0.09748
##  Residual             0.024148 0.15540
## Number of obs: 368, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    -0.014942   0.021075 215.722070  -0.709
## SptchannelCH9                   0.010471   0.016201 276.000000   0.646
## GROUPNH_adult                  -0.013233   0.031544 168.870345  -0.420
## Conditionsbabble                0.037763   0.020583 276.000000   1.835
## GROUPNH_adult:Conditionsbabble  0.002229   0.033371 276.000000   0.067
##                                Pr(>|t|)
## (Intercept)                      0.4791
## SptchannelCH9                    0.5186
## GROUPNH_adult                    0.6754
## Conditionsbabble                 0.0676 .
## GROUPNH_adult:Conditionsbabble   0.9468
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Correlation of Fixed Effects:
##             (Intr) SptCH9 GROUPNH_d Cndtns
## SptchnnlCH9 -0.384
## GROUPNH_dlt -0.569  0.000
## Condtnsbbbl -0.488  0.000  0.326
## GROUPNH_d:C  0.301  0.000 -0.529    -0.617
```

```
anova(ModelSptLH.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Sptchannel       0.010088 0.010088     1   276  0.4177 0.51861
## GROUP            0.004949 0.004949     1    92  0.2049 0.65183
## Conditions       0.131101 0.131101     1   276  5.4290 0.02053 *
## GROUP:Conditions 0.000108 0.000108     1   276  0.0045 0.94680
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSptLH.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                      SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Sptchannel       0.010088 0.010088     1   276 0.4177 0.51861   0.0015112
## GROUP            0.004949 0.004949     1    92 0.2049 0.65183   0.0022226
## Conditions       0.131101 0.131101     1   276 5.4290 0.02053   0.0192908
## GROUP:Conditions 0.000108 0.000108     1   276 0.0045 0.94680   0.0000162
```

CI children(averaged)-Spt-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLSpt.condition.interp.Times_CI <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub_ID),Raw
data_NHCI_CI_LH,REML = FALSE,na.action=na.omit)
summary(ModelLSpt.condition.interp.Times_CI)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_LH
##
##      AIC      BIC   logLik deviance df.resid
##    -70.6    -53.4     40.3    -80.6      223
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.1071 -0.5936 -0.0427  0.5801  3.2009
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01277  0.1130
##  Residual             0.03247  0.1802
## Number of obs: 228, groups:  sub_ID, 57
```

```
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       -0.008772   0.025520 149.854316  -0.344    0.732
## SptchannelCH9     -0.001870   0.023866 171.000000  -0.078    0.938
## Conditionsbabble   0.037763   0.023866 171.000000   1.582    0.115
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9
## SptchnnlCH9 -0.468
## Condtnsbbbl -0.468  0.000
```

```
anova(ModelLSpt.condition.interp.Times_CI)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value Pr(>F)
## Sptchannel 0.000199 0.000199     1   171  0.0061 0.9377
## Conditions 0.081283 0.081283     1   171  2.5036 0.1154
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOVA <- anova(ModelLSpt.condition.interp.Times_CI)
colnames(ResultsANOVA) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOVA %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Sptchannel 0.000199 0.000199     1   171 0.0061 0.93765   0.0000359
## Conditions 0.081283 0.081283     1   171 2.5036 0.11544   0.0144296
```

NH adult-Spt-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLSpt.condition.interp.Times_NH <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub_ID),Raw
data_NHCI_NH_LH,REML = FALSE,na.action=na.omit)
summary(ModelLSpt.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_LH
##
##      AIC      BIC   logLik deviance df.resid
##   -198.3   -183.6    104.1   -208.3      135
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.3988 -0.4722 -0.0615  0.6494  2.3126
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.004235 0.06508
##  Residual             0.010384 0.10190
## Number of obs: 140, groups:  sub_ID, 35
##
```

```
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)       -0.03822    0.01853  90.91663  -2.062   0.0420 *
## SptchannelCH9      0.03057    0.01722 105.00000   1.775   0.0788 .
## Conditionsbabble   0.03999    0.01722 105.00000   2.322   0.0222 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9
## SptchnnlCH9 -0.465
## Condtnsbbbl -0.465  0.000
```

