# Hb: 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 -779.87 -716.32 400.93  -801.87
## ModelT.condition.interp.Times2    14 -777.14 -696.27 402.57  -805.14 3.273
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.interp.Times2  3     0.3514
```

```
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 -777.14 -696.27 402.57  -805.14
## ModelT.condition.interp.Times3    17 -772.13 -673.93 403.07  -806.13 0.9927
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times2
## ModelT.condition.interp.Times3  3      0.803
```

```
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 -779.87 -716.32 400.93  -801.87
## ModelT.condition.interp.Times3    17 -772.13 -673.93 403.07  -806.13 4.2657
##                                 Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.interp.Times3  6     0.6408
```

```
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 -779.14 -704.05 402.57  -805.14
## ModelT.condition.slopeinterp.Times2   16 -775.38 -682.95 403.69  -807.38
##                                    Chisq Df Pr(>Chisq)
## ModelT.condition.slopeinterp.Times1
## ModelT.condition.slopeinterp.Times2 2.238  3     0.5245
```

```
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 -775.38 -682.95 403.69  -807.38
## ModelT.condition.slopeinterp.Times3   19 -770.38 -660.63 404.19  -808.38
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.slopeinterp.Times2
## ModelT.condition.slopeinterp.Times3 1.0006  3     0.8011
```

```
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 -779.14 -704.05 402.57  -805.14
## ModelT.condition.slopeinterp.Times3   19 -770.38 -660.63 404.19  -808.38
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.slopeinterp.Times1
## ModelT.condition.slopeinterp.Times3 3.2387  6     0.7784
```

```
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 -779.87 -716.32 400.93  -801.87
## ModelT.condition.slopeinterp.Times1   13 -779.14 -704.05 402.57  -805.14
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times1
## ModelT.condition.slopeinterp.Times1 3.2754  2     0.1944
```

```
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 -777.14 -696.27 402.57  -805.14
## ModelT.condition.slopeinterp.Times2   16 -775.38 -682.95 403.69  -807.38
##                                     Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times2
## ModelT.condition.slopeinterp.Times2 2.2404  2     0.3262
```

```
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 -772.13 -673.93 403.07  -806.13
## ModelT.condition.slopeinterp.Times3   19 -770.38 -660.63 404.19  -808.38
```

```
##                                       Chisq Df Pr(>Chisq)
## ModelT.condition.interp.Times3
## ModelT.condition.slopeinterp.Times3 2.2484  2     0.3249
```

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

summary(ModelT.condition.interp.Times1.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: TValues ~ Conditions + Hemisphere + TimesDur + Tchannel + (1 |
##     sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   -781.7   -735.4    398.8   -797.7     2376
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -8.9922 -0.4586  0.0190  0.5032  8.8592
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.000828 0.02877
##  Residual             0.041307 0.20324
## Number of obs: 2384, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -2.040e-02  1.048e-02  5.191e+02  -1.947   0.0521 .
## Conditionsbabble  1.355e-02  8.325e-03  2.328e+03   1.627   0.1039
## HemisphereR       2.715e-03  8.339e-03  2.338e+03   0.326   0.7448
## TimesDur          1.750e-04  5.986e-04  1.111e+03   0.292   0.7701
## TchannelCH5      -2.105e-02  1.005e-02  2.332e+03  -2.095   0.0363 *
## TchannelCH8      -1.476e-02  1.029e-02  2.338e+03  -1.435   0.1516
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns HmsphR TimsDr TchCH5
## Condtnsbbbl -0.397
## HemisphereR -0.400  0.000
## TimesDur    -0.297  0.000  0.014
## TchannelCH5 -0.476  0.000  0.001 -0.002
## TchannelCH8 -0.447  0.000 -0.028 -0.021  0.486
```

```
anova(ModelT.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 0.109349 0.109349     1 2328.2  2.6472 0.10387
## Hemisphere 0.004379 0.004379     1 2337.7  0.1060 0.74476
## TimesDur   0.003531 0.003531     1 1111.0  0.0855 0.77007
## Tchannel   0.190675 0.095338     2 2335.5  2.3080 0.09969 .
```

```
## ---
## 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.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 0.109349 0.109349     1 2328.2 2.6472 0.10387  0.00113575
## Hemisphere 0.004379 0.004379     1 2337.7 0.1060 0.74476  0.00004535
## TimesDur   0.003531 0.003531     1 1111.0 0.0855 0.77007  0.00007693
## Tchannel   0.190675 0.095338     2 2335.5 2.3080 0.09969  0.00197258
```

## 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
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
## ModelSpt.condition.interp.Times1   10 -1070.3 -1016.5 545.13  -1090.3
## ModelSpt.condition.interp.Times2   13 -1070.6 -1000.6 548.30  -1096.6
##                                    Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.interp.Times2 6.3404  3    0.09618 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
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 -1070.6 -1000.65 548.30  -1096.6
## ModelSpt.condition.interp.Times3   16 -1067.1  -981.01 549.56  -1099.1
##                                    Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times2
## ModelSpt.condition.interp.Times3 2.5074  3      0.474
```

```
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 -1070.3 -1016.45 545.13  -1090.3
## ModelSpt.condition.interp.Times3   16 -1067.1  -981.01 549.56  -1099.1
```

```
##                                    Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.interp.Times3 8.8478  6     0.1823
```

```
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
## ModelSpt.condition.slopeinterp.Times1   12 -1066.3 -1001.73 545.15
## ModelSpt.condition.slopeinterp.Times2   15 -1067.0  -986.22 548.47
##                                       deviance Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times1  -1090.3
## ModelSpt.condition.slopeinterp.Times2  -1097.0 6.641  3    0.08426 .
## ---
## 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 -1067.0 -986.22 548.47  -1097.0
## ModelSpt.condition.slopeinterp.Times3   18 -1063.2 -966.31 549.59  -1099.2
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times2
## ModelSpt.condition.slopeinterp.Times3 2.2356  3      0.525
```

```
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
## ModelSpt.condition.slopeinterp.Times1   12 -1066.3 -1001.73 545.15
## ModelSpt.condition.slopeinterp.Times3   18 -1063.2  -966.31 549.59
##                                       deviance  Chisq Df Pr(>Chisq)
## ModelSpt.condition.slopeinterp.Times1  -1090.3
## ModelSpt.condition.slopeinterp.Times3  -1099.2 8.8766  6     0.1806
```

