DrugGABAInteraction

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This is an R Markdown document. This contains a workflow for reproducing the results and plots obtained in the following publication:

- Perry, A., Hughes, L., Adams, N., Naessens, M., Murley, A., Rouse, M., ... & Rowe, J. (2022). The neurophysiological effect of NMDA-R antagonism of frontotemporal lobar degeneration is conditional on individual GABA concentration. *In review, Translational Psychiatry*

The report produces the two main results from the paper, which are:

1. No differential influence of memantine on MEG responses across control individuals and persons with bvFTD/PSP
2. Responses to drug in bvFTD/PSP persons are conditional on GABA concentration in frontal cortex

1) Group differences in drug response

For simplicity purposes, we will just report the responses in one region (auditory cortex).

First load required packages (ensure they are installed)

```
library(tidyverse)
library(rstatix)
```

```
#Load data
setwd("/Users/alistairperry/Documents/Cambridge/Project/Analysis/LFPs/newmaxfilter_icafixes/LFPs_COH_wra

datfname<-"LFP_RAud_MMNmean_rep3_ConsandPats_DrugInt.txt"

MMNtab <- read.delim(datfname)

#And print out
print(MMNtab)
```

```
##    meanMMNcol_PLA meanMMNcol_MEM Group PatSubGrp
## 1   -0.1016398480   -0.097434367     1         3
## 2   -0.0759412304   -0.043552859     1         3
## 3   -0.1295081145   -0.096081390     1         3
## 4   -0.0257056555   -0.079625032     1         3
## 5   -0.2020505729   -0.238637316     1         3
## 6   -0.0480867409   -0.036490127     1         3
```

```
## 7   -0.1140158963   -0.111910791     1         3
## 8   -0.0445506222   -0.062894368     1         3
## 9   -0.2622568284   -0.472643041     1         3
## 10  -0.0201826574   -0.027342640     1         3
## 11  -0.0818863939   -0.064103654     1         3
## 12  -0.1231763405   -0.177093822     1         3
## 13  -0.0334392206   -0.038480671     1         3
## 14  -0.0353026636   -0.034912203     1         3
## 15   0.0004792814    0.031969185     1         3
## 16  -0.0745597073   -0.074764710     1         3
## 17   0.0251493313   -0.010430397     1         3
## 18  -0.0920387240   -0.077214267     1         3
## 19  -0.0879631297   -0.097872277     1         3
## 20  -0.1849351887   -0.190968141     2         2
## 21  -0.1286717175   -0.120803083     2         2
## 22  -0.0297254965    0.019959475     2         2
## 23  -0.1201641346    0.004576214     2         2
## 24  -0.1697246044   -0.107531189     2         2
## 25  -0.1381957217   -0.104503813     2         1
## 26  -0.2251078630   -0.220281690     2         1
## 27  -0.0997601946   -0.041071885     2         1
## 28  -0.0741465670   -0.159278472     2         2
## 29  -0.0224415496   -0.011646729     2         2
## 30   0.0158121990   -0.012199387     2         1
## 31  -0.0709593560   -0.096356624     2         1
## 32  -0.0834745566   -0.094820232     2         1
## 33   0.0022994684    0.023737798     2         1
## 34  -0.0052084925   -0.046526950     2         2
## 35  -0.0548455065   -0.070734039     2         2
## 36  -0.0962376782   -0.075549765     2         2
## 37  -0.1084883766   -0.166104537     2         1
## 38   0.0013827150    0.045317567     2         1
```

Note, data needs to be in long format..

```
#You will need ID as a column
ID <- rep(seq(1,nrow(MMNtab)),1)
MMNtab_wID <- data.frame(ID, MMNtab)

#Now convert to long format
MMNtab_long <- MMNtab_wID %>% gather(drug, MMN, meanMMNcol_PLA:meanMMNcol_MEM, factor_key = TRUE)

#Ensure ID and drug session vars are factors
MMNtab_long$ID <- as.factor(MMNtab_long$ID)
MMNtab_long$drug <- as.factor(MMNtab_long$drug)
```

We can now run our statistical analysis, with a 2x2 mixed ANOVA used to assess differential group responses to drug - here we set *group* as between-subjects and *drug session* the within-subjects factor:

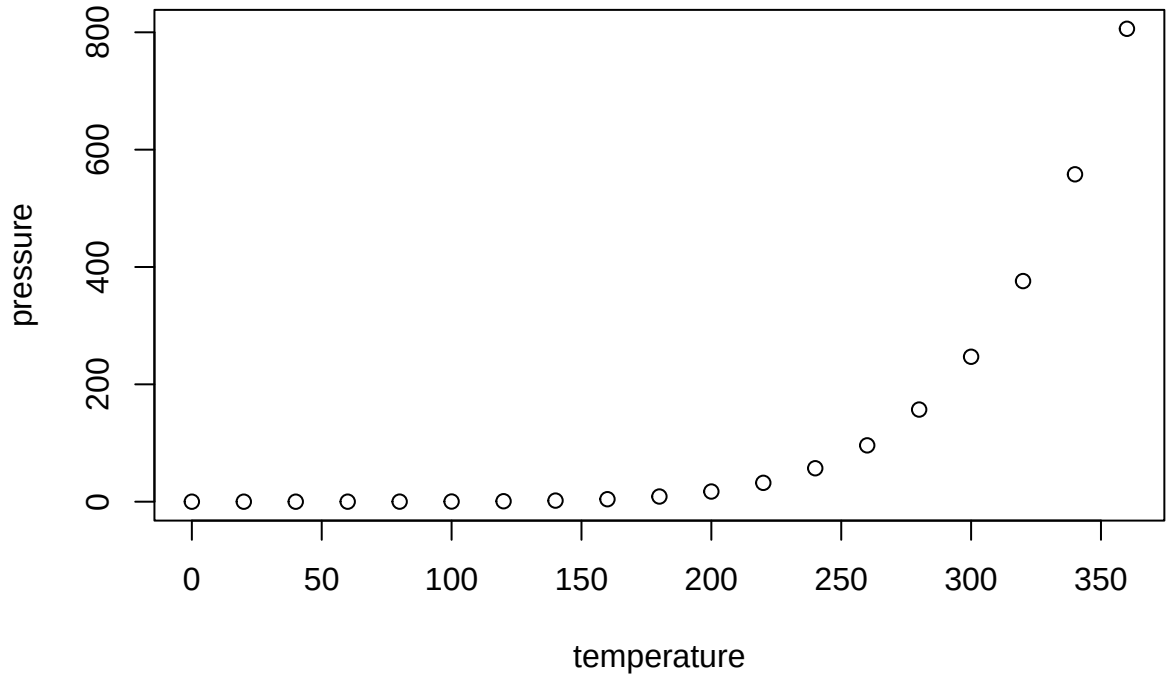
```
# Two-way mixed ANOVA test
res.aov <- anova_test(
  data = MMNtab_long, dv = MMN, wid = ID,
  between = Group, within = drug
```

```
  )
get_anova_table(res.aov)
```

```
## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05      ges
## 1      Group   1  36 0.110 0.742       0.003000
## 2       drug   1  36 0.132 0.718       0.000358
## 3 Group:drug   1  36 2.026 0.163       0.005000
```

From the output above, we find the *group x drug* interaction is non-significant (p=0.163), and hence can conclude that memantine does not have a differential group effect in the right auditory cortex.

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.