```
anova(ModelLSpt.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Sptchannel 0.032707 0.032707     1   105  3.1498 0.07883 .
## Conditions 0.055977 0.055977     1   105  5.3908 0.02217 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLSpt.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F       Pr eta_partial
## Sptchannel 0.032707 0.032707     1   105 3.1498 0.078832    0.029125
## Conditions 0.055977 0.055977     1   105 5.3908 0.022173    0.048834
```

Spt-RH

```
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_RH <- Rawdata_NHCI %>% filter(Hemisphere=='R')
ModelSptRH.condition.interp.Times <- lmer(Sptvalues ~ Sptchannel + GROUP*Conditions + (1|sub_I
D),Rawdata_NHCI_RH,REML = FALSE,na.action=na.omit)
summary(ModelSptRH.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_RH
##
##      AIC      BIC   logLik deviance df.resid
##   -218.5   -191.1    116.2   -232.5      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.5384 -0.5236 -0.0018  0.5187  3.6534
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.004764 0.06902
```

```
##  Residual             0.027265 0.16512
## Number of obs: 368, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                     0.031735   0.019921 269.399653   1.593
## SptchannelCH9                  -0.029180   0.017215 276.000000  -1.695
## GROUPNH_adult                  -0.060368   0.029127 208.137662  -2.073
## Conditionsbabble               -0.009126   0.021871 276.000000  -0.417
## GROUPNH_adult:Conditionsbabble  0.089337   0.035459 276.000000   2.519
##                                Pr(>|t|)
## (Intercept)                      0.1123
## SptchannelCH9                    0.0912 .
## GROUPNH_adult                    0.0394 *
## Conditionsbabble                 0.6768
## GROUPNH_adult:Conditionsbabble   0.0123 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9 GROUPNH_d Cndtns
## SptchnnlCH9 -0.432
## GROUPNH_dlt -0.556  0.000
## Condtnsbbbl -0.549  0.000  0.375
## GROUPNH_d:C  0.339  0.000 -0.609    -0.617
```

```
anova(ModelSptRH.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Sptchannel       0.078337 0.078337     1   276  2.8732 0.09119 .
## GROUP            0.012583 0.012583     1    92  0.4615 0.49863
## Conditions       0.109578 0.109578     1   276  4.0191 0.04597 *
## GROUP:Conditions 0.173070 0.173070     1   276  6.3478 0.01232 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSptRH.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Sptchannel       0.078337 0.078337     1   276 2.8732 0.09119   0.0103029
## GROUP            0.012583 0.012583     1    92 0.4615 0.49863   0.0049912
## Conditions       0.109578 0.109578     1   276 4.0191 0.04597   0.0143528
## GROUP:Conditions 0.173070 0.173070     1   276 6.3478 0.01232   0.0224821
```

CI children(averaged)-Spt-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRSpt.condition.interp.Times_CI <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub_ID),Raw
```

```
data_NHCI_CI_RH,REML = FALSE,na.action=na.omit)
summary(ModelRSpt.condition.interp.Times_CI)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_RH
##
##      AIC      BIC   logLik deviance df.resid
##    -56.3    -39.1     33.1    -66.3      223
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.15909 -0.55793 -0.04588  0.52107  3.01313
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.006321 0.0795
##  Residual             0.038604 0.1965
## Number of obs: 228, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)        0.047426   0.024876 186.986876   1.906   0.0581 .
## SptchannelCH9     -0.060563   0.026024 171.000000  -2.327   0.0211 *
## Conditionsbabble  -0.009126   0.026024 171.000000  -0.351   0.7263
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9
## SptchnnlCH9 -0.523
## Condtnsbbbl -0.523  0.000

anova(ModelRSpt.condition.interp.Times_CI)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Sptchannel 0.209071 0.209071     1   171  5.4158 0.02113 *
## Conditions 0.004747 0.004747     1   171  0.1230 0.72628
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRSpt.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Sptchannel 0.209071 0.209071     1   171 5.4158 0.02113   0.0306989
## Conditions 0.004747 0.004747     1   171 0.1230 0.72628   0.0007186
```