```
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 -1070.3 -1016.5 545.13  -1090.3
## ModelSpt.condition.slopeinterp.Times1   12 -1066.3 -1001.7 545.15  -1090.3
##                                        Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times1
## ModelSpt.condition.slopeinterp.Times1 0.0393  2     0.9805
```

```
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
## ModelSpt.condition.interp.Times2        13 -1070.6 -1000.65 548.30
## ModelSpt.condition.slopeinterp.Times2   15 -1067.0  -986.22 548.47
##                                       deviance Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times2       -1096.6
## ModelSpt.condition.slopeinterp.Times2  -1097.0  0.34  2     0.8437
```

```
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 -1067.1 -981.01 549.56  -1099.1
## ModelSpt.condition.slopeinterp.Times3    18 -1063.2 -966.31 549.59  -1099.2
##                                         Chisq Df Pr(>Chisq)
## ModelSpt.condition.interp.Times3
## ModelSpt.condition.slopeinterp.Times3 0.0681  2     0.9665

# 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
##  -1073.0  -1035.3    543.5  -1087.0     1599
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.6967 -0.5178 -0.0107  0.4591  9.6395
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.001196 0.03458
##  Residual             0.028970 0.17021
## Number of obs: 1606, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       8.794e-03  1.020e-02  3.379e+02   0.862   0.3890
## TimesDur          2.183e-04  6.285e-04  1.069e+03   0.347   0.7284
## Conditionsbabble  3.051e-03  8.494e-03  1.552e+03   0.359   0.7195
## HemisphereR       9.710e-04  8.502e-03  1.556e+03   0.114   0.9091
## SptchannelCH9    -1.413e-02  8.503e-03  1.557e+03  -1.662   0.0967 .
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TimsDr Cndtns HmsphR
## TimesDur    -0.304
## Condtnsbbbl -0.417  0.000
## HemisphereR -0.413 -0.005  0.000
## SptchnnlCH9 -0.417 -0.009  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   0.003495 0.003495     1 1069.0  0.1206 0.72840
## Conditions 0.003737 0.003737     1 1551.7  0.1290 0.71952
## Hemisphere 0.000378 0.000378     1 1556.3  0.0130 0.90909
## Sptchannel 0.080007 0.080007     1 1556.7  2.7617 0.09675 .
## ---
## 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(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   0.003495 0.003495     1 1069.0 0.1206 0.72840  0.00011284
## Conditions 0.003737 0.003737     1 1551.7 0.1290 0.71952  0.00008312
## Hemisphere 0.000378 0.000378     1 1556.3 0.0130 0.90909  0.00000838
## Sptchannel 0.080007 0.080007     1 1556.7 2.7617 0.09675  0.00177091
```

## Supramarginal gyrus (SMG)

```
# 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)
```

```r
# 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 -582.53 -540.30 300.27  -600.53
## ModelSMG.condition.interp.Times2   12 -581.82 -525.51 302.91  -605.82
##                                   Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.interp.Times2 5.2862  3      0.152
```

```r
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
## ModelSMG.condition.interp.Times2   12 -581.82 -525.51 302.91  -605.82
## ModelSMG.condition.interp.Times3   15 -581.40 -511.02 305.70  -611.40
##                                   Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times2
## ModelSMG.condition.interp.Times3 5.5795  3      0.134
```

```r
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 -582.53 -540.30 300.27  -600.53
## ModelSMG.condition.interp.Times3   15 -581.40 -511.02 305.70  -611.40
##                                   Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.interp.Times3 10.866  6    0.09262 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
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 -578.58 -526.96 300.29  -600.58
## ModelSMG.condition.slopeinterp.Times2   14 -578.05 -512.36 303.02  -606.05
##                                        Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times1
## ModelSMG.condition.slopeinterp.Times2 5.4687  3     0.1405
```

```
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 -578.05 -512.36 303.02  -606.05
## ModelSMG.condition.slopeinterp.Times3   17 -577.46 -497.69 305.73  -611.46
##                                          Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times2
## ModelSMG.condition.slopeinterp.Times3 5.4114  3      0.144
```

```
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 -578.58 -526.96 300.29  -600.58
## ModelSMG.condition.slopeinterp.Times3   17 -577.46 -497.69 305.73  -611.46
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.slopeinterp.Times1
## ModelSMG.condition.slopeinterp.Times3 10.88  6    0.09215 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 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 -582.53 -540.30 300.27  -600.53
## ModelSMG.condition.slopeinterp.Times1   11 -578.58 -526.96 300.29  -600.58
##                                       Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times1
## ModelSMG.condition.slopeinterp.Times1 0.046  2     0.9773
```

```
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 -581.82 -525.51 302.91  -605.82
## ModelSMG.condition.slopeinterp.Times2   14 -578.05 -512.36 303.02  -606.05
##                                        Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times2
## ModelSMG.condition.slopeinterp.Times2 0.2285  2      0.892

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 -581.40 -511.02 305.70  -611.40
## ModelSMG.condition.slopeinterp.Times3   17 -577.46 -497.69 305.73  -611.46
##                                        Chisq Df Pr(>Chisq)
## ModelSMG.condition.interp.Times3
## ModelSMG.condition.slopeinterp.Times3 0.0604  2     0.9703

# best fit
ModelSMG.condition.interp.Times1.N <- lmer(SMGvalues ~ Conditions + TimesDur + Hemisphere + (1|s
ub_ID), Rawdata_activity, REML = FALSE,control = ctrl,na.action=na.omit)

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

## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: SMGvalues ~ Conditions + TimesDur + Hemisphere + (1 | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##   -584.7   -556.5    298.3   -596.7      800
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.0719 -0.5907 -0.0103  0.5778  5.0186
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  sub_ID   (Intercept) 0.0007891 0.02809
##  Residual             0.0272675 0.16513
```

```
## Number of obs: 806, groups:  sub_ID, 57
##
## Fixed effects:
##                   Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      8.651e-05  1.159e-02 3.248e+02   0.007    0.994
## Conditionsbabble 1.389e-02  1.163e-02 7.559e+02   1.194    0.233
## TimesDur         9.051e-05  8.256e-04 5.821e+02   0.110    0.913
## HemisphereR      5.678e-03  1.164e-02 7.619e+02   0.488    0.626
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns TimsDr
## Condtnsbbbl -0.502
## TimesDur    -0.364  0.000
## HemisphereR -0.496  0.000 -0.014
```

