CI brain development

model codes and ouput

2022.2.26

# Anterior Temporal Lobe (ATL)

# M1:Random-intercept-with-poly1  
ModelT.condition.interp.Times1 <- lmer(TValues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Tchannel + (1|sub\_ID),Rawdata\_activity,REML = FALSE,control = ctrl,na.action=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 + Hemisphere\*TimesDur + Tchannel + Conditions\*I(TimesDur^2) + Hemisphere\*I(TimesDur^2) + (1|sub\_ID),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\*TimesDur + Hemisphere\*TimesDur + Tchannel + 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  
ModelT.condition.interp.Times3 <- lmer(TValues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*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 = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelT.condition.slopeinterp.Times3 <- lmer(TValues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Tchannel + 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(ModelT.condition.interp.Times1,ModelT.condition.interp.Times2)

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.interp.Times1: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + (1 | sub\_ID)  
## ModelT.condition.interp.Times2: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelT.condition.interp.Times1 11 2398.1 2461.5 -1188.0 2376.1   
## ModelT.condition.interp.Times2 14 2398.9 2479.7 -1185.5 2370.9 5.1733 3  
## Pr(>Chisq)  
## ModelT.condition.interp.Times1   
## ModelT.condition.interp.Times2 0.1595

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.interp.Times2: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelT.condition.interp.Times3: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelT.condition.interp.Times2 14 2398.9 2479.7 -1185.5 2370.9   
## ModelT.condition.interp.Times3 17 2389.0 2487.1 -1177.5 2355.0 15.906 3  
## Pr(>Chisq)   
## ModelT.condition.interp.Times2   
## ModelT.condition.interp.Times3 0.001186 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.interp.Times1: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + (1 | sub\_ID)  
## ModelT.condition.interp.Times3: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelT.condition.interp.Times1 11 2398.1 2461.5 -1188.0 2376.1   
## ModelT.condition.interp.Times3 17 2389.0 2487.1 -1177.5 2355.0 21.079 6  
## Pr(>Chisq)   
## ModelT.condition.interp.Times1   
## ModelT.condition.interp.Times3 0.001776 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.slopeinterp.Times1: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + (1 + TimesDur | sub\_ID)  
## ModelT.condition.slopeinterp.Times2: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelT.condition.slopeinterp.Times1 13 2395.4 2470.4 -1184.7 2369.4   
## ModelT.condition.slopeinterp.Times2 16 2395.8 2488.2 -1181.9 2363.8 5.5371  
## Df Pr(>Chisq)  
## ModelT.condition.slopeinterp.Times1   
## ModelT.condition.slopeinterp.Times2 3 0.1364

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.slopeinterp.Times1: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + (1 + TimesDur | sub\_ID)  
## ModelT.condition.slopeinterp.Times3: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelT.condition.slopeinterp.Times1 13 2395.4 2470.4 -1184.7 2369.4   
## ModelT.condition.slopeinterp.Times3 19 2385.7 2495.3 -1173.8 2347.7 21.676  
## Df Pr(>Chisq)   
## ModelT.condition.slopeinterp.Times1   
## ModelT.condition.slopeinterp.Times3 6 0.001386 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.interp.Times2: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelT.condition.slopeinterp.Times2: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelT.condition.interp.Times2 14 2398.9 2479.7 -1185.5 2370.9   
## ModelT.condition.slopeinterp.Times2 16 2395.8 2488.2 -1181.9 2363.8 7.0483  
## Df Pr(>Chisq)   
## ModelT.condition.interp.Times2   
## ModelT.condition.slopeinterp.Times2 2 0.02948 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

## Data: Rawdata\_activity  
## Models:  
## ModelT.condition.interp.Times3: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelT.condition.slopeinterp.Times3: TValues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Tchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelT.condition.interp.Times3 17 2389.0 2487.1 -1177.5 2355.0   
## ModelT.condition.slopeinterp.Times3 19 2385.7 2495.3 -1173.8 2347.7 7.281  
## Df Pr(>Chisq)   
## ModelT.condition.interp.Times3   
## ModelT.condition.slopeinterp.Times3 2 0.02624 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

# best fit  
ModelT.condition.slopeinterp.Times3.N <- lmer(TValues ~ Tchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) + Hemisphere\*TimesDur + Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID),Rawdata\_activity,REML = FALSE,control=ctrl,na.action=na.omit)  
  
summary(ModelT.condition.slopeinterp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: TValues ~ Tchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +   
## Hemisphere \* TimesDur + Conditions \* TimesDur + Conditions \*   
## I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## Data: Rawdata\_activity  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 2380.2 2472.5 -1174.1 2348.2 2351   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.0480 -0.5515 -0.0043 0.5561 3.9121   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## sub\_ID (Intercept) 1.654e-02 0.128608   
## TimesDur 7.254e-05 0.008517 -0.19  
## Residual 1.500e-01 0.387256   
## Number of obs: 2367, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) -6.321e-03 2.963e-02 2.210e+02 -0.213  
## TchannelCH5 -1.208e-02 1.920e-02 2.255e+03 -0.629  
## TchannelCH8 3.901e-02 1.971e-02 2.263e+03 1.979  
## TimesDur 2.917e-02 1.049e-02 1.678e+03 2.781  
## I(TimesDur^2) -2.411e-03 9.646e-04 1.585e+03 -2.499  
## I(TimesDur^3) 5.302e-05 2.246e-05 1.410e+03 2.361  
## HemisphereR 9.605e-02 1.979e-02 2.262e+03 4.852  
## Conditionsbabble 2.999e-02 2.595e-02 2.251e+03 1.156  
## TimesDur:HemisphereR -4.020e-03 2.120e-03 2.260e+03 -1.896  
## TimesDur:Conditionsbabble -6.266e-02 1.356e-02 2.251e+03 -4.622  
## I(TimesDur^2):Conditionsbabble 5.450e-03 1.250e-03 2.251e+03 4.359  
## I(TimesDur^3):Conditionsbabble -1.155e-04 2.877e-05 2.251e+03 -4.015  
## Pr(>|t|)   
## (Intercept) 0.83124   
## TchannelCH5 0.52935   
## TchannelCH8 0.04798 \*   
## TimesDur 0.00548 \*\*   
## I(TimesDur^2) 0.01255 \*   
## I(TimesDur^3) 0.01836 \*   
## HemisphereR 1.30e-06 \*\*\*  
## Conditionsbabble 0.24799   
## TimesDur:HemisphereR 0.05811 .   
## TimesDur:Conditionsbabble 4.02e-06 \*\*\*  
## I(TimesDur^2):Conditionsbabble 1.36e-05 \*\*\*  
## I(TimesDur^3):Conditionsbabble 6.15e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) TchCH5 TchCH8 TimsDr I(TmD^2) I(TmD^3) HmsphR Cndtns TmD:HR  
## TchannelCH5 -0.323   
## TchannelCH8 -0.288 0.484   
## TimesDur -0.483 0.002 -0.025   
## I(TimsDr^2) 0.372 -0.002 0.019 -0.942   
## I(TimsDr^3) -0.320 0.002 -0.018 0.869 -0.977   
## HemisphereR -0.342 0.003 -0.035 0.076 -0.013 0.012   
## Condtnsbbbl -0.436 -0.001 -0.001 0.443 -0.362 0.309 0.001   
## TmsDr:HmspR 0.202 -0.004 0.020 -0.108 0.007 -0.008 -0.591 -0.001   
## TmsDr:Cndtn 0.301 0.000 0.002 -0.647 0.619 -0.569 -0.002 -0.689 0.001  
## I(TmsD^2):C -0.245 0.000 -0.002 0.618 -0.649 0.629 0.002 0.561 -0.001  
## I(TmsD^3):C 0.212 0.000 0.002 -0.573 0.636 -0.642 -0.002 -0.485 0.001  
## TmsD:C I(TD^2):  
## TchannelCH5   
## TchannelCH8   
## TimesDur   
## I(TimsDr^2)   
## I(TimsDr^3)   
## HemisphereR   
## Condtnsbbbl   
## TmsDr:HmspR   
## TmsDr:Cndtn   
## I(TmsD^2):C -0.955   
## I(TmsD^3):C 0.886 -0.981   
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

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

## Type III Analysis of Variance Table with Satterthwaite's method  
## Sum Sq Mean Sq NumDF DenDF F value Pr(>F)   
## Tchannel 1.0799 0.5400 2 2260.19 3.6006 0.02746 \*   
## TimesDur 0.0414 0.0414 1 912.91 0.2764 0.59922   
## I(TimesDur^2) 0.0275 0.0275 1 854.22 0.1833 0.66866   
## I(TimesDur^3) 0.0113 0.0113 1 724.87 0.0755 0.78358   
## Hemisphere 3.5312 3.5312 1 2261.61 23.5467 1.302e-06 \*\*\*  
## Conditions 0.2002 0.2002 1 2251.39 1.3353 0.24799   
## TimesDur:Hemisphere 0.5390 0.5390 1 2260.43 3.5942 0.05811 .   
## TimesDur:Conditions 3.2035 3.2035 1 2251.41 21.3612 4.019e-06 \*\*\*  
## I(TimesDur^2):Conditions 2.8496 2.8496 1 2251.30 19.0016 1.365e-05 \*\*\*  
## I(TimesDur^3):Conditions 2.4170 2.4170 1 2251.25 16.1165 6.151e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