NH adult-Spt-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRSpt.condition.interp.Times_NH <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub_ID),Raw
data_NHCI_NH_RH,REML = FALSE,na.action=na.omit)
summary(ModelRSpt.condition.interp.Times_NH)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_RH
##
##      AIC      BIC   logLik deviance df.resid
##   -249.1   -234.4    129.6   -259.1      135
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.3049 -0.5151 -0.0468  0.6009  2.6233
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002581 0.05080
##  Residual             0.007392 0.08598
## Number of obs: 140, groups:  sub_ID, 35
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)       -0.05419    0.01524  95.60127  -3.556 0.000587 ***
## SptchannelCH9      0.02193    0.01453 105.00000   1.509 0.134324
## Conditionsbabble   0.08021    0.01453 105.00000   5.519 2.47e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9
## SptchnnlCH9 -0.477
## Condtnsbbbl -0.477  0.000

anova(ModelRSpt.condition.interp.Times_NH)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value    Pr(>F)
## Sptchannel 0.016831 0.016831     1   105  2.2768    0.1343
## Conditions 0.225187 0.225187     1   105 30.4623 2.473e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRSpt.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq   MeanSq NumDF DenDF       F      Pr eta_partial
```

```
## Sptchannel 0.016831 0.016831     1   105  2.2768 0.13432    0.021224
## Conditions 0.225187 0.225187     1   105 30.4623 0.00000    0.224877
```

SMG-LH

```
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_LH <- Rawdata_NHCI %>% filter(Hemisphere=='L')
ModelSMGLH.condition.interp.Times <- lmer(SMGvalues ~ GROUP*Conditions + (1|sub_ID),Rawdata_NHCI
_LH,REML = FALSE,na.action=na.omit)
summary(ModelSMGLH.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_LH
##
##      AIC      BIC   logLik deviance df.resid
##   -139.5   -120.2     75.7   -151.5      178
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.99857 -0.45304  0.01227  0.52034  2.70586
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.007669 0.08757
##  Residual             0.019153 0.13839
## Number of obs: 184, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                   -1.971e-02  2.169e-02  1.701e+02  -0.909
## GROUPNH_adult                 -5.986e-03  3.517e-02  1.701e+02  -0.170
## Conditionsbabble               6.584e-04  2.592e-02  9.200e+01   0.025
## GROUPNH_adult:Conditionsbabble  4.342e-02  4.203e-02  9.200e+01   1.033
##                                Pr(>|t|)
## (Intercept)                       0.365
## GROUPNH_adult                     0.865
## Conditionsbabble                  0.980
## GROUPNH_adult:Conditionsbabble    0.304
##
## Correlation of Fixed Effects:
##             (Intr) GROUPNH_d Cndtns
## GROUPNH_dlt -0.617
## Condtnsbbbl -0.598  0.369
## GROUPNH_d:C  0.369 -0.598    -0.617

anova(ModelSMGLH.condition.interp.Times)

## Type III Analysis of Variance Table with Satterthwaite's method
##                     Sum Sq   Mean Sq NumDF DenDF F value Pr(>F)
## GROUP            0.0059558 0.0059558     1    92  0.3110 0.5784
## Conditions       0.0217040 0.0217040     1    92  1.1332 0.2899
## GROUP:Conditions 0.0204452 0.0204452     1    92  1.0675 0.3042

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
```

```
ResultsANOV <- anova(ModelSMGLH.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                       SumSq    MeanSq NumDF DenDF      F      Pr
## GROUP             0.0059558 0.0059558     1    92 0.3110 0.57844
## Conditions        0.0217040 0.0217040     1    92 1.1332 0.28988
## GROUP:Conditions 0.0204452 0.0204452     1    92 1.0675 0.30422
##                   eta_partial
## GROUP               0.0033687
## Conditions          0.0121677
## GROUP:Conditions    0.0114701
```

CI children(averaged)-SMG-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLSMG.condition.interp.Times_CI <- lmer(SMGvalues ~ Conditions + (1|sub_ID),Rawdata_NHCI_CI_
LH,REML = FALSE,na.action=na.omit)
summary(ModelLSMG.condition.interp.Times_CI)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_LH
##
##      AIC      BIC   logLik deviance df.resid
##    -65.1    -54.1     36.5    -73.1      110
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.81834 -0.53495  0.02603  0.52720  2.47090
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.009433 0.09713
##  Residual             0.022814 0.15104
## Number of obs: 114, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -1.971e-02  2.379e-02  1.050e+02  -0.829    0.409
## Conditionsbabble  6.584e-04  2.829e-02  5.700e+01   0.023    0.982
##
## Correlation of Fixed Effects:
##             (Intr)
## Condtnsbbbl -0.595
```

```
anova(ModelLSMG.condition.interp.Times_CI)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                Sum Sq    Mean Sq NumDF DenDF F value Pr(>F)
## Conditions 1.2355e-05 1.2355e-05     1    57   5e-04 0.9815
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLSMG.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                 SumSq     MeanSq NumDF DenDF     F      Pr eta_partial
## Conditions 1.2355e-05 1.2355e-05     1    57 5e-04 0.98152  9.5008e-06
```