```
anova(ModelSMG.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 0.038857 0.038857     1 755.87  1.4250 0.2330
## TimesDur   0.000328 0.000328     1 582.06  0.0120 0.9127
## Hemisphere 0.006483 0.006483     1 761.94  0.2378 0.6260
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOVA <- anova(ModelSMG.condition.interp.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
## Conditions 0.038857 0.038857     1 755.87 1.4250 0.23295  0.00188175
## TimesDur   0.000328 0.000328     1 582.06 0.0120 0.91274  0.00002065
## Hemisphere 0.006483 0.006483     1 761.94 0.2378 0.62597  0.00031195
```

## 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)
```

```r
# 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
## ModelF.condition.interp.Times1   10 -804.95 -751.47 412.47  -824.95
## ModelF.condition.interp.Times2   13 -801.74 -732.22 413.87  -827.74 2.7883
##                                Df Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.interp.Times2  3     0.4254
```

```r
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 -801.74 -732.22 413.87  -827.74
## ModelF.condition.interp.Times3   16 -797.72 -712.16 414.86  -829.72 1.9804
##                                Df Pr(>Chisq)
## ModelF.condition.interp.Times2
## ModelF.condition.interp.Times3  3     0.5765
```

```r
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 -804.95 -751.47 412.47  -824.95
## ModelF.condition.interp.Times3   16 -797.72 -712.16 414.86  -829.72 4.7687
##                                 Df Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.interp.Times3  6     0.5738
```

```
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 -803.11 -738.94 413.56  -827.11
## ModelF.condition.slopeinterp.Times2   15 -799.24 -719.03 414.62  -829.24
##                                     Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times1
## ModelF.condition.slopeinterp.Times2 2.1288  3     0.5461
```

```
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 -799.24 -719.03 414.62  -829.24
## ModelF.condition.slopeinterp.Times3   18 -795.70 -699.44 415.85  -831.70
```

```
##                                        Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times2
## ModelF.condition.slopeinterp.Times3 2.4562  3     0.4833
```

```
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 -803.11 -738.94 413.56  -827.11
## ModelF.condition.slopeinterp.Times3   18 -795.70 -699.44 415.85  -831.70
##                                       Chisq Df Pr(>Chisq)
## ModelF.condition.slopeinterp.Times1
## ModelF.condition.slopeinterp.Times3 4.585  6      0.598
```

```
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 -804.95 -751.47 412.47  -824.95
## ModelF.condition.slopeinterp.Times1   12 -803.11 -738.94 413.56  -827.11
##                                        Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times1
## ModelF.condition.slopeinterp.Times1 2.1633  2      0.339
```

```
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 -801.74 -732.22 413.87  -827.74
```

```
## ModelF.condition.slopeinterp.Times2   15 -799.24 -719.03 414.62  -829.24
##                                      Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times2
## ModelF.condition.slopeinterp.Times2 1.5038  2     0.4715
```

```
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 -797.72 -712.16 414.86  -829.72
## ModelF.condition.slopeinterp.Times3   18 -795.70 -699.44 415.85  -831.70
##                                      Chisq Df Pr(>Chisq)
## ModelF.condition.interp.Times3
## ModelF.condition.slopeinterp.Times3 1.9796  2     0.3716
```

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

```
summary(ModelF.condition.interp.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
##   -803.9   -761.1    410.0   -819.9     1544
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.1009 -0.5802 -0.0085  0.5739  6.1206
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.001244 0.03526
##  Residual             0.033668 0.18349
## Number of obs: 1552, groups:  sub_ID, 57
##
## Fixed effects:
```

```
##                             Estimate Std. Error         df t value
## (Intercept)                3.996e-04  1.170e-02  4.157e+02   0.034
## HemisphereR                6.970e-03  9.348e-03  1.508e+03   0.746
## FchannelCH4               -1.749e-03  9.322e-03  1.500e+03  -0.188
## Conditionsbabble          -1.229e-02  1.152e-02  1.495e+03  -1.067
## TimesDur                  -1.323e-04  9.147e-04  1.362e+03  -0.145
## Conditionsbabble:TimesDur  1.416e-03  1.233e-03  1.495e+03   1.148
##                           Pr(>|t|)
## (Intercept)                  0.973
## HemisphereR                  0.456
## FchannelCH4                  0.851
## Conditionsbabble             0.286
## TimesDur                     0.885
## Conditionsbabble:TimesDur    0.251
##
## Correlation of Fixed Effects:
##             (Intr) HmsphR FchCH4 Cndtns TimsDr
## HemisphereR -0.428
## FchannelCH4 -0.395  0.000
## Condtnsbbbl -0.492  0.000  0.000
## TimesDur    -0.427  0.023 -0.003  0.396
## Cndtnsbb:TD  0.289  0.000  0.000 -0.588 -0.674
```

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

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                        Sum Sq  Mean Sq NumDF   DenDF F value Pr(>F)
## Hemisphere           0.018717 0.018717     1 1508.27  0.5559 0.4560
## Fchannel             0.001186 0.001186     1 1499.81  0.0352 0.8512
## Conditions           0.038357 0.038357     1 1495.48  1.1393 0.2860
## TimesDur             0.024430 0.024430     1  903.92  0.7256 0.3945
## Conditions:TimesDur 0.044381 0.044381     1 1495.48  1.3182 0.2511
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelF.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
## Hemisphere           0.018717 0.018717     1 1508.27 0.5559 0.45602
## Fchannel             0.001186 0.001186     1 1499.81 0.0352 0.85115
## Conditions           0.038357 0.038357     1 1495.48 1.1393 0.28598
## TimesDur             0.024430 0.024430     1  903.92 0.7256 0.39453
## Conditions:TimesDur 0.044381 0.044381     1 1495.48 1.3182 0.25110
##                      eta_partial
## Hemisphere            0.00036846
## Fchannel              0.00002348
## Conditions            0.00076122
## TimesDur              0.00080210
## Conditions:TimesDur   0.00088067
```

## AG

```
# 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
## ModelAG.condition.interp.Times1    9 -355.70 -313.95 186.85  -373.70
## ModelAG.condition.interp.Times2   12 -355.55 -299.88 189.77  -379.55
##                                  Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times1
## ModelAG.condition.interp.Times2 5.8494  3     0.1192

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
## ModelAG.condition.interp.Times2   12 -355.55 -299.88 189.77  -379.55
## ModelAG.condition.interp.Times3   15 -351.31 -281.73 190.66  -381.31
##                                  Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times2
## ModelAG.condition.interp.Times3 1.7668  3     0.6222
```