# M1:Random-intercept-with-poly1  
ModelLT.condition.interp.Times1 <- lmer(LTValues ~ Conditions\*TimesDur + LTchannel + (1|sub\_ID),Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelLT.condition.slopeinterp.Times1 <-lmer(LTValues ~ Conditions\*TimesDur + LTchannel + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelLT.condition.interp.Times2 <- lmer(LTValues ~ Conditions\*TimesDur + LTchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelLT.condition.slopeinterp.Times2 <- lmer(LTValues ~ Conditions\*TimesDur + LTchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelLT.condition.interp.Times3 <- lmer(LTValues ~ Conditions\*TimesDur + LTchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID),Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelLT.condition.slopeinterp.Times3 <- lmer(LTValues ~ Conditions\*TimesDur + LTchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelLT.condition.interp.Times1,ModelLT.condition.interp.Times2)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelLT.condition.interp.Times3: LTValues ~ Conditions \* TimesDur + LTchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelLT.condition.slopeinterp.Times3: LTValues ~ Conditions \* TimesDur + LTchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelLT.condition.interp.Times3 12 1066.5 1127.2 -521.23 1042.5   
## ModelLT.condition.slopeinterp.Times3 14 1069.8 1140.7 -520.90 1041.8 0.6602  
## Df Pr(>Chisq)  
## ModelLT.condition.interp.Times3   
## ModelLT.condition.slopeinterp.Times3 2 0.7189

# best fit  
ModelLT.condition.interp.Times3.N <- lmer(LTValues ~ LTchannel + Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelLT.condition.interp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula:   
## LTValues ~ LTchannel + Conditions \* TimesDur + Conditions \* I(TimesDur^2) +   
## Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## Data: Rawdata\_activity  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 1066.5 1127.2 -521.2 1042.5 1157   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.9334 -0.5439 0.0284 0.5781 3.6470   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01051 0.1025   
## Residual 0.13654 0.3695   
## Number of obs: 1169, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) -1.030e-02 3.243e-02 4.418e+02 -0.318  
## LTchannelCH5 -3.354e-02 2.582e-02 1.112e+03 -1.299  
## LTchannelCH8 3.640e-02 2.706e-02 1.124e+03 1.345  
## Conditionsbabble 7.627e-02 3.559e-02 1.109e+03 2.143  
## TimesDur 3.630e-02 1.342e-02 1.168e+03 2.705  
## I(TimesDur^2) -2.771e-03 1.229e-03 1.169e+03 -2.255  
## I(TimesDur^3) 5.736e-05 2.822e-05 1.168e+03 2.033  
## Conditionsbabble:TimesDur -8.341e-02 1.830e-02 1.109e+03 -4.557  
## Conditionsbabble:I(TimesDur^2) 6.803e-03 1.685e-03 1.109e+03 4.038  
## Conditionsbabble:I(TimesDur^3) -1.423e-04 3.876e-05 1.109e+03 -3.673  
## Pr(>|t|)   
## (Intercept) 0.750876   
## LTchannelCH5 0.194258   
## LTchannelCH8 0.178815   
## Conditionsbabble 0.032307 \*   
## TimesDur 0.006922 \*\*   
## I(TimesDur^2) 0.024318 \*   
## I(TimesDur^3) 0.042310 \*   
## Conditionsbabble:TimesDur 5.75e-06 \*\*\*  
## Conditionsbabble:I(TimesDur^2) 5.76e-05 \*\*\*  
## Conditionsbabble:I(TimesDur^3) 0.000251 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) LTcCH5 LTcCH8 Cndtns TimsDr I(TD^2 I(TD^3 Cnd:TD C:I(TD^2  
## LTchannlCH5 -0.400   
## LTchannlCH8 -0.353 0.474   
## Condtnsbbbl -0.547 -0.002 -0.002   
## TimesDur -0.550 0.009 -0.026 0.472   
## I(TimsDr^2) 0.451 -0.008 0.017 -0.386 -0.955   
## I(TimsDr^3) -0.392 0.006 -0.012 0.334 0.888 -0.981   
## Cndtnsbb:TD 0.380 0.000 0.001 -0.693 -0.682 0.654 -0.608   
## Cnd:I(TD^2) -0.309 0.000 -0.001 0.564 0.651 -0.686 0.673 -0.954   
## Cnd:I(TD^3) 0.267 0.000 0.001 -0.487 -0.604 0.672 -0.687 0.886 -0.980   
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

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

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

## right-Anterior Temporal Lobe(RH-ATL)

# M1:Random-intercept-with-poly1  
ModelRT.condition.interp.Times1 <- lmer(RTValues ~ Conditions\*TimesDur + RTchannel + (1|sub\_ID),Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelRT.condition.slopeinterp.Times1 <-lmer(RTValues ~ Conditions\*TimesDur + RTchannel + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelRT.condition.interp.Times2 <- lmer(RTValues ~ Conditions\*TimesDur + RTchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelRT.condition.slopeinterp.Times2 <- lmer(RTValues ~ Conditions\*TimesDur + RTchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelRT.condition.interp.Times3 <- lmer(RTValues ~ Conditions\*TimesDur + RTchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelRT.condition.slopeinterp.Times3 <- lmer(RTValues ~ Conditions\*TimesDur + RTchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activity,REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelRT.condition.interp.Times1,ModelRT.condition.interp.Times2)

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

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

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

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelRT.condition.slopeinterp.Times1: RTValues ~ Conditions \* TimesDur + RTchannel + (1 + TimesDur | sub\_ID)  
## ModelRT.condition.slopeinterp.Times2: RTValues ~ Conditions \* TimesDur + RTchannel + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelRT.condition.slopeinterp.Times1 10 1328.9 1379.8 -654.46 1308.9   
## ModelRT.condition.slopeinterp.Times2 12 1332.0 1393.1 -654.01 1308.0 0.9038  
## Df Pr(>Chisq)  
## ModelRT.condition.slopeinterp.Times1   
## ModelRT.condition.slopeinterp.Times2 2 0.6364

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelRT.condition.slopeinterp.Times1: RTValues ~ Conditions \* TimesDur + RTchannel + (1 + TimesDur | sub\_ID)  
## ModelRT.condition.slopeinterp.Times3: RTValues ~ Conditions \* TimesDur + RTchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelRT.condition.slopeinterp.Times1 10 1328.9 1379.8 -654.46 1308.9   
## ModelRT.condition.slopeinterp.Times3 14 1331.3 1402.6 -651.67 1303.3 5.5829  
## Df Pr(>Chisq)  
## ModelRT.condition.slopeinterp.Times1   
## ModelRT.condition.slopeinterp.Times3 4 0.2325

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

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

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

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

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

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

# best fit  
ModelRT.condition.interp.Times1.N <- lmer(RTValues ~ Conditions + RTchannel + TimesDur + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelRT.condition.interp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: RTValues ~ Conditions + RTchannel + TimesDur + (1 | sub\_ID)  
## Data: Rawdata\_activity  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 1325.7 1361.4 -655.9 1311.7 1191   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.3736 -0.5795 -0.0514 0.5415 3.5599   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.02492 0.1579   
## Residual 0.16375 0.4047   
## Number of obs: 1198, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 1.166e-01 3.266e-02 1.717e+02 3.571 0.000461 \*\*\*  
## Conditionsbabble -5.263e-02 2.338e-02 1.139e+03 -2.251 0.024593 \*   
## RTchannelCH5 9.708e-03 2.850e-02 1.140e+03 0.341 0.733455   
## RTchannelCH8 4.122e-02 2.875e-02 1.144e+03 1.434 0.151905   
## TimesDur -2.513e-03 1.774e-03 1.153e+03 -1.417 0.156778   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) Cndtns RTcCH5 RTcCH8  
## Condtnsbbbl -0.359   
## RTchannlCH5 -0.431 0.000   
## RTchannlCH8 -0.427 0.001 0.493   
## TimesDur -0.267 -0.001 -0.008 -0.005

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

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

# speech

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

# best fit  
ModelLT.speech.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) + (1|sub\_ID), Rawdata\_activity\_speech, REML = FALSE,control = ctrl,na.action=na.omit)  
summary(ModelLT.speech.interp.Times3.N)

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

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

# best fit  
ModelRT.speech.interp.Times1.N <- lmer(RTValues ~ RTchannel + TimesDur + (1|sub\_ID), Rawdata\_activity\_speech, REML = FALSE,control = ctrl,na.action=na.omit)  
summary(ModelRT.speech.interp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: RTValues ~ RTchannel + TimesDur + (1 | sub\_ID)  
## Data: Rawdata\_activity\_speech  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 658.5 684.8 -323.2 646.5 592   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.3773 -0.5794 -0.0572 0.5096 3.4754   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.02987 0.1728   
## Residual 0.15579 0.3947   
## Number of obs: 598, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 0.115528 0.038169 165.129917 3.027 0.00287 \*\*  
## RTchannelCH5 0.006374 0.039368 541.403935 0.162 0.87143   
## RTchannelCH8 0.046176 0.039667 543.020433 1.164 0.24489   
## TimesDur -0.003690 0.002405 593.563514 -1.534 0.12550   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) RTcCH5 RTcCH8  
## RTchannlCH5 -0.510   
## RTchannlCH8 -0.505 0.493   
## TimesDur -0.313 -0.008 -0.005

# noise:

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

#best fit  
ModelLT.noise.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2)+ I(TimesDur^3) + (1|sub\_ID), Rawdata\_activity\_noise, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelLT.noise.interp.Times3.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) +   
## (1 | sub\_ID)  
## Data: Rawdata\_activity\_noise  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 568 603 -276 552 577   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.5225 -0.5427 0.0488 0.5429 3.2352   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01772 0.1331   
## Residual 0.13892 0.3727   
## Number of obs: 585, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 6.804e-02 3.785e-02 2.447e+02 1.797 0.073522 .   
## LTchannelCH5 -4.380e-02 3.681e-02 5.243e+02 -1.190 0.234540   
## LTchannelCH8 8.146e-02 3.861e-02 5.314e+02 2.110 0.035345 \*   
## TimesDur -5.549e-02 1.390e-02 5.839e+02 -3.992 7.38e-05 \*\*\*  
## I(TimesDur^2) 4.716e-03 1.270e-03 5.849e+02 3.715 0.000223 \*\*\*  
## I(TimesDur^3) -1.009e-04 2.913e-05 5.842e+02 -3.463 0.000573 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) LTcCH5 LTcCH8 TimsDr I(TD^2  
## LTchannlCH5 -0.491   
## LTchannlCH8 -0.435 0.475   
## TimesDur -0.486 0.011 -0.034   
## I(TimsDr^2) 0.401 -0.010 0.021 -0.955   
## I(TimsDr^3) -0.351 0.008 -0.016 0.890 -0.981  
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