NH adult-SMG-LH

```r
# best fit
# M1:Random-intercept-with-poly1
ModelLSMG.condition.interp.Times_NH <- lmer(SMGvalues ~ Conditions + (1|sub_ID),Rawdata_NHCI_NH_
LH,REML = FALSE,na.action=na.omit)
summary(ModelLSMG.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_LH
##
##      AIC      BIC   logLik deviance df.resid
##    -77.2    -68.2     42.6    -85.2       66
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.0198 -0.5042 -0.0081  0.5408  2.1220
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.004795 0.06924
##  Residual             0.013190 0.11485
## Number of obs: 70, groups:  sub_ID, 35
##
## Fixed effects:
##                  Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)      -0.02570    0.02267 65.35506  -1.134    0.261
## Conditionsbabble  0.04408    0.02745 35.00000   1.606    0.117
##
## Correlation of Fixed Effects:
##             (Intr)
## Condtnsbbbl -0.606
```

```r
anova(ModelLSMG.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value Pr(>F)
## Conditions 0.034008 0.034008     1    35  2.5783 0.1173
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLSMG.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
```

```r
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Conditions 0.034008 0.034008     1    35 2.5783 0.11733     0.06861
```

SMG-RH

```r
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_RH <- Rawdata_NHCI %>% filter(Hemisphere=='R')
ModelSMGRH.condition.interp.Times <- lmer(SMGvalues ~ GROUP*Conditions + (1|sub_ID),Rawdata_NHCI
_RH,REML = FALSE,na.action=na.omit)
summary(ModelSMGRH.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_RH
##
##      AIC      BIC   logLik deviance df.resid
##    -81.7    -62.4     46.9    -93.7      178
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.70913 -0.48369  0.02815  0.53739  3.03697
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01300  0.1140
##  Residual             0.02451  0.1566
## Number of obs: 184, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    -0.002269   0.025652 164.274340  -0.088
## GROUPNH_adult                  -0.031019   0.041590 164.274340  -0.746
## Conditionsbabble                0.039155   0.029326  92.000000   1.335
## GROUPNH_adult:Conditionsbabble  0.047218   0.047546  92.000000   0.993
##                                Pr(>|t|)
## (Intercept)                       0.930
## GROUPNH_adult                     0.457
## Conditionsbabble                  0.185
## GROUPNH_adult:Conditionsbabble    0.323
##
## Correlation of Fixed Effects:
##             (Intr) GROUPNH_d Cndtns
## GROUPNH_dlt -0.617
## Condtnsbbbl -0.572  0.353
## GROUPNH_d:C  0.353 -0.572    -0.617
```

```r
anova(ModelSMGRH.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                    Sum Sq  Mean Sq NumDF DenDF F value   Pr(>F)
## GROUP            0.001156 0.001156     1    92  0.0471 0.828588
## Conditions       0.170848 0.170848     1    92  6.9702 0.009736 **
```

```
## GROUP:Conditions 0.024173 0.024173     1    92  0.9862 0.323273
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelSMGRH.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## GROUP            0.001156 0.001156     1    92 0.0471 0.82859    0.000512
## Conditions       0.170848 0.170848     1    92 6.9702 0.00974    0.070428
## GROUP:Conditions 0.024173 0.024173     1    92 0.9862 0.32327    0.010606
```

CI children(averaged)-SMG-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRSMG.condition.interp.Times_CI <- lmer(SMGvalues ~ Conditions + (1|sub_ID),Rawdata_NHCI_CI_RH,REML = FALSE,na.action=na.omit)
summary(ModelRSMG.condition.interp.Times_CI)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_RH
##
##      AIC      BIC   logLik deviance df.resid
##    -16.1     -5.1     12.0    -24.1      110
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.33971 -0.53577  0.04901  0.62559  2.61620
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01726  0.1314
##  Residual             0.03319  0.1822
## Number of obs: 114, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       -0.002269   0.029749 102.056524  -0.076    0.939
## Conditionsbabble   0.039155   0.034125  57.000000   1.147    0.256
##
## Correlation of Fixed Effects:
##             (Intr)
## Condtnsbbbl -0.574
```