```
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
## ModelAG.condition.interp.Times1    9 -355.70 -313.95 186.85  -373.70
## ModelAG.condition.interp.Times3   15 -351.31 -281.73 190.66  -381.31
##                                  Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times1
## ModelAG.condition.interp.Times3 7.6162  6     0.2676
```

```
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 -351.72 -300.69 186.86  -373.72
## ModelAG.condition.slopeinterp.Times2   14 -351.55 -286.61 189.77  -379.55
```

```
##                                          Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times1
## ModelAG.condition.slopeinterp.Times2 5.8305  3     0.1202
```

```
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 -351.55 -286.61 189.77  -379.55
## ModelAG.condition.slopeinterp.Times3   17 -347.31 -268.46 190.66  -381.31
##                                          Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times2
## ModelAG.condition.slopeinterp.Times3 1.7649  3     0.6226
```

```
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 -351.72 -300.69 186.86  -373.72
## ModelAG.condition.slopeinterp.Times3   17 -347.31 -268.46 190.66  -381.31
##                                          Chisq Df Pr(>Chisq)
## ModelAG.condition.slopeinterp.Times1
## ModelAG.condition.slopeinterp.Times3 7.5954  6     0.2693
```

```
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 -355.70 -313.95 186.85  -373.70
## ModelAG.condition.slopeinterp.Times1     11 -351.72 -300.69 186.86  -373.72
##                                         Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times1
## ModelAG.condition.slopeinterp.Times1 0.0214  2     0.9894
```

```
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 -355.55 -299.88 189.77  -379.55
## ModelAG.condition.slopeinterp.Times2     14 -351.55 -286.61 189.77  -379.55
##                                         Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times2
## ModelAG.condition.slopeinterp.Times2 0.0025  2     0.9988
```

```
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 -351.31 -281.73 190.66  -381.31
## ModelAG.condition.slopeinterp.Times3     17 -347.31 -268.46 190.66  -381.31
##                                        Chisq Df Pr(>Chisq)
## ModelAG.condition.interp.Times3
## ModelAG.condition.slopeinterp.Times3 6e-04  2     0.9997
```

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

```r
summary(ModelAG.condition.interp.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
##   -359.7   -331.8    185.8   -371.7      758
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.0058 -0.5016 -0.0288  0.5041  5.5432
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  sub_ID   (Intercept) 0.0007458 0.02731
##  Residual             0.0353417 0.18799
## Number of obs: 764, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)       2.408e-03  1.311e-02  3.386e+02   0.184    0.854
## HemisphereR       1.244e-02  1.364e-02  7.292e+02   0.912    0.362
## Conditionsbabble -1.093e-02  1.360e-02  7.158e+02  -0.804    0.422
## TimesDur         -5.872e-04  9.539e-04  4.813e+02  -0.616    0.538
##
## Correlation of Fixed Effects:
##             (Intr) HmsphR Cndtns
## HemisphereR -0.489
## Condtnsbbbl -0.519  0.000
## TimesDur    -0.368 -0.009  0.000
```

```r
anova(ModelAG.condition.interp.Times1.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq  Mean Sq NumDF  DenDF F value Pr(>F)
## Hemisphere 0.029375 0.029375     1 729.22  0.8312 0.3622
## Conditions 0.022837 0.022837     1 715.83  0.6462 0.4218
## TimesDur   0.013392 0.013392     1 481.34  0.3789 0.5385
```

```r
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelAG.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
## Hemisphere 0.029375 0.029375     1 729.22 0.8312 0.36223  0.00113851
## Conditions 0.022837 0.022837     1 715.83 0.6462 0.42175  0.00090187
## TimesDur   0.013392 0.013392     1 481.34 0.3789 0.53846  0.00078665
```

## 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
## ModelFA.condition.interp.Times1    9 -46.686 -5.2502 32.343  -64.686
## ModelFA.condition.interp.Times2   12 -42.883 12.3638 33.442  -66.883
##                                  Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.interp.Times2 2.1978  3     0.5324

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 -42.883 12.364 33.442  -66.883
## ModelFA.condition.interp.Times3   15 -44.710 24.349 37.355  -74.710 7.8269
##                                 Df Pr(>Chisq)
## ModelFA.condition.interp.Times2
## ModelFA.condition.interp.Times3  3    0.04973 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
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 -46.686 -5.2502 32.343  -64.686
## ModelFA.condition.interp.Times3   15 -44.710 24.3487 37.355  -74.710
##                                  Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.interp.Times3 10.025  6     0.1236
```

```
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 -43.190  7.4536 32.595  -65.190
## ModelFA.condition.slopeinterp.Times2   14 -39.269 25.1865 33.634  -67.269
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times1
## ModelFA.condition.slopeinterp.Times2 2.079  3     0.5562
```

```
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 -39.269 25.187 33.634  -67.269
## ModelFA.condition.slopeinterp.Times3   17 -41.542 36.725 37.771  -75.542
##                                        Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times2
## ModelFA.condition.slopeinterp.Times3 8.2735  3    0.04069 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
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 -43.190  7.454 32.595  -65.190
## ModelFA.condition.slopeinterp.Times3   17 -41.542 36.725 37.771  -75.542
##                                        Chisq Df Pr(>Chisq)
## ModelFA.condition.slopeinterp.Times1
## ModelFA.condition.slopeinterp.Times3 10.352  6     0.1106
```

```
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 -46.686 -5.2502 32.343  -64.686
## ModelFA.condition.slopeinterp.Times1   11 -43.190  7.4536 32.595  -65.190
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times1
## ModelFA.condition.slopeinterp.Times1 0.5041  2     0.7772
```

```
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 -42.883 12.364 33.442  -66.883
## ModelFA.condition.slopeinterp.Times2   14 -39.269 25.186 33.634  -67.269
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times2
## ModelFA.condition.slopeinterp.Times2 0.3852  2     0.8248
```

```
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 -44.710 24.349 37.355  -74.710
## ModelFA.condition.slopeinterp.Times3   17 -41.542 36.725 37.771  -75.542
##                                       Chisq Df Pr(>Chisq)
## ModelFA.condition.interp.Times3
## ModelFA.condition.slopeinterp.Times3 0.8318  2     0.6598
```

```r
# best fit
ModelFA.condition.slopeinterp.Times3.N <- lmer(FAvalues ~  Conditions+TimesDur + Hemisphere +  I
(TimesDur^2) + I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity,REML = FALSE,control = ctrl,
na.action=na.omit)

summary(ModelFA.condition.slopeinterp.Times3.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula: FAvalues ~ Conditions + TimesDur + Hemisphere + I(TimesDur^2) +
##     I(TimesDur^3) + (1 + TimesDur | sub_ID)
##    Data: Rawdata_activity
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    -49.3     -3.3     34.7    -69.3      728
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.4529 -0.4719 -0.0165  0.4509  7.0635
##
## Random effects:
##  Groups   Name        Variance  Std.Dev. Corr
##  sub_ID   (Intercept) 1.062e-03 0.032584
##           TimesDur    1.966e-06 0.001402 -1.00
##  Residual             5.262e-02 0.229399
## Number of obs: 738, groups:  sub_ID, 57
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -1.388e-02  1.853e-02  2.719e+02  -0.749  0.45462
## Conditionsbabble -5.755e-03  1.689e-02  6.896e+02  -0.341  0.73339
## TimesDur          2.319e-02  7.368e-03  6.626e+02   3.147  0.00173 **
## HemisphereR      -4.181e-02  1.694e-02  7.131e+02  -2.468  0.01381 *
## I(TimesDur^2)    -1.925e-03  6.737e-04  7.164e+02  -2.858  0.00439 **
## I(TimesDur^3)     4.097e-05  1.540e-05  7.352e+02   2.661  0.00796 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns TimsDr HmsphR I(TD^2
## Condtnsbbbl -0.456
## TimesDur    -0.513  0.000
## HemisphereR -0.429  0.000 -0.013
## I(TimsDr^2)  0.414  0.000 -0.954  0.012
## I(TimsDr^3) -0.358  0.000  0.886 -0.013 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
## optimizer (bobyqa) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```r
anova(ModelFA.condition.slopeinterp.Times3.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                Sum Sq Mean Sq NumDF  DenDF F value   Pr(>F)
## Conditions    0.00611 0.00611     1 689.56  0.1161 0.733390
## TimesDur      0.52104 0.52104     1 662.61  9.9012 0.001726 **
```

```
## Hemisphere    0.32064 0.32064     1 713.12  6.0930 0.013805 *
## I(TimesDur^2) 0.42982 0.42982     1 716.43  8.1678 0.004388 **
## I(TimesDur^3) 0.37262 0.37262     1 735.19  7.0808 0.007962 **
## ---
## 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(ModelFA.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 eta_partial
## Conditions    0.00611 0.00611     1 689.56 0.1161 0.73339   0.0001684
## TimesDur      0.52104 0.52104     1 662.61 9.9012 0.00173   0.0147229
## Hemisphere    0.32064 0.32064     1 713.12 6.0930 0.01381   0.0084718
## I(TimesDur^2) 0.42982 0.42982     1 716.43 8.1678 0.00439   0.0112722
## I(TimesDur^3) 0.37262 0.37262     1 735.19 7.0808 0.00796   0.0095393
```