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

#best fit  
ModelRT.noise.interp.Times1.N <- lmer(RTValues ~ RTchannel + TimesDur + (1|sub\_ID), Rawdata\_activity\_noise, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelRT.noise.interp.Times1.N)

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

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

# best fit  
ModelLT.SpBa.interp.Times3.N <- lmer(LTValues ~ LTchannel + TimesDur + I(TimesDur^2) + I(TimesDur^3) + (1|sub\_ID), Rawdata\_activity\_SpBa, REML = FALSE,control = ctrl,na.action=na.omit)  
summary(ModelLT.SpBa.interp.Times3.N)

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

# Sylvian parieto-temporal areas(Spt)

# M1:Random-intercept-with-poly1  
ModelSpt.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelSpt.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Sptchannel + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = 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|sub\_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\*TimesDur + 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) + Conditions\*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  
ModelSpt.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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 + Hemisphere \* TimesDur + Sptchannel + (1 | sub\_ID)  
## ModelSpt.condition.interp.Times2: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelSpt.condition.interp.Times1 10 1230 1283.8 -604.99 1210   
## ModelSpt.condition.interp.Times2 13 1234 1304.0 -604.02 1208 1.9503 3  
## Pr(>Chisq)  
## ModelSpt.condition.interp.Times1   
## ModelSpt.condition.interp.Times2 0.5828

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

## Data: Rawdata\_activity  
## Models:  
## ModelSpt.condition.interp.Times2: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelSpt.condition.interp.Times3: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelSpt.condition.interp.Times2 13 1234.0 1304.0 -604.02 1208.0   
## ModelSpt.condition.interp.Times3 16 1236.5 1322.6 -602.25 1204.5 3.5384 3  
## Pr(>Chisq)  
## ModelSpt.condition.interp.Times2   
## ModelSpt.condition.interp.Times3 0.3158

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

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

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelSpt.condition.slopeinterp.Times2: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelSpt.condition.slopeinterp.Times3: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSpt.condition.slopeinterp.Times2 15 1229.6 1310.3 -599.81 1199.6  
## ModelSpt.condition.slopeinterp.Times3 18 1232.3 1329.1 -598.13 1196.3  
## Chisq Df Pr(>Chisq)  
## ModelSpt.condition.slopeinterp.Times2   
## ModelSpt.condition.slopeinterp.Times3 3.3556 3 0.34

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelSpt.condition.interp.Times1: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + (1 | sub\_ID)  
## ModelSpt.condition.slopeinterp.Times1: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSpt.condition.interp.Times1 10 1230.0 1283.8 -604.99 1210.0   
## ModelSpt.condition.slopeinterp.Times1 12 1249.9 1314.5 -612.96 1225.9 0  
## Df Pr(>Chisq)  
## ModelSpt.condition.interp.Times1   
## ModelSpt.condition.slopeinterp.Times1 2 1

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelSpt.condition.interp.Times3: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelSpt.condition.slopeinterp.Times3: Sptvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSpt.condition.interp.Times3 16 1236.5 1322.6 -602.25 1204.5  
## ModelSpt.condition.slopeinterp.Times3 18 1232.3 1329.1 -598.13 1196.3  
## Chisq Df Pr(>Chisq)   
## ModelSpt.condition.interp.Times3   
## ModelSpt.condition.slopeinterp.Times3 8.2349 2 0.01629 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

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

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

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

## Sylvian parieto-temporal areas(Spt)-LH

Rawdata\_activitySptLH <- Rawdata\_activity %>% filter(Hemisphere=='L')  
# M1:Random-intercept-with-poly1  
ModelSptLH.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelSptLH.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + (1+TimesDur|sub\_ID), Rawdata\_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelSptLH.condition.interp.Times2 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelSptLH.condition.slopeinterp.Times2 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelSptLH.condition.interp.Times3 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activitySptLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelSptLH.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activitySptLH,REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelSptLH.condition.interp.Times1,ModelSptLH.condition.interp.Times2)

## Data: Rawdata\_activitySptLH  
## Models:  
## ModelSptLH.condition.interp.Times1: Sptvalues ~ Conditions \* TimesDur + Sptchannel + (1 | sub\_ID)  
## ModelSptLH.condition.interp.Times2: Sptvalues ~ Conditions \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSptLH.condition.interp.Times1 7 601.10 633.96 -293.55 587.10   
## ModelSptLH.condition.interp.Times2 9 603.99 646.24 -292.99 585.99 1.1176  
## Df Pr(>Chisq)  
## ModelSptLH.condition.interp.Times1   
## ModelSptLH.condition.interp.Times2 2 0.5719

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Sylvian parieto-temporal areas(Spt)-RH

Rawdata\_activitySptRH <- Rawdata\_activity %>% filter(Hemisphere=='R')  
# M1:Random-intercept-with-poly1  
ModelSptRH.condition.interp.Times1 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelSptRH.condition.slopeinterp.Times1 <-lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + (1+TimesDur|sub\_ID), Rawdata\_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelSptRH.condition.interp.Times2 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelSptRH.condition.slopeinterp.Times2 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelSptRH.condition.interp.Times3 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activitySptRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelSptRH.condition.slopeinterp.Times3 <- lmer(Sptvalues ~ Conditions\*TimesDur + Sptchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activitySptRH,REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelSptRH.condition.interp.Times1,ModelSptRH.condition.interp.Times2)

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

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

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

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

## Data: Rawdata\_activitySptRH  
## Models:  
## ModelSptRH.condition.interp.Times1: Sptvalues ~ Conditions \* TimesDur + Sptchannel + (1 | sub\_ID)  
## ModelSptRH.condition.interp.Times3: Sptvalues ~ Conditions \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSptRH.condition.interp.Times1 7 637.40 670.14 -311.70 623.40   
## ModelSptRH.condition.interp.Times3 11 639.88 691.33 -308.94 617.88 5.5213  
## Df Pr(>Chisq)  
## ModelSptRH.condition.interp.Times1   
## ModelSptRH.condition.interp.Times3 4 0.2379

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

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

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

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

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

## Data: Rawdata\_activitySptRH  
## Models:  
## ModelSptRH.condition.slopeinterp.Times1: Sptvalues ~ Conditions \* TimesDur + Sptchannel + (1 + TimesDur | sub\_ID)  
## ModelSptRH.condition.slopeinterp.Times3: Sptvalues ~ Conditions \* TimesDur + Sptchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSptRH.condition.slopeinterp.Times1 9 640.99 683.08 -311.50 622.99  
## ModelSptRH.condition.slopeinterp.Times3 13 643.82 704.62 -308.91 617.82  
## Chisq Df Pr(>Chisq)  
## ModelSptRH.condition.slopeinterp.Times1   
## ModelSptRH.condition.slopeinterp.Times3 5.1697 4 0.2703

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

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

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

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

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

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

## Spt-speech-LH

# best fit  
Rawdata\_activitySptSPL <- Rawdata\_activity %>% filter(Conditions=='aspeech',Hemisphere=='L')  
ModelSptL.speech.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptSPL, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSptL.speech.slopeinterp.Times1.N)

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

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

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

## Spt-speech-RH

# best fit  
Rawdata\_activitySptSPR <- Rawdata\_activity %>% filter(Conditions=='aspeech',Hemisphere=='R')  
ModelSptR.speech.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptSPR, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSptR.speech.slopeinterp.Times1.N)

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

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

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

## Spt-noise-LH

# best fit  
Rawdata\_activitySptNOL <- Rawdata\_activity %>% filter(Conditions=='babble',Hemisphere=='L')  
ModelSpt.noise.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptNOL, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSpt.noise.slopeinterp.Times1.N)

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

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

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

## Spt-noise-RH

# best fit  
Rawdata\_activitySptNOR <- Rawdata\_activity %>% filter(Conditions=='babble',Hemisphere=='R')  
ModelSpt.noise.slopeinterp.Times1.N <- lmer(Sptvalues ~ TimesDur + Sptchannel + (1|sub\_ID), Rawdata\_activitySptNOR, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSpt.noise.slopeinterp.Times1.N)

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

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

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

# 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\*TimesDur + 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), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelSMG.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Conditions\*I(TimesDur^2) + Hemisphere\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelSMG.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Conditions\*I(TimesDur^2) + Hemisphere\*I(TimesDur^2) + Conditions\*I(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  
ModelSMG.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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,control = 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 + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelSMG.condition.interp.Times2: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelSMG.condition.interp.Times1 9 640.98 683.23 -311.49 622.98   
## ModelSMG.condition.interp.Times2 12 641.18 697.51 -308.59 617.18 5.7994 3  
## Pr(>Chisq)  
## ModelSMG.condition.interp.Times1   
## ModelSMG.condition.interp.Times2 0.1218

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

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

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

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

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelSMG.condition.slopeinterp.Times2: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSMG.condition.slopeinterp.Times2 14 652.84 718.57 -312.42 624.84  
## ModelSMG.condition.slopeinterp.Times3 17 656.54 736.35 -311.27 622.54  
## Chisq Df Pr(>Chisq)  
## ModelSMG.condition.slopeinterp.Times2   
## ModelSMG.condition.slopeinterp.Times3 2.2998 3 0.5126

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

## Data: Rawdata\_activity  
## Models:  
## ModelSMG.condition.slopeinterp.Times1: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 + TimesDur | sub\_ID)  
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSMG.condition.slopeinterp.Times1 11 640.82 692.46 -309.41 618.82   
## ModelSMG.condition.slopeinterp.Times3 17 656.54 736.35 -311.27 622.54 0  
## Df Pr(>Chisq)  
## ModelSMG.condition.slopeinterp.Times1   
## ModelSMG.condition.slopeinterp.Times3 6 1