```
anova(ModelRSMG.condition.interp.Times_CI)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value Pr(>F)
## Conditions 0.043694 0.043694     1    57  1.3165  0.256
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRSMG.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Conditions 0.043694 0.043694     1    57 1.3165 0.25601    0.022576
```

NH adult-SMG-RH

```r
# best fit
# M1:Random-intercept-with-poly1
ModelRSMG.condition.interp.Times_NH <- lmer(SMGvalues ~ Conditions + (1|sub_ID),Rawdata_NHCI_NH_RH,REML = FALSE,na.action=na.omit)
summary(ModelRSMG.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_RH
##
##      AIC      BIC   logLik deviance df.resid
##      -86      -77       47      -94       66
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.33526 -0.43713  0.00395  0.47766  1.59819
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.00606  0.07785
##  Residual             0.01038  0.10188
## Number of obs: 70, groups:  sub_ID, 35
##
## Fixed effects:
##                  Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)      -0.03329    0.02167 61.62486  -1.536  0.12967
## Conditionsbabble  0.08637    0.02435 35.00000   3.547  0.00113 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr)
## Condtnsbbbl -0.562
```

```r
anova(ModelRSMG.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF DenDF F value   Pr(>F)
## Conditions 0.13056 0.13056     1    35  12.579 0.001132 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRSMG.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF DenDF      F        Pr eta_partial
## Conditions 0.13056 0.13056     1    35 12.579 0.0011321     0.26438
```

IFG-LH

```r
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_LH <- Rawdata_NHCI %>% filter(Hemisphere=='L')
ModelLF.condition.interp.Times <- lmer(Fvalues ~ Fchannel + GROUP*Conditions + (1|sub_ID),Rawdata_NHCI_LH,REML = FALSE,na.action=na.omit)
summary(ModelLF.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_LH
##
##      AIC      BIC   logLik deviance df.resid
##     17.4     44.5     -1.7      3.4      351
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.1185 -0.5546 -0.0290  0.6010  2.2023
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01336  0.1156
##  Residual             0.04917  0.2217
## Number of obs: 358, groups:  sub_ID, 90
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    -0.032365   0.028342 236.710184  -1.142
## FchannelCH4                     0.020919   0.023463 269.607559   0.892
## GROUPNH_adult                  -0.008233   0.042765 183.746862  -0.193
## Conditionsbabble                0.009891   0.029370 268.305922   0.337
## GROUPNH_adult:Conditionsbabble  0.098558   0.048739 268.305922   2.022
##                                Pr(>|t|)
## (Intercept)                      0.2546
## FchannelCH4                      0.3734
## GROUPNH_adult                    0.8475
## Conditionsbabble                 0.7366
## GROUPNH_adult:Conditionsbabble   0.0442 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4 GROUPNH_d Cndtns
## FchannelCH4 -0.414
## GROUPNH_dlt -0.552  0.006
```

```
## Condtnsbbbl -0.518  0.000  0.343
## GROUPNH_d:C  0.312  0.000 -0.570    -0.603
```