## FA- LH

```
Rawdata_activity_FAL <- Rawdata_activity %>% filter(Hemisphere=='L')
# best fit
ModelFA.condition.slopeinterp.Times3.N <- lmer(FAvalues ~  Conditions+TimesDur + I(TimesDur^2) +
 I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity_FAL,REML = FALSE,control = ctrl,na.action=
na.omit)

summary(ModelFA.condition.slopeinterp.Times3.N)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use
##   Satterthwaite's method [lmerModLmerTest]
## Formula:
## FAvalues ~ Conditions + TimesDur + I(TimesDur^2) + I(TimesDur^3) +
##     (1 + TimesDur | sub_ID)
##    Data: Rawdata_activity_FAL
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    -19.7     15.9     18.8    -37.7      375
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5649 -0.5300 -0.0682  0.4894  7.0891
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.  Corr
##  sub_ID   (Intercept) 1.569e-13 3.961e-07
##           TimesDur    1.915e-16 1.384e-08 -1.00
##  Residual             5.308e-02 2.304e-01
## Number of obs: 384, groups:  sub_ID, 57
##
## Fixed effects:
##                    Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -1.183e-02  2.210e-02  3.840e+02  -0.535   0.5928
## Conditionsbabble  6.696e-03  2.351e-02  3.840e+02   0.285   0.7760
```

```
## TimesDur          2.117e-02  1.017e-02  3.840e+02   2.082   0.0380 *
## I(TimesDur^2)    -1.802e-03  9.404e-04  3.840e+02  -1.916   0.0561 .
## I(TimesDur^3)     3.654e-05  2.158e-05  3.840e+02   1.693   0.0912 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns TimsDr I(TD^2
## Condtnsbbbl -0.532
## TimesDur    -0.574  0.000
## I(TimsDr^2)  0.468  0.000 -0.955
## I(TimsDr^3) -0.407  0.000  0.888 -0.981
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
## optimizer (bobyqa) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
anova(ModelFA.condition.slopeinterp.Times3.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                 Sum Sq  Mean Sq NumDF DenDF F value  Pr(>F)
## Conditions    0.004304 0.004304     1   384  0.0811 0.77598
## TimesDur      0.229970 0.229970     1   384  4.3328 0.03805 *
## I(TimesDur^2) 0.194787 0.194787     1   384  3.6699 0.05614 .
## I(TimesDur^3) 0.152169 0.152169     1   384  2.8670 0.09123 .
## ---
## 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(ModelFA.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 eta_partial
## Conditions    0.004304 0.004304     1   384 0.0811 0.77598   0.0002111
## TimesDur      0.229970 0.229970     1   384 4.3328 0.03805   0.0111574
## I(TimesDur^2) 0.194787 0.194787     1   384 3.6699 0.05614   0.0094667
## I(TimesDur^3) 0.152169 0.152169     1   384 2.8670 0.09123   0.0074108
```

## FA- RH

```
Rawdata_activity_FAR <- Rawdata_activity %>% filter(Hemisphere=='R')
# best fit
ModelFA.condition.slopeinterp.Times3.N <- lmer(FAvalues ~  Conditions+TimesDur + I(TimesDur^2) +
 I(TimesDur^3) + (1+TimesDur|sub_ID),Rawdata_activity_FAR,REML = FALSE,control = ctrl,na.action=
na.omit)
```

```
summary(ModelFA.condition.slopeinterp.Times3.N)
```

