Assignment 02

Marwin Carmo

library(ggplot2)  
library(kableExtra)  
library(psych)

library(moments)

mydata <- read.csv("../data/mydata.csv")

sel\_data <- mydata[, c("record\_id", "redcap\_event\_name", "insomina\_severity")]  
  
  
mydata2\_wide <- reshape(sel\_data,  
 timevar = "redcap\_event\_name",  
 idvar = "record\_id",  
 direction = "wide")  
  
mydata2 <- mydata2\_wide[complete.cases(mydata2\_wide), ]

# Residualized Gain Scores

## Write out the equation for the residualized gain model.

## Run the model for pairs of consecutive occasions (T1 and T2; T2 and T3) and save the residualized gain scores

## Create a table summarizing results of the models

Table 1. Model summary of T2 regressed on T1

|  |  | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Est. | 2.5 % | 97.5 % | S.E. | t | p |
| (Intercept) | 0.242 | -3.398 | 3.882 | 1.845 | 0.131 | 0.896 |
| insomina\_severity.1 | 0.627\*\*\* | 0.442 | 0.811 | 0.094 | 6.693 | <0.001 |
| R2 | 0.192 |  |  |  |  |  |

Table 2. Model summary of T2 regressed on T3

|  |  | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Est. | 2.5 % | 97.5 % | S.E. | t | p |
| (Intercept) | 2.241\*\*\* | 0.932 | 3.549 | 0.663 | 3.377 | <0.001 |
| insomina\_severity.2 | 0.808\*\*\* | 0.712 | 0.904 | 0.049 | 16.596 | <0.001 |
| R2 | 0.593 |  |  |  |  |  |

## Summary Statistics for the residualized gain scores

Table 3. Residualized gain scores for T2 - T1

| n | mean | sd | median | min | max | range | skew | kurtosis | se |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 191 | 0 | 5.3 | 0.5 | -13.3 | 13.2 | 26.5 | -0.2 | -0.4 | 0.4 |

Table 4. Residualized gain scores for T3 - T2

| n | mean | sd | median | min | max | range | skew | kurtosis | se |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 191 | 0 | 3.9 | 0.2 | -10.2 | 10.5 | 20.7 | -0.2 | -0.1 | 0.3 |

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

For the T2–T1 model, the regression analysis revealed a significant negative effect of time, b = –6.918, 95% CI [–7.866, –5.969], t = –14.34, p < .001, indicating that participants showed significant reductions in insomnia severity from Time 1 to Time 2 after controlling for baseline scores. In contrast, for the T3–T2 model, the effect of time was non-significant, b = –0.188, 95% CI [–1.378, 1.001], t = –0.31, p = .756, suggesting no reliable change in insomnia severity from Time 2 to Time 3 after adjusting for Time 2 levels.

# Trend Scores

## Equations

## Compute the linear and quadratic trend scores for your data.

# Coefficients for linear and quadratic trends  
linear <- c(-0.679, -0.226, 0.793)  
quadratic <- c(0.588, -0.784, 0.196)  
  
  
mydata2$linear\_trend <- with(mydata2,  
 insomina\_severity.1 \* linear[1] +  
 insomina\_severity.2 \* linear[2] +  
 insomina\_severity.3 \* linear[3]  
)  
  
mydata2$quadratic\_trend <- with(mydata2,  
 insomina\_severity.1 \* quadratic[1] +  
 insomina\_severity.2 \* quadratic[2] +  
 insomina\_severity.3 \* quadratic[3]  
)

## Table of Summary Statistics

Table 5. Descriptive statistics of trend scores

|  | n | mean | sd | median | min | max | range | skew | kurtosis |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time1 | 191 | 19.3 | 4.1 | 19.0 | 9.0 | 28.0 | 19.0 | -0.1 | -0.6 |
| Time2 | 191 | 12.3 | 5.8 | 12.0 | 0.0 | 28.0 | 28.0 | 0.1 | -0.4 |
| Time3 | 191 | 12.2 | 6.1 | 12.0 | 1.0 | 28.0 | 27.0 | 0.2 | -0.7 |
| Linear | 191 | -6.2 | 3.6 | -5.5 | -15.6 | 2.0 | 17.6 | -0.3 | -0.4 |
| Quadratic | 191 | 4.1 | 3.6 | 3.7 | -3.5 | 13.5 | 17.1 | 0.4 | -0.5 |

Table 6. Pearson correlations between trend scores

|  | Time1 | Time2 | Time3 | Linear | Quadratic |
| --- | --- | --- | --- | --- | --- |
| Time1 | 1.00 | 0.44 | 0.51 | -0.25 | 0.28 |
| Time2 | 0.44 | 1.00 | 0.77 | 0.34 | -0.72 |
| Time3 | 0.51 | 0.77 | 1.00 | 0.68 | -0.31 |
| Linear | -0.25 | 0.34 | 0.68 | 1.00 | -0.37 |
| Quadratic | 0.28 | -0.72 | -0.31 | -0.37 | 1.00 |

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

On average, participants showed a steady decline in insomnia severity over time (b = –6.2, SD = 3.6). The mean quadratic trend score was 4.1 (SD = 3.6), suggesting a curvilinear pattern in which the rate of improvement was steeper between Time 1 and Time 2 and then leveled off by Time 3.

# Individual Curves

## Write out the equation for obtaining the individual curve.

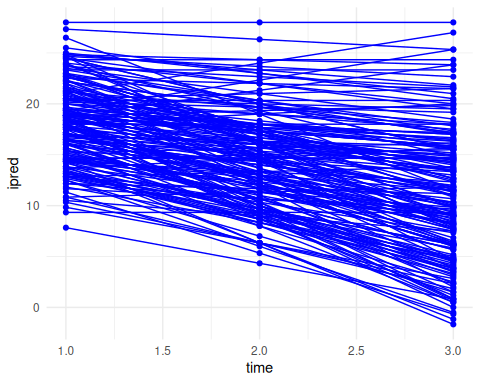
## Compute the individual curves parameters (Intercept and Slope) for your data

mydata2\_long <- reshape(mydata2,  
 varying = list(c("insomina\_severity.1", "insomina\_severity.2", "insomina\_severity.3")),  
 v.names = "insomina\_severity",  
 timevar = "time",  
 times = c(1, 2, 3),  
 idvar = "record\_id",  
 direction = "long")  
  
  
istats <- data.frame(id=unique(mydata2\_long$record\_id),  
 iintercept=rep(NA,length(unique(mydata2\_long$record\_id))),  
 islope=rep(NA,length(unique(mydata2\_long$record\_id))))  
  
# run individual regressions  
for (i in unique(mydata2\_long$record\_id)){  
 pos <- which(istats$id == i)  
 datai <- mydata2\_long[which(mydata2\_long$record\_id == i),] # subset data for each individual  
  
 istats$iintercept[pos] <- coefficients(lm(insomina\_severity~time,data=datai))[1]  
 istats$islope[pos] <- coefficients(lm(insomina\_severity~time,data=datai))[2]  
 rm(datai)  
}

Table 7. Descriptive statistics of individual curve parameters

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mean | SD | Correlation |
| Intercept | 21.68 | 4.96 | -0.61 |
| Slope | -3.54 | 2.69 |  |

## Plot for predicted curves



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

On average, participants had an intercept of 21.68 (SD = 4.96), indicating a relatively high baseline level of insomnia severity. The mean slope was –3.54 (SD = 2.69), suggesting that most individuals experienced a decrease in insomnia severity over time. The correlation between intercept and slope was –0.61, indicating that participants with higher initial insomnia severity tended to show greater improvements (i.e., more negative slopes).