```
anova(ModelLF.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                    Sum Sq  Mean Sq NumDF   DenDF F value  Pr(>F)
## Fchannel         0.039086 0.039086     1 269.608  0.7949 0.37341
## GROUP            0.067075 0.067075     1  90.429  1.3642 0.24588
## Conditions       0.289862 0.289862     1 268.306  5.8952 0.01584 *
## GROUP:Conditions 0.201057 0.201057     1 268.306  4.0891 0.04415 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLF.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                     SumSq   MeanSq NumDF   DenDF      F      Pr
## Fchannel         0.039086 0.039086     1 269.608 0.7949 0.37341
## GROUP            0.067075 0.067075     1  90.429 1.3642 0.24588
## Conditions       0.289862 0.289862     1 268.306 5.8952 0.01584
## GROUP:Conditions 0.201057 0.201057     1 268.306 4.0891 0.04415
##                  eta_partial
## Fchannel           0.0029398
## GROUP              0.0148614
## Conditions         0.0214997
## GROUP:Conditions   0.0150117
```

CI children-IFG-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLF.condition.interp.Times_CI <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub_ID),Rawdata_N
HCI_CI_LF,REML = FALSE,na.action=na.omit)
summary(ModelLF.condition.interp.Times_CI)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_LF
##
##      AIC      BIC   logLik deviance df.resid
##     14.7     31.8     -2.3      4.7      223
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.43056 -0.59126 -0.05665  0.66967  2.14601
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01665  0.1290
##  Residual             0.04809  0.2193
```

```
## Number of obs: 228, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       -0.043541   0.030410 156.107475  -1.432    0.154
## FchannelCH4        0.043271   0.029046 171.000001   1.490    0.138
## Conditionsbabble   0.009891   0.029046 171.000001   0.341    0.734
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.478
## Condtnsbbbl -0.478  0.000
```

```
anova(ModelLF.condition.interp.Times_CI)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value Pr(>F)
## Fchannel   0.106726 0.106726     1   171  2.2193 0.1381
## Conditions 0.005576 0.005576     1   171  0.1159 0.7339
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLF.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Fchannel   0.106726 0.106726     1   171 2.2193 0.13814   0.0128121
## Conditions 0.005576 0.005576     1   171 0.1159 0.73389   0.0006776
```

NH adult-IFG-LH

```
# best fit
# M1:Random-intercept-with-poly1
ModelLF.condition.interp.Times_NH <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub_ID),Rawdata_N
HCI_NH_LF,REML = FALSE,na.action=na.omit)
summary(ModelLF.condition.interp.Times_NH)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_LF
##
##      AIC      BIC   logLik deviance df.resid
##      5.9     20.2      2.1     -4.1      125
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.3104 -0.4392  0.0569  0.4425  2.1428
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.007734 0.08794
##  Residual             0.050299 0.22427
## Number of obs: 130, groups:  sub_ID, 33
```

```
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)       -0.02129    0.03719 108.32855  -0.573  0.56815
## FchannelCH4       -0.01895    0.03942  98.80498  -0.481  0.63169
## Conditionsbabble   0.10845    0.03934  97.39537   2.757  0.00697 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.520
## Condtnsbbbl -0.529  0.000
```

```
anova(ModelLF.condition.interp.Times_NH)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF  DenDF F value   Pr(>F)
## Fchannel   0.01163 0.01163     1 98.805  0.2312 0.631693
## Conditions 0.38224 0.38224     1 97.395  7.5992 0.006972 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLF.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF  DenDF      F      Pr eta_partial
## Fchannel   0.01163 0.01163     1 98.805 0.2312 0.63169    0.002335
## Conditions 0.38224 0.38224     1 97.395 7.5992 0.00697    0.072377
```

IFG-RH

```
# best fit
# M1:Random-intercept-with-poly1
Rawdata_NHCI_RH <- Rawdata_NHCI %>% filter(Hemisphere=='R')
ModelRF.condition.interp.Times <- lmer(Fvalues ~ Fchannel + GROUP*Conditions + (1|sub_ID),Rawdat
a_NHCI_RH,REML = FALSE,na.action=na.omit)
summary(ModelRF.condition.interp.Times)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + GROUP * Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_RH
##
##      AIC      BIC   logLik deviance df.resid
##    -43.8    -16.4     28.9    -57.8      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.1942 -0.5147  0.0042  0.5189  3.7502
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
```

```
##  sub_ID   (Intercept) 0.01298  0.1139
##  Residual             0.04075  0.2019
## Number of obs: 368, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    2.431e-02  2.638e-02  2.307e+02   0.921
## FchannelCH4                   -6.154e-04  2.105e-02  2.760e+02  -0.029
## GROUPNH_adult                 -4.113e-02  3.922e-02  1.792e+02  -1.049
## Conditionsbabble              -5.039e-02  2.674e-02  2.760e+02  -1.884
## GROUPNH_adult:Conditionsbabble  1.260e-01  4.335e-02  2.760e+02   2.907
##                                Pr(>|t|)
## (Intercept)                     0.35775
## FchannelCH4                     0.97669
## GROUPNH_adult                   0.29571
## Conditionsbabble                0.06056 .
## GROUPNH_adult:Conditionsbabble  0.00395 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4 GROUPNH_d Cndtns
## FchannelCH4 -0.399
## GROUPNH_dlt -0.566  0.000
## Condtnsbbbl -0.507  0.000  0.341
## GROUPNH_d:C  0.313  0.000 -0.553    -0.617
```

```
anova(ModelRF.condition.interp.Times)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                   Sum Sq Mean Sq NumDF DenDF F value  Pr(>F)
## Fchannel         0.00003 0.00003     1   276  0.0009 0.97669
## GROUP            0.01824 0.01824     1    92  0.4477 0.50509
## Conditions       0.01380 0.01380     1   276  0.3387 0.56106
## GROUP:Conditions 0.34426 0.34426     1   276  8.4483 0.00395 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRF.condition.interp.Times)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                    SumSq  MeanSq NumDF DenDF      F      Pr eta_partial
## Fchannel         0.00003 0.00003     1   276 0.0009 0.97669   0.0000031
## GROUP            0.01824 0.01824     1    92 0.4477 0.50509   0.0048431
## Conditions       0.01380 0.01380     1   276 0.3387 0.56106   0.0012256
## GROUP:Conditions 0.34426 0.34426     1   276 8.4483 0.00395   0.0297006
```