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

```
##    Data: Rawdata_activity_FAR
## Control: ctrl
##
##      AIC      BIC   logLik deviance df.resid
##    -25.1      9.7     21.5    -43.1      345
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.8201 -0.4067  0.0218  0.4399  3.5725
##
## Random effects:
##  Groups   Name        Variance  Std.Dev. Corr
##  sub_ID   (Intercept) 8.069e-03 0.089829
##           TimesDur    2.162e-05 0.004649 -1.00
##  Residual             4.770e-02 0.218406
## Number of obs: 354, groups:  sub_ID, 56
##
## Fixed effects:
##                     Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      -5.404e-02  2.607e-02  1.383e+02  -2.073   0.0400 *
## Conditionsbabble -1.926e-02  2.322e-02  3.043e+02  -0.830   0.4074
## TimesDur          2.428e-02  1.041e-02  3.540e+02   2.332   0.0202 *
## I(TimesDur^2)    -1.998e-03  9.365e-04  3.467e+02  -2.133   0.0336 *
## I(TimesDur^3)     4.480e-05  2.129e-05  3.288e+02   2.105   0.0361 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) Cndtns TimsDr I(TD^2
## Condtnsbbbl -0.445
## TimesDur    -0.569  0.000
## I(TimsDr^2)  0.446  0.000 -0.953
## I(TimsDr^3) -0.384  0.000  0.882 -0.980
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
## optimizer (bobyqa) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
anova(ModelFA.condition.slopeinterp.Times3.N)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##                 Sum Sq  Mean Sq NumDF  DenDF F value  Pr(>F)
## Conditions    0.032831 0.032831     1 304.26  0.6883 0.40741
## TimesDur      0.259504 0.259504     1 353.97  5.4402 0.02024 *
## I(TimesDur^2) 0.217068 0.217068     1 346.69  4.5506 0.03361 *
## I(TimesDur^3) 0.211347 0.211347     1 328.81  4.4306 0.03606 *
## ---
## 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(ModelFA.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 eta_partial
## Conditions    0.032831 0.032831     1 304.26 0.6883 0.40741   0.0022569
## TimesDur      0.259504 0.259504     1 353.97 5.4402 0.02024   0.0151364
## I(TimesDur^2) 0.217068 0.217068     1 346.69 4.5506 0.03361   0.0129557
## I(TimesDur^3) 0.211347 0.211347     1 328.81 4.4306 0.03606   0.0132957
```

## 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
##   -953.5   -919.1    484.8   -969.5      542
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.7945 -0.4615  0.0038  0.4739  4.1078
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002063 0.04542
##  Residual             0.008663 0.09307
## Number of obs: 550, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    -0.017462   0.010882 290.603450  -1.605
## TchannelCH5                    -0.013900   0.009704 458.283348  -1.432
## TchannelCH8                    -0.019826   0.009737 459.338318  -2.036
## GROUPNH_adult                   0.016170   0.015120 177.580355   1.069
## Conditionsbabble                0.012974   0.010095 458.283348   1.285
## GROUPNH_adult:Conditionsbabble -0.007229   0.016338 458.283348  -0.442
##                                Pr(>|t|)
## (Intercept)                      0.1096
## TchannelCH5                      0.1527
## TchannelCH8                      0.0423 *
## GROUPNH_adult                    0.2863
## Conditionsbabble                 0.1994
## GROUPNH_adult:Conditionsbabble   0.6583
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
```

```
##             (Intr) TchCH5 TchCH8 GROUPNH_d Cndtns
## TchannelCH5 -0.446
## TchannelCH8 -0.443  0.498
## GROUPNH_dlt -0.529  0.000 -0.002
## Condtnsbbbl -0.464  0.000  0.000  0.334
## GROUPNH_d:C  0.287  0.000  0.000 -0.540    -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         0.037927 0.0189633     2 458.98  2.1891 0.1132
## GROUP            0.008436 0.0084358     1  92.12  0.9738 0.3263
## Conditions       0.011372 0.0113721     1 458.28  1.3128 0.2525
## GROUP:Conditions 0.001696 0.0016961     1 458.28  0.1958 0.6583
```

```
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
ResultsANOV <- anova(ModelLT.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
## Tchannel         0.037927 0.0189633     2 458.98 2.1891 0.11319
## GROUP            0.008436 0.0084358     1  92.12 0.9738 0.32632
## Conditions       0.011372 0.0113721     1 458.28 1.3128 0.25249
## GROUP:Conditions 0.001696 0.0016961     1 458.28 0.1958 0.65835
##                  eta_partial
## Tchannel           0.0094486
## GROUP              0.0104607
## Conditions         0.0028563
## GROUP:Conditions   0.0004270
```

## ATL-RH

```
# 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
##   -895.1   -860.6    455.5   -911.1      544
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.4166 -0.5372  0.0229  0.5297  3.3264
##
## Random effects:
```

```
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.003071 0.05541
##  Residual             0.009377 0.09683
## Number of obs: 552, groups:  sub_ID, 92
##
## Fixed effects:
##                                Estimate Std. Error        df t value
## (Intercept)                    -0.02256    0.01194 254.40651  -1.889
## TchannelCH5                    -0.01448    0.01010 460.00000  -1.434
## TchannelCH8                    -0.01605    0.01010 460.00000  -1.589
## GROUPNH_adult                   0.02010    0.01690 160.86338   1.189
## Conditionsbabble                0.01521    0.01047 460.00000   1.453
## GROUPNH_adult:Conditionsbabble  -0.03479    0.01698 460.00000  -2.049
##                               Pr(>|t|)
## (Intercept)                     0.0601 .
## TchannelCH5                     0.1523
## TchannelCH8                     0.1126
## GROUPNH_adult                   0.2363
## Conditionsbabble                0.1470
## GROUPNH_adult:Conditionsbabble   0.0410 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) TchCH5 TchCH8 GROUPNH_d Cndtns
## TchannelCH5 -0.423
## TchannelCH8 -0.423  0.500
## GROUPNH_dlt -0.538  0.000  0.000
## Condtnsbbbl -0.438  0.000  0.000  0.310
## GROUPNH_d:C  0.270  0.000  0.000 -0.502    -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         0.028796 0.014398     2   460  1.5355 0.21645
## GROUP            0.000321 0.000321     1    92  0.0342 0.85372
## Conditions       0.000619 0.000619     1   460  0.0660 0.79734
## GROUP:Conditions 0.039361 0.039361     1   460  4.1978 0.04104 *
## ---
## 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(ModelRT.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         0.028796 0.014398     2   460 1.5355 0.21645   0.0066318
## GROUP            0.000321 0.000321     1    92 0.0342 0.85372   0.0003714
## Conditions       0.000619 0.000619     1   460 0.0660 0.79734   0.0001435
## GROUP:Conditions 0.039361 0.039361     1   460 4.1978 0.04104   0.0090431
```

## CI children(averaged)-ATL-RH