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelSMG.condition.interp.Times2: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelSMG.condition.slopeinterp.Times2: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSMG.condition.interp.Times2 12 641.18 697.51 -308.59 617.18   
## ModelSMG.condition.slopeinterp.Times2 14 652.84 718.57 -312.42 624.84 0  
## Df Pr(>Chisq)  
## ModelSMG.condition.interp.Times2   
## ModelSMG.condition.slopeinterp.Times2 2 1

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

## Data: Rawdata\_activity  
## Models:  
## ModelSMG.condition.interp.Times3: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelSMG.condition.slopeinterp.Times3: SMGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSMG.condition.interp.Times3 15 644.38 714.80 -307.19 614.38   
## ModelSMG.condition.slopeinterp.Times3 17 656.54 736.35 -311.27 622.54 0  
## Df Pr(>Chisq)  
## ModelSMG.condition.interp.Times3   
## ModelSMG.condition.slopeinterp.Times3 2 1

# best fit  
ModelSMG.condition.slopeinterp.Times2.N <- lmer(SMGvalues ~ Conditions + TimesDur + I(TimesDur^2) + Hemisphere + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSMG.condition.slopeinterp.Times2.N)

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

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

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

## Supramarginal gyrus(SMG)-LH

Rawdata\_activitySMGLH <- Rawdata\_activity %>% filter(Hemisphere=='L')  
# M1:Random-intercept-with-poly1  
ModelSMGLH.condition.interp.Times1 <- lmer(SMGvalues ~ Conditions\*TimesDur + (1|sub\_ID), Rawdata\_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelSMGLH.condition.slopeinterp.Times1 <-lmer(SMGvalues ~ Conditions\*TimesDur + (1+TimesDur|sub\_ID), Rawdata\_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelSMGLH.condition.interp.Times2 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelSMGLH.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelSMGLH.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activitySMGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelSMGLH.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activitySMGLH,REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelSMGLH.condition.interp.Times1,ModelSMGLH.condition.interp.Times2)

## Data: Rawdata\_activitySMGLH  
## Models:  
## ModelSMGLH.condition.interp.Times1: SMGvalues ~ Conditions \* TimesDur + (1 | sub\_ID)  
## ModelSMGLH.condition.interp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSMGLH.condition.interp.Times1 6 253.36 277.40 -120.68 241.36   
## ModelSMGLH.condition.interp.Times2 8 256.77 288.82 -120.38 240.77 0.5929  
## Df Pr(>Chisq)  
## ModelSMGLH.condition.interp.Times1   
## ModelSMGLH.condition.interp.Times2 2 0.7434

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

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

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

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

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

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

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

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

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

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

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

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

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

## Data: Rawdata\_activitySMGLH  
## Models:  
## ModelSMGLH.condition.interp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelSMGLH.condition.slopeinterp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSMGLH.condition.interp.Times2 8 256.77 288.82 -120.38 240.77  
## ModelSMGLH.condition.slopeinterp.Times2 10 259.87 299.94 -119.94 239.87  
## Chisq Df Pr(>Chisq)  
## ModelSMGLH.condition.interp.Times2   
## ModelSMGLH.condition.slopeinterp.Times2 0.892 2 0.6402

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

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

## Supramarginal gyrus(SMG)-RH

Rawdata\_activitySMGRH <- Rawdata\_activity %>% filter(Hemisphere=='R')  
# M1:Random-intercept-with-poly1  
ModelSMGRH.condition.interp.Times1 <- lmer(SMGvalues ~ Conditions\*TimesDur + (1|sub\_ID), Rawdata\_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelSMGRH.condition.slopeinterp.Times1 <-lmer(SMGvalues ~ Conditions\*TimesDur + (1+TimesDur|sub\_ID), Rawdata\_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelSMGRH.condition.interp.Times2 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelSMGRH.condition.slopeinterp.Times2 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelSMGRH.condition.interp.Times3 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activitySMGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelSMGRH.condition.slopeinterp.Times3 <- lmer(SMGvalues ~ Conditions\*TimesDur + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activitySMGRH,REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelSMGRH.condition.interp.Times1,ModelSMGRH.condition.interp.Times2)

## Data: Rawdata\_activitySMGRH  
## Models:  
## ModelSMGRH.condition.interp.Times1: SMGvalues ~ Conditions \* TimesDur + (1 | sub\_ID)  
## ModelSMGRH.condition.interp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelSMGRH.condition.interp.Times1 6 387.44 411.42 -187.72 375.44   
## ModelSMGRH.condition.interp.Times2 8 386.84 418.81 -185.42 370.84 4.5939  
## Df Pr(>Chisq)  
## ModelSMGRH.condition.interp.Times1   
## ModelSMGRH.condition.interp.Times2 2 0.1006

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

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

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

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

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

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

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

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

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

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

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

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

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

## Data: Rawdata\_activitySMGRH  
## Models:  
## ModelSMGRH.condition.interp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelSMGRH.condition.slopeinterp.Times2: SMGvalues ~ Conditions \* TimesDur + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelSMGRH.condition.interp.Times2 8 386.84 418.81 -185.42 370.84  
## ModelSMGRH.condition.slopeinterp.Times2 10 390.65 430.61 -185.32 370.65  
## Chisq Df Pr(>Chisq)  
## ModelSMGRH.condition.interp.Times2   
## ModelSMGRH.condition.slopeinterp.Times2 0.195 2 0.9071

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

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

## Supramarginal gyrus (SMG)–speech-LH

# best fit  
Rawdata\_activitySMGSPL <- Rawdata\_activity %>% filter(Conditions=='aspeech',Hemisphere=='L')  
ModelSMGL.speech.slopeinterp.Times1.N <- lmer(SMGvalues ~ TimesDur + (1|sub\_ID), Rawdata\_activitySMGSPL, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSMGL.speech.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: SMGvalues ~ TimesDur + (1 | sub\_ID)  
## Data: Rawdata\_activitySMGSPL  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 74.8 88.0 -33.4 66.8 198   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.30879 -0.62438 -0.01973 0.65532 2.86889   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.002587 0.05086   
## Residual 0.079019 0.28110   
## Number of obs: 202, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) -1.565e-02 2.546e-02 1.109e+02 -0.615 0.540  
## TimesDur 8.319e-04 2.769e-03 2.020e+02 0.300 0.764  
##   
## Correlation of Fixed Effects:  
## (Intr)  
## TimesDur -0.564

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

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

## Supramarginal gyrus (SMG)–speech-RH

# best fit  
Rawdata\_activitySMGSPR <- Rawdata\_activity %>% filter(Conditions=='aspeech',Hemisphere=='R')  
ModelSMGR.speech.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySMGSPR, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSMGR.speech.slopeinterp.Times2.N)

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

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

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

## Supramarginal gyrus (SMG)–noise-LH

# best fit  
Rawdata\_activitySMGNOL <- Rawdata\_activity %>% filter(Conditions=='babble',Hemisphere=='L')  
ModelSMGL.noise.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + (1|sub\_ID), Rawdata\_activitySMGNOL, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSMGL.noise.slopeinterp.Times2.N)

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

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

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

## Supramarginal gyrus (SMG)–noise-RH

# best fit  
Rawdata\_activitySMGNOR <- Rawdata\_activity %>% filter(Conditions=='babble',Hemisphere=='R')  
ModelSMGR.noise.slopeinterp.Times2.N <- lmer(SMGvalues ~ TimesDur + I(TimesDur^2) + (1|sub\_ID), Rawdata\_activitySMGNOR, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelSMGR.noise.slopeinterp.Times2.N)

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

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

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

# Inferior Frontal Gyrus (IFG)

# M1:Random-intercept-with-poly1  
ModelF.condition.interp.Times1 <- lmer(Fvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Fchannel + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=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 + Hemisphere\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Hemisphere\*I(TimesDur^2) + (1|sub\_ID), 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\*TimesDur + Hemisphere\*TimesDur + Fchannel + 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  
ModelF.condition.interp.Times3 <- lmer(Fvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Hemisphere\*I(TimesDur^2) + Conditions\*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\*TimesDur + Hemisphere\*TimesDur + Fchannel + 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(ModelF.condition.interp.Times1,ModelF.condition.interp.Times2)

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.interp.Times2: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelF.condition.interp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelF.condition.interp.Times2 13 1617.0 1686.5 -795.53 1591.0   
## ModelF.condition.interp.Times3 16 1620.5 1706.0 -794.27 1588.5 2.5131 3  
## Pr(>Chisq)  
## ModelF.condition.interp.Times2   
## ModelF.condition.interp.Times3 0.4729

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.interp.Times1: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + (1 | sub\_ID)  
## ModelF.condition.interp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelF.condition.interp.Times1 10 1613.0 1666.4 -796.50 1593.0   
## ModelF.condition.interp.Times3 16 1620.5 1706.0 -794.27 1588.5 4.4652 6  
## Pr(>Chisq)  
## ModelF.condition.interp.Times1   
## ModelF.condition.interp.Times3 0.614

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.slopeinterp.Times2: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelF.condition.slopeinterp.Times2 15 1613.6 1693.8 -791.82 1583.6   
## ModelF.condition.slopeinterp.Times3 18 1616.6 1712.8 -790.32 1580.6 2.9886  
## Df Pr(>Chisq)  
## ModelF.condition.slopeinterp.Times2   
## ModelF.condition.slopeinterp.Times3 3 0.3934

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.slopeinterp.Times1: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + (1 + TimesDur | sub\_ID)  
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelF.condition.slopeinterp.Times1 12 1610.0 1674.2 -793.02 1586.0   
## ModelF.condition.slopeinterp.Times3 18 1616.6 1712.8 -790.32 1580.6 5.403  
## Df Pr(>Chisq)  
## ModelF.condition.slopeinterp.Times1   
## ModelF.condition.slopeinterp.Times3 6 0.4933

