Assignment 03

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library(ez)   
library(nlme)

mydata <- read.csv("../data/mydata.csv")  
  
# To run the ANOVA, I need to filter out some participants that don't have all three time points  
mydata\_clean <- mydata[!is.na(mydata$insomnia\_severity), ]  
timepoint\_counts <- table(mydata\_clean$record\_id)  
complete\_ids <- names(timepoint\_counts[timepoint\_counts == 3])  
mydata\_complete <- mydata\_clean[mydata\_clean$record\_id %in% complete\_ids, ]  
mydata\_complete$redcap\_event\_name <- factor(mydata\_complete$redcap\_event\_name)

## (1) Select a variable in your data for modeling over time. (1 variable, at least 3 occasions). Use the same variable and data as Assignment 2.

Consistent with last week’s assignment, I will work with the outcome of insomnia severity.

## (2) Repeated Measures ANOVA

### a. Run repeated measures ANOVA using the ezANOVA function in the ez package

m1 <- ezANOVA(data=mydata\_complete, dv=insomnia\_severity, wid=record\_id, within=redcap\_event\_name)

### b. Decide whether you use the univariate or multivariate test, and justify your decision

Because the Mauchly’s test for sphericity is significant (W = 0.88, *p* < 0.001), we assume there is a violation of heterogeneity of variances and use the multivariate test.

### c. If you decide to use the univariate test, test for polynomial contrasts (e.g., linear, quadratic time effects) with proper time spacing using the aov function

### d. If you decide to use the multivariate test, run the multivariate test (i.e., the MANOVA approach)

# contrasts for unequally spaced time  
contrasts(mydata\_complete$redcap\_event\_name) <- contr.poly(c(0, 1.5, 6))  
  
mUN <- gls(insomnia\_severity ~ redcap\_event\_name, corr = corSymm(form = ~1|record\_id), weights = varIdent(form = ~ 1 | redcap\_event\_name),   
 method="ML",data=mydata\_complete)  
  
mCS <- gls(insomnia\_severity ~ redcap\_event\_name, corr = corCompSymm(form = ~1|record\_id), method="ML", data=mydata\_complete)  
  
anova(mUN, mCS)

## Model df AIC BIC logLik Test L.Ratio p-value  
## mUN 1 9 3316.165 3355.323 -1649.082   
## mCS 2 5 3392.484 3414.238 -1691.242 1 vs 2 84.31886 <.0001

### e. Write a few sentences reporting the results and their interpretation.

I examined how insomnia severity changed over three measurement occasions (baseline, posttreatment, and followup) in a sample of 191 participants. The assumption of equal variance and covariance, tested with the Mauchly’s test of Sphericity did not adequately describe the data, as indicated by the significant p-value of the test. Therefore, I fitted a multivariate ANOVA model, in which each variance and covariance was estimated separately. The Unstructured model fitted significantly better than a model assuming Compound Symmetry ((4) = 84.32, *p* < 0.001), and had lower AIC (3316.17 vs. 3392.48) and BIC (3355.32 vs. 3414.24). Significant mean differences in insomnia severity were observed across occasions within the multivariate model, F(1, 2) = 186.38, *p* < .001. The linear time slope was significant (*p* < 0.001), with an estimated coefficient of -5.01 (SE = 0.28). The quadratic time slope was also significant and positive (*b* = 2.78, SE = 0.24, *p* < 0.001), indicating that while insomnia symptoms decreased over time, the rate of this improvement slowed down at later time points.

## (3) Include the code you used to complete the assignment.