```
Rawdata_NHCI_CI_RT <- Rawdata_NHCI_RH %>% filter(GROUP=='CI_child')

# 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)
anova(ModelRT.condition.interp.Times_CI)
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
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
```

## NH adult-ATL-RH

```
Rawdata_NHCI_NH_RT<- Rawdata_NHCI_RH %>% filter(GROUP=='NH_adult')

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

## speech(averaged)-ATL-RH

```
Rawdata_NHCI_SP_RT <- Rawdata_NHCI_RH %>% filter(Conditions=='aspeech')

# best fit
# M1:Random-intercept-with-poly1
ModelRT.condition.interp.Times_CI <- lmer(Tvalues ~ Tchannel + GROUP +  (1|sub_ID),Rawdata_NHCI_
SP_RT,REML = FALSE,na.action=na.omit)
summary(ModelRT.condition.interp.Times_CI)
anova(ModelRT.condition.interp.Times_CI)
# Calculating the effect size
# formula: partial eta-squared = F * df1 / (F * df1 + df2)
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
```

## noise-ATL-RH

```
Rawdata_NHCI_BA_RT<- Rawdata_NHCI_RH %>% filter(Conditions=='babble')

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

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

## Spt-LH

```r
# 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_ID),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
##   -802.0   -774.7    408.0   -816.0      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.4675 -0.5204  0.0350  0.5307  4.8979
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.001219 0.03492
##  Residual             0.005431 0.07370
## Number of obs: 368, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    4.565e-03  9.154e-03  2.543e+02   0.499
## SptchannelCH9                  2.914e-05  7.684e-03  2.760e+02   0.004
## GROUPNH_adult                 -1.154e-02  1.347e-02  1.963e+02  -0.856
## Conditionsbabble              -1.469e-04  9.762e-03  2.760e+02  -0.015
## GROUPNH_adult:Conditionsbabble -6.729e-03  1.583e-02  2.760e+02  -0.425
##                                Pr(>|t|)
## (Intercept)                       0.618
## SptchannelCH9                     0.997
## GROUPNH_adult                     0.393
## Conditionsbabble                  0.988
## GROUPNH_adult:Conditionsbabble    0.671
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9 GROUPNH_d Cndtns
## SptchnnlCH9 -0.420
## GROUPNH_dlt -0.560  0.000
## Condtnsbbbl -0.533  0.000  0.362
## GROUPNH_d:C  0.329  0.000 -0.587    -0.617
```

```r
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       0.0000001 0.0000001     1   276  0.0000 0.9970
## GROUP            0.0101486 0.0101486     1    92  1.8685 0.1750
## Conditions       0.0010696 0.0010696     1   276  0.1969 0.6576
## GROUP:Conditions 0.0009820 0.0009820     1   276  0.1808 0.6710
```

```
# 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
## Sptchannel       0.0000001 0.0000001     1   276 0.0000 0.99698
## GROUP            0.0101486 0.0101486     1    92 1.8685 0.17498
## Conditions       0.0010696 0.0010696     1   276 0.1969 0.65756
## GROUP:Conditions 0.0009820 0.0009820     1   276 0.1808 0.67102
##                  eta_partial
## Sptchannel         0.0000001
## GROUP              0.0199053
## Conditions         0.0007130
## GROUP:Conditions   0.0006546
```

## 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
##   -858.4   -831.0    436.2   -872.4      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.7559 -0.4437  0.0018  0.4777  3.8735
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  sub_ID   (Intercept) 0.0009579 0.03095
##  Residual             0.0047145 0.06866
## Number of obs: 368, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                     0.010654   0.008425 260.512152   1.265
## SptchannelCH9                  -0.014001   0.007159 276.000003  -1.956
```

```
## GROUPNH_adult                   -0.003378   0.012364 201.100984  -0.273
## Conditionsbabble                 0.001328   0.009095 276.000003   0.146
## GROUPNH_adult:Conditionsbabble  -0.026804   0.014745 276.000003  -1.818
##                                Pr(>|t|)
## (Intercept)                      0.2071
## SptchannelCH9                    0.0515 .
## GROUPNH_adult                    0.7850
## Conditionsbabble                 0.8840
## GROUPNH_adult:Conditionsbabble   0.0702 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) SptCH9 GROUPNH_d Cndtns
## SptchnnlCH9 -0.425
## GROUPNH_dlt -0.558  0.000
## Condtnsbbbl -0.540  0.000  0.368
## GROUPNH_d:C  0.333  0.000 -0.596    -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       0.018035 0.018035     1   276  3.8255 0.05149 .
## GROUP            0.013473 0.013473     1    92  2.8578 0.09432 .
## Conditions       0.012644 0.012644     1   276  2.6819 0.10263
## GROUP:Conditions 0.015579 0.015579     1   276  3.3046 0.07017 .
## ---
## 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       0.018035 0.018035     1   276 3.8255 0.051488   0.0136709
## GROUP            0.013473 0.013473     1    92 2.8578 0.094317   0.0301273
## Conditions       0.012644 0.012644     1   276 2.6819 0.102634   0.0096235
## GROUP:Conditions 0.015579 0.015579     1   276 3.3046 0.070171   0.0118315
```

## 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
##   -410.8   -391.5    211.4   -422.8      178
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.10334 -0.63620 -0.02751  0.59446  2.53958
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  sub_ID   (Intercept) 0.0004367 0.02090
##  Residual             0.0054622 0.07391
## Number of obs: 184, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                     0.002179   0.010173 182.996968   0.214
## GROUPNH_adult                  -0.014028   0.016493 182.996968  -0.851
## Conditionsbabble                0.011809   0.013844  91.999984   0.853
## GROUPNH_adult:Conditionsbabble -0.011949   0.022445  91.999984  -0.532
##                                Pr(>|t|)
## (Intercept)                       0.831
## GROUPNH_adult                     0.396
## Conditionsbabble                  0.396
## GROUPNH_adult:Conditionsbabble    0.596
##
## Correlation of Fixed Effects:
##             (Intr) GROUPNH_d Cndtns
## GROUPNH_dlt -0.617
## Condtnsbbbl -0.680  0.420
## GROUPNH_d:C  0.420 -0.680    -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            0.0149599 0.0149599     1    92  2.7388 0.1013
## Conditions       0.0014765 0.0014765     1    92  0.2703 0.6044
## GROUP:Conditions 0.0015481 0.0015481     1    92  0.2834 0.5958
```