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.interp.Times2: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelF.condition.slopeinterp.Times2: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelF.condition.interp.Times2 13 1617.0 1686.5 -795.53 1591.0   
## ModelF.condition.slopeinterp.Times2 15 1613.6 1693.8 -791.82 1583.6 7.4219  
## Df Pr(>Chisq)   
## ModelF.condition.interp.Times2   
## ModelF.condition.slopeinterp.Times2 2 0.02445 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

## Data: Rawdata\_activity  
## Models:  
## ModelF.condition.interp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelF.condition.slopeinterp.Times3: Fvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelF.condition.interp.Times3 16 1620.5 1706.0 -794.27 1588.5   
## ModelF.condition.slopeinterp.Times3 18 1616.6 1712.8 -790.32 1580.6 7.8974  
## Df Pr(>Chisq)   
## ModelF.condition.interp.Times3   
## ModelF.condition.slopeinterp.Times3 2 0.01928 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

# best fit  
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Hemisphere + Fchannel + Conditions \* TimesDur + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelF.condition.slopeinterp.Times1.N)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Fvalues ~ Hemisphere + Fchannel + Conditions \* TimesDur + (1 |   
## sub\_ID)  
## Data: Rawdata\_activity  
## Control: ctrl  
##   
## AIC BIC logLik deviance df.resid   
## 1612.6 1655.4 -798.3 1596.6 1537   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.4853 -0.5812 0.0171 0.5731 4.0926   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01477 0.1215   
## Residual 0.15723 0.3965   
## Number of obs: 1545, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -3.996e-02 2.837e-02 2.252e+02 -1.408 0.1604   
## HemisphereR 2.709e-02 2.027e-02 1.491e+03 1.337 0.1815   
## FchannelCH4 1.461e-02 2.020e-02 1.485e+03 0.724 0.4695   
## Conditionsbabble 6.178e-03 2.496e-02 1.482e+03 0.248 0.8045   
## TimesDur 3.385e-03 2.031e-03 1.496e+03 1.666 0.0959 .  
## Conditionsbabble:TimesDur -4.885e-03 2.668e-03 1.482e+03 -1.831 0.0674 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) HmsphR FchCH4 Cndtns TimsDr  
## HemisphereR -0.384   
## FchannelCH4 -0.352 0.003   
## Condtnsbbbl -0.438 -0.003 -0.003   
## TimesDur -0.388 0.029 -0.005 0.387   
## Cndtnsbb:TD 0.258 0.000 0.002 -0.589 -0.658

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

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

## Inferior Frontal Gyrus (IFG)-LH

Rawdata\_activityIFGLH <- Rawdata\_activity %>% filter(Hemisphere=='L')  
# M1:Random-intercept-with-poly1  
ModelFLH.condition.interp.Times1 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + (1|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelFLH.condition.slopeinterp.Times1 <-lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + (1+TimesDur|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelFLH.condition.interp.Times2 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelFLH.condition.slopeinterp.Times2 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelFLH.condition.interp.Times3 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelFLH.condition.slopeinterp.Times3 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activityIFGLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelFLH.condition.interp.Times1,ModelFLH.condition.interp.Times2)

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

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

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

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

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

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

## Data: Rawdata\_activityIFGLH  
## Models:  
## ModelFLH.condition.slopeinterp.Times1: Fvalues ~ Conditions \* TimesDur + Fchannel + (1 + TimesDur | sub\_ID)  
## ModelFLH.condition.slopeinterp.Times2: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFLH.condition.slopeinterp.Times1 9 839.51 880.92 -410.75 821.51  
## ModelFLH.condition.slopeinterp.Times2 11 843.50 894.11 -410.75 821.50  
## Chisq Df Pr(>Chisq)  
## ModelFLH.condition.slopeinterp.Times1   
## ModelFLH.condition.slopeinterp.Times2 0.0087 2 0.9957

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

## Data: Rawdata\_activityIFGLH  
## Models:  
## ModelFLH.condition.slopeinterp.Times2: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFLH.condition.slopeinterp.Times2 11 843.50 894.11 -410.75 821.50  
## ModelFLH.condition.slopeinterp.Times3 13 846.13 905.95 -410.07 820.13  
## Chisq Df Pr(>Chisq)  
## ModelFLH.condition.slopeinterp.Times2   
## ModelFLH.condition.slopeinterp.Times3 1.3649 2 0.5054

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

## Data: Rawdata\_activityIFGLH  
## Models:  
## ModelFLH.condition.slopeinterp.Times1: Fvalues ~ Conditions \* TimesDur + Fchannel + (1 + TimesDur | sub\_ID)  
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFLH.condition.slopeinterp.Times1 9 839.51 880.92 -410.75 821.51  
## ModelFLH.condition.slopeinterp.Times3 13 846.13 905.95 -410.07 820.13  
## Chisq Df Pr(>Chisq)  
## ModelFLH.condition.slopeinterp.Times1   
## ModelFLH.condition.slopeinterp.Times3 1.3736 4 0.8488

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

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

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

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

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

## Data: Rawdata\_activityIFGLH  
## Models:  
## ModelFLH.condition.interp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelFLH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFLH.condition.interp.Times3 11 846.20 896.81 -412.10 824.20  
## ModelFLH.condition.slopeinterp.Times3 13 846.13 905.95 -410.07 820.13  
## Chisq Df Pr(>Chisq)  
## ModelFLH.condition.interp.Times3   
## ModelFLH.condition.slopeinterp.Times3 4.0653 2 0.131

## Inferior Frontal Gyrus (IFG)-RH

Rawdata\_activityIFGRH <- Rawdata\_activity %>% filter(Hemisphere=='R')  
# M1:Random-intercept-with-poly1  
ModelFRH.condition.interp.Times1 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + (1|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelFRH.condition.slopeinterp.Times1 <-lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + (1+TimesDur|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M3:Random-intercept-with-poly2  
ModelFRH.condition.interp.Times2 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + (1|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelFRH.condition.slopeinterp.Times2 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + (1+TimesDur|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M5:Random-intercept-with-poly3  
ModelFRH.condition.interp.Times3 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M6:Random-intercept-and-slope-with-poly3  
ModelFRH.condition.slopeinterp.Times3 <- lmer(Fvalues ~ Conditions\*TimesDur + Fchannel + Conditions\*I(TimesDur^2) + Conditions\*I(TimesDur^3) + (1+TimesDur|sub\_ID), Rawdata\_activityIFGRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# model contrast  
anova(ModelFRH.condition.interp.Times1,ModelFRH.condition.interp.Times2)

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

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

## Data: Rawdata\_activityIFGRH  
## Models:  
## ModelFRH.condition.interp.Times2: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelFRH.condition.interp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelFRH.condition.interp.Times2 9 798.49 840.75 -390.25 780.49   
## ModelFRH.condition.interp.Times3 11 795.18 846.83 -386.59 773.18 7.3169 2  
## Pr(>Chisq)   
## ModelFRH.condition.interp.Times2   
## ModelFRH.condition.interp.Times3 0.02577 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

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

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

## Data: Rawdata\_activityIFGRH  
## Models:  
## ModelFRH.condition.slopeinterp.Times1: Fvalues ~ Conditions \* TimesDur + Fchannel + (1 + TimesDur | sub\_ID)  
## ModelFRH.condition.slopeinterp.Times2: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFRH.condition.slopeinterp.Times1 9 798.12 840.39 -390.06 780.12  
## ModelFRH.condition.slopeinterp.Times2 11 802.02 853.68 -390.01 780.02  
## Chisq Df Pr(>Chisq)  
## ModelFRH.condition.slopeinterp.Times1   
## ModelFRH.condition.slopeinterp.Times2 0.1009 2 0.9508

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

## Data: Rawdata\_activityIFGRH  
## Models:  
## ModelFRH.condition.slopeinterp.Times2: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFRH.condition.slopeinterp.Times2 11 802.02 853.68 -390.01 780.02  
## ModelFRH.condition.slopeinterp.Times3 13 799.07 860.12 -386.54 773.07  
## Chisq Df Pr(>Chisq)   
## ModelFRH.condition.slopeinterp.Times2   
## ModelFRH.condition.slopeinterp.Times3 6.9522 2 0.03093 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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

## Data: Rawdata\_activityIFGRH  
## Models:  
## ModelFRH.condition.slopeinterp.Times1: Fvalues ~ Conditions \* TimesDur + Fchannel + (1 + TimesDur | sub\_ID)  
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFRH.condition.slopeinterp.Times1 9 798.12 840.39 -390.06 780.12  
## ModelFRH.condition.slopeinterp.Times3 13 799.07 860.12 -386.54 773.07  
## Chisq Df Pr(>Chisq)  
## ModelFRH.condition.slopeinterp.Times1   
## ModelFRH.condition.slopeinterp.Times3 7.0531 4 0.1331

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

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

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

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

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

## Data: Rawdata\_activityIFGRH  
## Models:  
## ModelFRH.condition.interp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelFRH.condition.slopeinterp.Times3: Fvalues ~ Conditions \* TimesDur + Fchannel + Conditions \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFRH.condition.interp.Times3 11 795.18 846.83 -386.59 773.18  
## ModelFRH.condition.slopeinterp.Times3 13 799.07 860.12 -386.54 773.07  
## Chisq Df Pr(>Chisq)  
## ModelFRH.condition.interp.Times3   
## ModelFRH.condition.slopeinterp.Times3 0.1039 2 0.9494

## speech-LH

# best fit  
Rawdata\_activitySPLH <- Rawdata\_activity %>% filter(Conditions=='aspeech', Hemisphere == 'L')  
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub\_ID), Rawdata\_activitySPLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelF.condition.slopeinterp.Times1.N)

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

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

## Type III Analysis of Variance Table with Satterthwaite's method  
## Sum Sq Mean Sq NumDF DenDF F value Pr(>F)  
## Fchannel 0.013176 0.013176 1 316.16 0.0825 0.7741  
## TimesDur 0.045081 0.045081 1 343.41 0.2823 0.5955

