Lab 7

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Mon Apr 12 2021

Contents

Problem 2

Complete the 2x2 factorial lab found here https://crumplab.github.io/statisticsLab/lab-10-factorial-anova.html, up to section 10.4.8. More specifically, your task is to follow that lab exercise to load in the data, transform the data into long-format, conduct a 2x2 between subjects ANOVA, and write a short results section reporting the main effects and interaction. (3 points)

Load & Transform data

```
all_data <- read.csv("open_data/stroop_stand.csv")

RTs <- c(as.numeric(unlist(all_data[,1])),
        as.numeric(unlist(all_data[,2])),
        as.numeric(unlist(all_data[,3])),
        as.numeric(unlist(all_data[,4]))
        )

Congruency <- rep(rep(c("Congruent","Incongruent"),each=50),2)
Posture <- rep(c("Stand","Sit"),each=100)
Subject <- rep(1:50,4)

stroop_df <- data.frame(Subject,Congruency,Posture,RTs)
```

ANOVA

```
aov_out<- aov(RTs ~ Congruency*Posture, stroop_df) %>% summary()
aov_out
```

```
##                    Df  Sum Sq Mean Sq F value   Pr(>F)
## Congruency          1  576822  576822  43.734 3.49e-10 ***
## Posture             1   32303   32303   2.449    0.119
## Congruency:Posture  1    6560    6560   0.497    0.481
## Residuals         196 2585080   13189
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Results

We conducted a 2x2 between subjects ANOVA where Congruency and Posture were our independent variables and the dependent variable was the mean reaction time to name the color. We found a main effect of Congruency, $F(1,196) = 43.73$, $MSE = 13,189.18$, $p < .001$, $\hat{\eta}^2_G = .182$

There was also a main effect of Posture $F(1,196) = 2.45$, $MSE = 13,189.18$, $p = .119$, $\hat{\eta}^2_G = .012$

There was no two-way interaction between Congruency and Posture, F (1, 196) = .497, MSE = 13189.185, p < 0.481.

(I couldn't get the apa print function to print the interaction results for some reason it kept coming up as an error so I just wrote it out)

Problem 4

In the conceptual section of this lab we used an R simulation to find the family-wise type I error rate for a simple factorial design with 2 independent variables. Use an R simulation to find the family-wise type I error rate for a factorial design with 3 independent variables. (3 points)

```
save_sim <- tibble()

for(i in 1:1000){
n <- 12
factorial_data <- tibble(A = factor(rep(c("L1","L2"), each = n)),
                         B = factor(rep(rep(c("L1","L2"), each = n/2),2)),
                         C = factor(rep(c("L1","L2"), n)),
                         DV = rnorm(n*2,0,1))

output <- summary(aov(DV ~ A*B*C, data = factorial_data))

  sim_tibble <- tibble(p_vals = output[[1]]$`Pr(>F)`[1:7],
                       effect = c("A","B","C", "AxB","AxC", "BxC","AxBxC"),
                       sim = rep(i,7))

  save_sim <-rbind(save_sim,sim_tibble)
}

type_1 <- save_sim %>%
  filter(p_vals < .05) %>%
  group_by(sim) %>%
  count()

dim(type_1)[1]/1000
```

```
## [1] 0.266
```