CI children-IFG-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRF.condition.interp.Times_CI <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub_ID),Rawdata_N
```

```
HCI_CI_RF,REML = FALSE,na.action=na.omit)
summary(ModelRF.condition.interp.Times_CI)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_CI_RF
##
##      AIC      BIC   logLik deviance df.resid
##    -13.6      3.6     11.8    -23.6      223
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.6862 -0.6417  0.0131  0.5701  3.6240
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.01866  0.1366
##  Residual             0.04070  0.2017
## Number of obs: 228, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)        0.025066   0.029373 142.237565   0.853    0.395
## FchannelCH4       -0.002131   0.026720 171.000000  -0.080    0.937
## Conditionsbabble  -0.050385   0.026720 171.000000  -1.886    0.061 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.455
## Condtnsbbbl -0.455  0.000

anova(ModelRF.condition.interp.Times_CI)

## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Fchannel   0.000259 0.000259     1   171  0.0064 0.93653
## Conditions 0.144705 0.144705     1   171  3.5558 0.06104 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRF.condition.interp.Times_CI)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##               SumSq   MeanSq NumDF DenDF      F      Pr eta_partial
## Fchannel   0.000259 0.000259     1   171 0.0064 0.93653   0.0000372
## Conditions 0.144705 0.144705     1   171 3.5558 0.06104   0.0203703
```

NH adult-IFG-RH

```
# best fit
# M1:Random-intercept-with-poly1
ModelRF.condition.interp.Times_NH <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub_ID),Rawdata_N
HCI_NH_RF,REML = FALSE,na.action=na.omit)
summary(ModelRF.condition.interp.Times_NH)

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub_ID)
##    Data: Rawdata_NHCI_NH_RF
##
##      AIC      BIC   logLik deviance df.resid
##    -29.6    -14.8     19.8    -39.6      135
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.9453 -0.4979 -0.0417  0.4524  3.7360
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.003731 0.06108
##  Residual             0.040832 0.20207
## Number of obs: 140, groups:  sub_ID, 35
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       -0.018055   0.031330 123.965980  -0.576    0.565
## FchannelCH4        0.001853   0.034156 104.999999   0.054    0.957
## Conditionsbabble   0.075613   0.034156 104.999999   2.214    0.029 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4
## FchannelCH4 -0.545
## Condtnsbbbl -0.545  0.000

anova(ModelRF.condition.interp.Times_NH)

## Type III Analysis of Variance Table with Satterthwaite's method
##             Sum Sq Mean Sq NumDF DenDF F value  Pr(>F)
## Fchannel   0.00012 0.00012     1   105  0.0029 0.95684
## Conditions 0.20011 0.20011     1   105  4.9007 0.02901 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelRF.condition.interp.Times_NH)
colnames(ResultsANOV) <- c('SumSq','MeanSq','NumDF','DenDF','F','Pr')
Data_Eta <- ResultsANOV %>% mutate(eta_partial=F * NumDF/(F * NumDF + DenDF))
Data_Eta

## Type III Analysis of Variance Table with Satterthwaite's method
##              SumSq  MeanSq NumDF DenDF      F      Pr eta_partial
```

```
## Fchannel   0.00012 0.00012     1   105 0.0029 0.95684    0.000028
## Conditions 0.20011 0.20011     1   105 4.9007 0.02901    0.044592
```