## speech-RH

# best fit  
Rawdata\_activitySPRH <- Rawdata\_activity %>% filter(Conditions=='aspeech', Hemisphere == 'R' )  
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub\_ID), Rawdata\_activitySPRH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelF.condition.slopeinterp.Times1.N)

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

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

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

## noise-LH

# best fit  
Rawdata\_activityNOLH <- Rawdata\_activity %>% filter(Conditions=='babble', Hemisphere == 'L' )  
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub\_ID), Rawdata\_activityNOLH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelF.condition.slopeinterp.Times1.N)

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

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

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

## noise-RH

# best fit  
Rawdata\_activityNORH <- Rawdata\_activity %>% filter(Conditions=='babble', Hemisphere == 'R' )  
ModelF.condition.slopeinterp.Times1.N <- lmer(Fvalues ~ Fchannel + TimesDur + (1|sub\_ID), Rawdata\_activityNORH, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelF.condition.slopeinterp.Times1.N)

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

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

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

# 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.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelAG.condition.slopeinterp.Times1 <-lmer(AGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.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), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelAG.condition.slopeinterp.Times2 <- lmer(AGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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(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  
ModelAG.condition.slopeinterp.Times3 <- lmer(AGvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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,control = 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 + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelAG.condition.interp.Times1 9 716.45 759.08 -349.23 698.45   
## ModelAG.condition.interp.Times2 12 719.89 776.72 -347.95 695.89 2.5593 3  
## Pr(>Chisq)  
## ModelAG.condition.interp.Times1   
## ModelAG.condition.interp.Times2 0.4647

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelAG.condition.interp.Times2 12 719.89 776.72 -347.95 695.89   
## ModelAG.condition.interp.Times3 15 723.50 794.54 -346.75 693.50 2.3949 3  
## Pr(>Chisq)  
## ModelAG.condition.interp.Times2   
## ModelAG.condition.interp.Times3 0.4946

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.interp.Times1: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelAG.condition.interp.Times1 9 716.45 759.08 -349.23 698.45   
## ModelAG.condition.interp.Times3 15 723.50 794.54 -346.75 693.50 4.9542 6  
## Pr(>Chisq)  
## ModelAG.condition.interp.Times1   
## ModelAG.condition.interp.Times3 0.5497

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.slopeinterp.Times2: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelAG.condition.slopeinterp.Times2 14 723.76 790.07 -347.88 695.76   
## ModelAG.condition.slopeinterp.Times3 17 727.21 807.72 -346.61 693.21 2.552  
## Df Pr(>Chisq)  
## ModelAG.condition.slopeinterp.Times2   
## ModelAG.condition.slopeinterp.Times3 3 0.466

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.slopeinterp.Times1: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 + TimesDur | sub\_ID)  
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelAG.condition.slopeinterp.Times1 11 720.26 772.35 -349.13 698.26   
## ModelAG.condition.slopeinterp.Times3 17 727.21 807.72 -346.61 693.21 5.0489  
## Df Pr(>Chisq)  
## ModelAG.condition.slopeinterp.Times1   
## ModelAG.condition.slopeinterp.Times3 6 0.5376

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.interp.Times1: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelAG.condition.slopeinterp.Times1: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelAG.condition.interp.Times1 9 716.45 759.08 -349.23 698.45   
## ModelAG.condition.slopeinterp.Times1 11 720.26 772.35 -349.13 698.26 0.1925  
## Df Pr(>Chisq)  
## ModelAG.condition.interp.Times1   
## ModelAG.condition.slopeinterp.Times1 2 0.9083

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.interp.Times2: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelAG.condition.slopeinterp.Times2: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelAG.condition.interp.Times2 12 719.89 776.72 -347.95 695.89   
## ModelAG.condition.slopeinterp.Times2 14 723.76 790.07 -347.88 695.76 0.1301  
## Df Pr(>Chisq)  
## ModelAG.condition.interp.Times2   
## ModelAG.condition.slopeinterp.Times2 2 0.937

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

## Data: Rawdata\_activity  
## Models:  
## ModelAG.condition.interp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelAG.condition.slopeinterp.Times3: AGvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelAG.condition.interp.Times3 15 723.50 794.54 -346.75 693.50   
## ModelAG.condition.slopeinterp.Times3 17 727.21 807.72 -346.61 693.21 0.2872  
## Df Pr(>Chisq)  
## ModelAG.condition.interp.Times3   
## ModelAG.condition.slopeinterp.Times3 2 0.8662

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

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

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

## Type III Analysis of Variance Table with Satterthwaite's method  
## Sum Sq Mean Sq NumDF DenDF F value Pr(>F)  
## Hemisphere 0.091080 0.091080 1 789.13 0.6996 0.4032  
## Conditions 0.000018 0.000018 1 789.12 0.0001 0.9905  
## TimesDur 0.001452 0.001452 1 653.06 0.0112 0.9159

# 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.omit)  
  
# M2:Random-intercept-and-slope-with-poly1  
ModelFA.condition.slopeinterp.Times1 <-lmer(FAvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + Hemisphere\*TimesDur + (1+TimesDur|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.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), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
# M4:Random-intercept-slope-with-poly2  
ModelFA.condition.slopeinterp.Times2 <- lmer(FAvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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(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  
ModelFA.condition.slopeinterp.Times3 <- lmer(FAvalues ~ Conditions\*Hemisphere + Conditions\*TimesDur + 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,control = 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 + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelFA.condition.interp.Times1 9 928.86 971.49 -455.43 910.86   
## ModelFA.condition.interp.Times2 12 933.86 990.70 -454.93 909.86 1.0003 3  
## Pr(>Chisq)  
## ModelFA.condition.interp.Times1   
## ModelFA.condition.interp.Times2 0.8012

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelFA.condition.interp.Times2 12 933.86 990.7 -454.93 909.86   
## ModelFA.condition.interp.Times3 15 937.87 1008.9 -453.94 907.87 1.9856 3  
## Pr(>Chisq)  
## ModelFA.condition.interp.Times2   
## ModelFA.condition.interp.Times3 0.5754

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.interp.Times1: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## npar AIC BIC logLik deviance Chisq Df  
## ModelFA.condition.interp.Times1 9 928.86 971.49 -455.43 910.86   
## ModelFA.condition.interp.Times3 15 937.87 1008.93 -453.94 907.87 2.9859 6  
## Pr(>Chisq)  
## ModelFA.condition.interp.Times1   
## ModelFA.condition.interp.Times3 0.8106

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

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

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.slopeinterp.Times2: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelFA.condition.slopeinterp.Times2 14 937.85 1004.2 -454.92 909.85   
## ModelFA.condition.slopeinterp.Times3 17 941.76 1022.3 -453.88 907.76 2.0903  
## Df Pr(>Chisq)  
## ModelFA.condition.slopeinterp.Times2   
## ModelFA.condition.slopeinterp.Times3 3 0.5539

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.slopeinterp.Times1: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 + TimesDur | sub\_ID)  
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance  
## ModelFA.condition.slopeinterp.Times1 11 932.84 984.95 -455.42 910.84  
## ModelFA.condition.slopeinterp.Times3 17 941.76 1022.29 -453.88 907.76  
## Chisq Df Pr(>Chisq)  
## ModelFA.condition.slopeinterp.Times1   
## ModelFA.condition.slopeinterp.Times3 3.0868 6 0.7979

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.interp.Times1: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 | sub\_ID)  
## ModelFA.condition.slopeinterp.Times1: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelFA.condition.interp.Times1 9 928.86 971.49 -455.43 910.86   
## ModelFA.condition.slopeinterp.Times1 11 932.84 984.95 -455.42 910.84 0.0165  
## Df Pr(>Chisq)  
## ModelFA.condition.interp.Times1   
## ModelFA.condition.slopeinterp.Times1 2 0.9918

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.interp.Times2: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 | sub\_ID)  
## ModelFA.condition.slopeinterp.Times2: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelFA.condition.interp.Times2 12 933.86 990.7 -454.93 909.86   
## ModelFA.condition.slopeinterp.Times2 14 937.85 1004.2 -454.92 909.85 0.0127  
## Df Pr(>Chisq)  
## ModelFA.condition.interp.Times2   
## ModelFA.condition.slopeinterp.Times2 2 0.9937

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

## Data: Rawdata\_activity  
## Models:  
## ModelFA.condition.interp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 | sub\_ID)  
## ModelFA.condition.slopeinterp.Times3: FAvalues ~ Conditions \* Hemisphere + Conditions \* TimesDur + Hemisphere \* TimesDur + Conditions \* I(TimesDur^2) + Hemisphere \* I(TimesDur^2) + Conditions \* I(TimesDur^3) + Hemisphere \* I(TimesDur^3) + (1 + TimesDur | sub\_ID)  
## npar AIC BIC logLik deviance Chisq  
## ModelFA.condition.interp.Times3 15 937.87 1008.9 -453.94 907.87   
## ModelFA.condition.slopeinterp.Times3 17 941.76 1022.3 -453.88 907.76 0.1174  
## Df Pr(>Chisq)  
## ModelFA.condition.interp.Times3   
## ModelFA.condition.slopeinterp.Times3 2 0.943

# best fit  
ModelFA.condition.slopeinterp.Times1.N <- lmer(FAvalues ~ Hemisphere + Conditions + TimesDur + (1|sub\_ID), Rawdata\_activity, REML = FALSE,control = ctrl,na.action=na.omit)  
  
summary(ModelFA.condition.slopeinterp.Times1.N)