```
# 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            0.0149599 0.0149599     1    92 2.7388 0.10135
## Conditions       0.0014765 0.0014765     1    92 0.2703 0.60437
## GROUP:Conditions 0.0015481 0.0015481     1    92 0.2834 0.59575
##                  eta_partial
## GROUP              0.0289091
## Conditions         0.0029296
## GROUP:Conditions   0.0030712
```

## SMG-RH

```
# 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
##   -392.0   -372.7    202.0   -404.0      178
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6834 -0.5433  0.0604  0.5182  2.1963
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.001673 0.04090
##  Residual             0.005054 0.07109
## Number of obs: 184, groups:  sub_ID, 92
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                   -6.601e-04  1.086e-02  1.733e+02  -0.061
## GROUPNH_adult                 -2.770e-02  1.761e-02  1.733e+02  -1.573
## Conditionsbabble               1.669e-02  1.332e-02  9.200e+01   1.254
## GROUPNH_adult:Conditionsbabble -1.896e-02  2.159e-02  9.200e+01  -0.878
##                                Pr(>|t|)
## (Intercept)                       0.952
## GROUPNH_adult                     0.118
## Conditionsbabble                  0.213
## GROUPNH_adult:Conditionsbabble    0.382
##
## Correlation of Fixed Effects:
##             (Intr) GROUPNH_d Cndtns
## GROUPNH_dlt -0.617
## Condtnsbbbl -0.613  0.378
## GROUPNH_d:C  0.378 -0.613    -0.617

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            0.036066 0.036066     1    92  7.1364 0.008933 **
## Conditions       0.002256 0.002256     1    92  0.4463 0.505764
## GROUP:Conditions 0.003899 0.003899     1    92  0.7714 0.382067
## ---
## 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)
```

```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
## GROUP             0.036066 0.036066     1    92 7.1364 0.00893    0.071985
## Conditions        0.002256 0.002256     1    92 0.4463 0.50576    0.004828
## GROUP:Conditions 0.003899 0.003899     1    92 0.7714 0.38207    0.008315
```

## 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),Rawdat
a_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
##   -453.8   -426.7    233.9   -467.8      351
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.1387 -0.5612  0.0198  0.5273  5.6160
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002564 0.05063
##  Residual             0.013791 0.11744
## Number of obs: 358, groups:  sub_ID, 90
##
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                     0.002126   0.014302 259.493058   0.149
## FchannelCH4                    -0.005153   0.012423 269.147849  -0.415
## GROUPNH_adult                   0.021049   0.021360 200.778765   0.985
## Conditionsbabble               -0.004355   0.015555 267.762199  -0.280
## GROUPNH_adult:Conditionsbabble  0.015654   0.025813 267.762199   0.606
##                                Pr(>|t|)
## (Intercept)                       0.882
## FchannelCH4                       0.679
## GROUPNH_adult                     0.326
## Conditionsbabble                  0.780
## GROUPNH_adult:Conditionsbabble    0.545
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4 GROUPNH_d Cndtns
## FchannelCH4 -0.434
## GROUPNH_dlt -0.546  0.006
## Condtnsbbbl -0.544  0.000  0.364
## GROUPNH_d:C  0.328  0.000 -0.604    -0.603
```

```r
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         0.002373 0.002373     1 269.148  0.1721 0.67861
## GROUP            0.039697 0.039697     1  89.849  2.8784 0.09324 .
## Conditions       0.000998 0.000998     1 267.762  0.0724 0.78813
## GROUP:Conditions 0.005072 0.005072     1 267.762  0.3678 0.54475
## ---
## 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(ModelLF.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
## Fchannel         0.002373 0.002373     1 269.148 0.1721 0.67861
## GROUP            0.039697 0.039697     1  89.849 2.8784 0.09324
## Conditions       0.000998 0.000998     1 267.762 0.0724 0.78813
## GROUP:Conditions 0.005072 0.005072     1 267.762 0.3678 0.54475
##                  eta_partial
## Fchannel           0.0006389
## GROUP              0.0310418
## Conditions         0.0002702
## GROUP:Conditions   0.0013715
```

## IFG-RH

```r
# 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
##   -578.2   -550.9    296.1   -592.2      361
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6941 -0.5632 -0.0307  0.5046  4.2167
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  sub_ID   (Intercept) 0.002102 0.04585
##  Residual             0.010061 0.10030
## Number of obs: 368, groups:  sub_ID, 92
##
```

```
## Fixed effects:
##                                 Estimate Std. Error         df t value
## (Intercept)                    -0.011303   0.012348 258.797798  -0.915
## FchannelCH4                     0.018480   0.010457 276.000000   1.767
## GROUPNH_adult                   0.007950   0.018136 199.773477   0.438
## Conditionsbabble                0.005458   0.013286 276.000000   0.411
## GROUPNH_adult:Conditionsbabble -0.025355   0.021540 276.000000  -1.177
##                                Pr(>|t|)
## (Intercept)                      0.3608
## FchannelCH4                      0.0783 .
## GROUPNH_adult                    0.6616
## Conditionsbabble                 0.6815
## GROUPNH_adult:Conditionsbabble   0.2402
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) FchCH4 GROUPNH_d Cndtns
## FchannelCH4 -0.423
## GROUPNH_dlt -0.559  0.000
## Condtnsbbbl -0.538  0.000  0.366
## GROUPNH_d:C  0.332  0.000 -0.594    -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         0.0314185 0.0314185     1   276  3.1228 0.07831 .
## GROUP            0.0010559 0.0010559     1    92  0.1050 0.74670
## Conditions       0.0045209 0.0045209     1   276  0.4494 0.50320
## GROUP:Conditions 0.0139407 0.0139407     1   276  1.3856 0.24016
## ---
## 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
## Fchannel         0.0314185 0.0314185     1   276 3.1228 0.07831
## GROUP            0.0010559 0.0010559     1    92 0.1050 0.74670
## Conditions       0.0045209 0.0045209     1   276 0.4494 0.50320
## GROUP:Conditions 0.0139407 0.0139407     1   276 1.3856 0.24016
##                  eta_partial
## Fchannel           0.0111880
## GROUP              0.0011395
## Conditions         0.0016255
## GROUP:Conditions   0.0049953
```