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

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

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

# \*\* NH Adults vs. CI child(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),Rawdata\_NHCI\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLT.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Tvalues ~ Tchannel + GROUP \* Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_LH  
##   
## AIC BIC logLik deviance df.resid   
## -141.0 -106.5 78.5 -157.0 542   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.2288 -0.4809 0.0259 0.5590 3.2545   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01354 0.1164   
## Residual 0.03616 0.1901   
## Number of obs: 550, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) 0.06324 0.02410 239.90893 2.624 0.00924  
## TchannelCH5 -0.04567 0.01982 458.15550 -2.304 0.02168  
## TchannelCH8 0.03153 0.01990 459.01718 1.585 0.11366  
## GROUPNH\_adult -0.09291 0.03438 154.56784 -2.703 0.00765  
## Conditionsbabble -0.05188 0.02062 458.15550 -2.515 0.01224  
## GROUPNH\_adult:Conditionsbabble 0.14027 0.03338 458.15550 4.202 3.18e-05  
##   
## (Intercept) \*\*   
## TchannelCH5 \*   
## TchannelCH8   
## GROUPNH\_adult \*\*   
## Conditionsbabble \*   
## GROUPNH\_adult:Conditionsbabble \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) TchCH5 TchCH8 GROUPNH\_d Cndtns  
## TchannelCH5 -0.411   
## TchannelCH8 -0.409 0.498   
## GROUPNH\_dlt -0.543 0.000 -0.002   
## Condtnsbbbl -0.428 0.000 0.000 0.300   
## GROUPNH\_d:C 0.264 0.000 0.000 -0.485 -0.618

anova(ModelLT.condition.interp.Times)

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

## CI children(averaged)-ATL-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLT.condition.interp.Times\_CI <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_LT,REML = FALSE,na.action=na.omit)   
summary(ModelLT.condition.interp.Times\_CI)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_CI\_LT  
##   
## AIC BIC logLik deviance df.resid   
## -46.4 -23.5 29.2 -58.4 334   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.97146 -0.60111 0.02644 0.53921 3.07069   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01365 0.1168   
## Residual 0.04105 0.2026   
## Number of obs: 340, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 0.05914 0.02684 189.90709 2.204 0.0288 \*  
## TchannelCH5 -0.03774 0.02684 283.17171 -1.406 0.1607   
## TchannelCH8 0.03597 0.02699 284.08909 1.333 0.1837   
## Conditionsbabble -0.05188 0.02198 283.17171 -2.361 0.0189 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) TchCH5 TchCH8  
## TchannelCH5 -0.500   
## TchannelCH8 -0.497 0.497   
## Condtnsbbbl -0.409 0.000 0.000

anova(ModelLT.condition.interp.Times\_CI)

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

## NH adult-ATL-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLT.condition.interp.Times\_NH <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_LT,REML = FALSE,na.action=na.omit)   
summary(ModelLT.condition.interp.Times\_NH)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Tvalues ~ Tchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_NH\_LT  
##   
## AIC BIC logLik deviance df.resid   
## -94.4 -74.3 53.2 -106.4 204   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.5871 -0.4214 -0.0190 0.5744 3.3895   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01337 0.1156   
## Residual 0.02818 0.1679   
## Number of obs: 210, groups: sub\_ID, 35  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -0.02298 0.03031 98.84390 -0.758 0.450139   
## TchannelCH5 -0.05858 0.02838 175.00000 -2.064 0.040470 \*   
## TchannelCH8 0.02440 0.02838 175.00000 0.860 0.391134   
## Conditionsbabble 0.08839 0.02317 175.00000 3.815 0.000189 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) TchCH5 TchCH8  
## TchannelCH5 -0.468   
## TchannelCH8 -0.468 0.500   
## Condtnsbbbl -0.382 0.000 0.000

anova(ModelLT.condition.interp.Times\_NH)

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

# 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),Rawdata\_NHCI\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRT.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Tvalues ~ Tchannel + GROUP \* Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_RH  
##   
## AIC BIC logLik deviance df.resid   
## -31.6 2.9 23.8 -47.6 543   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.8805 -0.5231 -0.0016 0.5117 5.1267   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01990 0.1411   
## Residual 0.04303 0.2074   
## Number of obs: 551, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) 0.08632 0.02751 218.06761 3.138 0.001937  
## TchannelCH5 0.03623 0.02163 459.03533 1.675 0.094593  
## TchannelCH8 0.03733 0.02166 459.17781 1.723 0.085499  
## GROUPNH\_adult -0.07371 0.03974 145.06008 -1.855 0.065654  
## Conditionsbabble -0.03459 0.02247 459.18860 -1.539 0.124454  
## GROUPNH\_adult:Conditionsbabble 0.12360 0.03639 459.09377 3.396 0.000743  
##   
## (Intercept) \*\*   
## TchannelCH5 .   
## TchannelCH8 .   
## GROUPNH\_adult .   
## Conditionsbabble   
## GROUPNH\_adult:Conditionsbabble \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) TchCH5 TchCH8 GROUPNH\_d Cndtns  
## TchannelCH5 -0.393   
## TchannelCH8 -0.393 0.499   
## GROUPNH\_dlt -0.550 0.000 0.000   
## Condtnsbbbl -0.408 0.000 0.003 0.282   
## GROUPNH\_d:C 0.252 0.000 -0.002 -0.457 -0.617

anova(ModelRT.condition.interp.Times)

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

## CI children(averaged)-ATL-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRT.condition.interp.Times\_CI <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_RT,REML = FALSE,na.action=na.omit)   
summary(ModelRT.condition.interp.Times\_CI)

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

anova(ModelRT.condition.interp.Times\_CI)

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

## NH adult-ATL-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRT.condition.interp.Times\_NH <- lmer(Tvalues ~ Tchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_RT,REML = FALSE,na.action=na.omit)   
summary(ModelRT.condition.interp.Times\_NH)

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

anova(ModelRT.condition.interp.Times\_NH)

## Type III Analysis of Variance Table with Satterthwaite's method  
## Sum Sq Mean Sq NumDF DenDF F value Pr(>F)   
## Tchannel 0.07904 0.03952 2 175 1.5514 0.2149   
## Conditions 0.41597 0.41597 1 175 16.3301 7.958e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

# Spt-LH

# best fit  
# M1:Random-intercept-with-poly1  
Rawdata\_NHCI\_LH <- Rawdata\_NHCI %>% filter(Hemisphere=='L')  
ModelSptLH.condition.interp.Times <- lmer(Sptvalues ~ Sptchannel + GROUP\*Conditions + (1|sub\_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   
## -224.9 -197.6 119.5 -238.9 361   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.4035 -0.5378 -0.0232 0.5342 3.6715   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.009503 0.09748   
## Residual 0.024148 0.15540   
## Number of obs: 368, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) -0.014942 0.021075 215.722070 -0.709  
## SptchannelCH9 0.010471 0.016201 276.000000 0.646  
## GROUPNH\_adult -0.013233 0.031544 168.870345 -0.420  
## Conditionsbabble 0.037763 0.020583 276.000000 1.835  
## GROUPNH\_adult:Conditionsbabble 0.002229 0.033371 276.000000 0.067  
## Pr(>|t|)   
## (Intercept) 0.4791   
## SptchannelCH9 0.5186   
## GROUPNH\_adult 0.6754   
## Conditionsbabble 0.0676 .  
## GROUPNH\_adult:Conditionsbabble 0.9468   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SptCH9 GROUPNH\_d Cndtns  
## SptchnnlCH9 -0.384   
## GROUPNH\_dlt -0.569 0.000   
## Condtnsbbbl -0.488 0.000 0.326   
## GROUPNH\_d:C 0.301 0.000 -0.529 -0.617

anova(ModelSptLH.condition.interp.Times)

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

## CI children(averaged)-Spt-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLSpt.condition.interp.Times\_CI <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLSpt.condition.interp.Times\_CI)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_CI\_LH  
##   
## AIC BIC logLik deviance df.resid   
## -70.6 -53.4 40.3 -80.6 223   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.1071 -0.5936 -0.0427 0.5801 3.2009   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01277 0.1130   
## Residual 0.03247 0.1802   
## Number of obs: 228, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) -0.008772 0.025520 149.854316 -0.344 0.732  
## SptchannelCH9 -0.001870 0.023866 171.000000 -0.078 0.938  
## Conditionsbabble 0.037763 0.023866 171.000000 1.582 0.115  
##   
## Correlation of Fixed Effects:  
## (Intr) SptCH9  
## SptchnnlCH9 -0.468   
## Condtnsbbbl -0.468 0.000

anova(ModelLSpt.condition.interp.Times\_CI)

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

## NH adult-Spt-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLSpt.condition.interp.Times\_NH <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLSpt.condition.interp.Times\_NH)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Sptvalues ~ Sptchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_NH\_LH  
##   
## AIC BIC logLik deviance df.resid   
## -198.3 -183.6 104.1 -208.3 135   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.3988 -0.4722 -0.0615 0.6494 2.3126   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.004235 0.06508   
## Residual 0.010384 0.10190   
## Number of obs: 140, groups: sub\_ID, 35  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -0.03822 0.01853 90.91663 -2.062 0.0420 \*  
## SptchannelCH9 0.03057 0.01722 105.00000 1.775 0.0788 .  
## Conditionsbabble 0.03999 0.01722 105.00000 2.322 0.0222 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SptCH9  
## SptchnnlCH9 -0.465   
## Condtnsbbbl -0.465 0.000

anova(ModelLSpt.condition.interp.Times\_NH)

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

# 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\_ID),Rawdata\_NHCI\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelSptRH.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Sptvalues ~ Sptchannel + GROUP \* Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_RH  
##   
## AIC BIC logLik deviance df.resid   
## -218.5 -191.1 116.2 -232.5 361   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.5384 -0.5236 -0.0018 0.5187 3.6534   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.004764 0.06902   
## Residual 0.027265 0.16512   
## Number of obs: 368, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) 0.031735 0.019921 269.399653 1.593  
## SptchannelCH9 -0.029180 0.017215 276.000000 -1.695  
## GROUPNH\_adult -0.060368 0.029127 208.137662 -2.073  
## Conditionsbabble -0.009126 0.021871 276.000000 -0.417  
## GROUPNH\_adult:Conditionsbabble 0.089337 0.035459 276.000000 2.519  
## Pr(>|t|)   
## (Intercept) 0.1123   
## SptchannelCH9 0.0912 .  
## GROUPNH\_adult 0.0394 \*  
## Conditionsbabble 0.6768   
## GROUPNH\_adult:Conditionsbabble 0.0123 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SptCH9 GROUPNH\_d Cndtns  
## SptchnnlCH9 -0.432   
## GROUPNH\_dlt -0.556 0.000   
## Condtnsbbbl -0.549 0.000 0.375   
## GROUPNH\_d:C 0.339 0.000 -0.609 -0.617

anova(ModelSptRH.condition.interp.Times)

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

## CI children(averaged)-Spt-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRSpt.condition.interp.Times\_CI <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRSpt.condition.interp.Times\_CI)

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

anova(ModelRSpt.condition.interp.Times\_CI)

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

## NH adult-Spt-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRSpt.condition.interp.Times\_NH <- lmer(Sptvalues ~ Sptchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRSpt.condition.interp.Times\_NH)

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

anova(ModelRSpt.condition.interp.Times\_NH)

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

# SMG-LH

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

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

anova(ModelSMGLH.condition.interp.Times)

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

## CI children(averaged)-SMG-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLSMG.condition.interp.Times\_CI <- lmer(SMGvalues ~ Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLSMG.condition.interp.Times\_CI)

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

anova(ModelLSMG.condition.interp.Times\_CI)

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

## NH adult-SMG-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLSMG.condition.interp.Times\_NH <- lmer(SMGvalues ~ Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLSMG.condition.interp.Times\_NH)

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

anova(ModelLSMG.condition.interp.Times\_NH)

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

# 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   
## -81.7 -62.4 46.9 -93.7 178   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.70913 -0.48369 0.02815 0.53739 3.03697   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01300 0.1140   
## Residual 0.02451 0.1566   
## Number of obs: 184, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) -0.002269 0.025652 164.274340 -0.088  
## GROUPNH\_adult -0.031019 0.041590 164.274340 -0.746  
## Conditionsbabble 0.039155 0.029326 92.000000 1.335  
## GROUPNH\_adult:Conditionsbabble 0.047218 0.047546 92.000000 0.993  
## Pr(>|t|)  
## (Intercept) 0.930  
## GROUPNH\_adult 0.457  
## Conditionsbabble 0.185  
## GROUPNH\_adult:Conditionsbabble 0.323  
##   
## Correlation of Fixed Effects:  
## (Intr) GROUPNH\_d Cndtns  
## GROUPNH\_dlt -0.617   
## Condtnsbbbl -0.572 0.353   
## GROUPNH\_d:C 0.353 -0.572 -0.617

anova(ModelSMGRH.condition.interp.Times)

## Type III Analysis of Variance Table with Satterthwaite's method  
## Sum Sq Mean Sq NumDF DenDF F value Pr(>F)   
## GROUP 0.001156 0.001156 1 92 0.0471 0.828588   
## Conditions 0.170848 0.170848 1 92 6.9702 0.009736 \*\*  
## GROUP:Conditions 0.024173 0.024173 1 92 0.9862 0.323273   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## CI children(averaged)-SMG-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRSMG.condition.interp.Times\_CI <- lmer(SMGvalues ~ Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRSMG.condition.interp.Times\_CI)

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

anova(ModelRSMG.condition.interp.Times\_CI)

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

## NH adult-SMG-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRSMG.condition.interp.Times\_NH <- lmer(SMGvalues ~ Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRSMG.condition.interp.Times\_NH)

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

anova(ModelRSMG.condition.interp.Times\_NH)

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

# IFG-LH

# best fit  
# M1:Random-intercept-with-poly1  
Rawdata\_NHCI\_LH <- Rawdata\_NHCI %>% filter(Hemisphere=='L')  
ModelLF.condition.interp.Times <- lmer(Fvalues ~ Fchannel + GROUP\*Conditions + (1|sub\_ID),Rawdata\_NHCI\_LH,REML = FALSE,na.action=na.omit)   
summary(ModelLF.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Fvalues ~ Fchannel + GROUP \* Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_LH  
##   
## AIC BIC logLik deviance df.resid   
## 17.4 44.5 -1.7 3.4 351   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.1185 -0.5546 -0.0290 0.6010 2.2023   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01336 0.1156   
## Residual 0.04917 0.2217   
## Number of obs: 358, groups: sub\_ID, 90  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) -0.032365 0.028342 236.710184 -1.142  
## FchannelCH4 0.020919 0.023463 269.607559 0.892  
## GROUPNH\_adult -0.008233 0.042765 183.746862 -0.193  
## Conditionsbabble 0.009891 0.029370 268.305922 0.337  
## GROUPNH\_adult:Conditionsbabble 0.098558 0.048739 268.305922 2.022  
## Pr(>|t|)   
## (Intercept) 0.2546   
## FchannelCH4 0.3734   
## GROUPNH\_adult 0.8475   
## Conditionsbabble 0.7366   
## GROUPNH\_adult:Conditionsbabble 0.0442 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) FchCH4 GROUPNH\_d Cndtns  
## FchannelCH4 -0.414   
## GROUPNH\_dlt -0.552 0.006   
## Condtnsbbbl -0.518 0.000 0.343   
## GROUPNH\_d:C 0.312 0.000 -0.570 -0.603

anova(ModelLF.condition.interp.Times)

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

## CI children-IFG-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLF.condition.interp.Times\_CI <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_LF,REML = FALSE,na.action=na.omit)   
summary(ModelLF.condition.interp.Times\_CI)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_CI\_LF  
##   
## AIC BIC logLik deviance df.resid   
## 14.7 31.8 -2.3 4.7 223   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.43056 -0.59126 -0.05665 0.66967 2.14601   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01665 0.1290   
## Residual 0.04809 0.2193   
## Number of obs: 228, groups: sub\_ID, 57  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) -0.043541 0.030410 156.107475 -1.432 0.154  
## FchannelCH4 0.043271 0.029046 171.000001 1.490 0.138  
## Conditionsbabble 0.009891 0.029046 171.000001 0.341 0.734  
##   
## Correlation of Fixed Effects:  
## (Intr) FchCH4  
## FchannelCH4 -0.478   
## Condtnsbbbl -0.478 0.000

anova(ModelLF.condition.interp.Times\_CI)

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

## NH adult-IFG-LH

# best fit  
# M1:Random-intercept-with-poly1  
ModelLF.condition.interp.Times\_NH <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_LF,REML = FALSE,na.action=na.omit)   
summary(ModelLF.condition.interp.Times\_NH)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Fvalues ~ Fchannel + Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_NH\_LF  
##   
## AIC BIC logLik deviance df.resid   
## 5.9 20.2 2.1 -4.1 125   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.3104 -0.4392 0.0569 0.4425 2.1428   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.007734 0.08794   
## Residual 0.050299 0.22427   
## Number of obs: 130, groups: sub\_ID, 33  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -0.02129 0.03719 108.32855 -0.573 0.56815   
## FchannelCH4 -0.01895 0.03942 98.80498 -0.481 0.63169   
## Conditionsbabble 0.10845 0.03934 97.39537 2.757 0.00697 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) FchCH4  
## FchannelCH4 -0.520   
## Condtnsbbbl -0.529 0.000

anova(ModelLF.condition.interp.Times\_NH)

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

# IFG-RH

# best fit  
# M1:Random-intercept-with-poly1  
Rawdata\_NHCI\_RH <- Rawdata\_NHCI %>% filter(Hemisphere=='R')  
ModelRF.condition.interp.Times <- lmer(Fvalues ~ Fchannel + GROUP\*Conditions + (1|sub\_ID),Rawdata\_NHCI\_RH,REML = FALSE,na.action=na.omit)   
summary(ModelRF.condition.interp.Times)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: Fvalues ~ Fchannel + GROUP \* Conditions + (1 | sub\_ID)  
## Data: Rawdata\_NHCI\_RH  
##   
## AIC BIC logLik deviance df.resid   
## -43.8 -16.4 28.9 -57.8 361   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.1942 -0.5147 0.0042 0.5189 3.7502   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## sub\_ID (Intercept) 0.01298 0.1139   
## Residual 0.04075 0.2019   
## Number of obs: 368, groups: sub\_ID, 92  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) 2.431e-02 2.638e-02 2.307e+02 0.921  
## FchannelCH4 -6.154e-04 2.105e-02 2.760e+02 -0.029  
## GROUPNH\_adult -4.113e-02 3.922e-02 1.792e+02 -1.049  
## Conditionsbabble -5.039e-02 2.674e-02 2.760e+02 -1.884  
## GROUPNH\_adult:Conditionsbabble 1.260e-01 4.335e-02 2.760e+02 2.907  
## Pr(>|t|)   
## (Intercept) 0.35775   
## FchannelCH4 0.97669   
## GROUPNH\_adult 0.29571   
## Conditionsbabble 0.06056 .   
## GROUPNH\_adult:Conditionsbabble 0.00395 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) FchCH4 GROUPNH\_d Cndtns  
## FchannelCH4 -0.399   
## GROUPNH\_dlt -0.566 0.000   
## Condtnsbbbl -0.507 0.000 0.341   
## GROUPNH\_d:C 0.313 0.000 -0.553 -0.617

anova(ModelRF.condition.interp.Times)

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

## CI children-IFG-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRF.condition.interp.Times\_CI <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_CI\_RF,REML = FALSE,na.action=na.omit)   
summary(ModelRF.condition.interp.Times\_CI)

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

anova(ModelRF.condition.interp.Times\_CI)

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

## NH adult-IFG-RH

# best fit  
# M1:Random-intercept-with-poly1  
ModelRF.condition.interp.Times\_NH <- lmer(Fvalues ~ Fchannel + Conditions + (1|sub\_ID),Rawdata\_NHCI\_NH\_RF,REML = FALSE,na.action=na.omit)   
summary(ModelRF.condition.interp.Times\_NH)

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

anova(ModelRF.condition.interp.Times\_NH)

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