Assignment 07

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I estimated three latent growth model (LGM) of insomnia severity over three time points. Linear and quadratic slopes, and a linear slope with randomization as the time-invariant predictor were estimated. However, quadratic and time-invariant models did not converge properly, given the standard errors could not be estimated. Therefore, the results include only the estimates of the linear model and no model comparison was made.

The linear model fit was poor, suggesting misfit to the data: (3) = 191.85, *p* < .001, RMSEA = 0.57 [.51, .64], CFI = 0.167, TLI = .167. The estimated intercept mean was 16.89 (SE = 0.29, *p* < .001), and the slope mean was -0.92 (SE = 0.06, *p* < .001), indicating a significant linear decrease in insomnia severity over time. The slope and intercept were significantly correlated (*r* = .60, *p* < .001).

The MLM for the linear growth model fitted in Assignment 5 showed a similar intercept (*b* = 21.91, *p* < .001) pattern of improvement (*b* = -3.61, *p* < .001), with significant random effects for both intercept and slope. These results support a linear decline in insomnia over time. However, the estimates for intercept and slope are somewhat different across the two models, indicating the estimates from the SEM model may not be accurate due to the poor model fit.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | SE | Z | p |
| *Latent Means* |  |  |  |  |
| Intercept | 16.88 | 0.292 | 57.84 | <.001 |
| Slope | -.915 | .057 | -16.09 | <.001 |
| *Latent Covariances* | |  |  |  |
| Intercept-Slope | 3.95 | .45 | 8.78 | <.001 |
| *Latent Variances* | |  |  |  |
| Intercept | -3.00 | 2.58 | -1.16 | 0.245 |
| Slope | -.895 | .167 | -5.35 | <.001 |

library(lavaan)  
library(ggplot2)

mydata <- read.csv("../data/mydata.csv")  
# removing NAs  
mydata <- mydata[!is.na(mydata$insomnia\_severity), ]  
# convert the randomization variable to factor  
mydata$randomization <- factor(mydata$randomization)  
  
sel\_data <- mydata[, c("record\_id", "redcap\_event\_name", "insomnia\_severity")]  
  
groups <- dplyr::group\_by(mydata, record\_id) |>   
 dplyr::slice\_head()  
  
mydata2 <- reshape(sel\_data,  
 timevar = "redcap\_event\_name",  
 idvar = "record\_id",  
 direction = "wide")  
  
mydata2$randomization <- factor(groups$randomization, ordered = TRUE)

## Linear LGM  
  
Llgm <- '  
#Level/Intercept (all constraint to 1)  
Inter =~ 1\*insomnia\_severity.1 + 1\*insomnia\_severity.2 + 1\*insomnia\_severity.3  
  
#Slope  
Slope =~ 0\*insomnia\_severity.1 + 1.5\*insomnia\_severity.2 + 6\*insomnia\_severity.3  
  
#Residuals (Equality constraints)  
insomnia\_severity.1 ~~ In\*insomnia\_severity.1  
insomnia\_severity.2 ~~ In\*insomnia\_severity.2  
insomnia\_severity.3 ~~ In\*insomnia\_severity.3  
  
#Intercept & slope means  
Inter~1  
Slope~1  
  
#Intercept & slope variances  
Inter ~~ Inter  
Slope ~~ Slope  
Inter ~~ Slope  
'  
  
## Quadratic LGM  
  
Qlgm <- '  
#Level/Intercept (all constraint to 1)  
Inter =~ 1\*insomnia\_severity.1 + 1\*insomnia\_severity.2 + 1\*insomnia\_severity.3  
  
#Linear Slope  
Lin =~ 0\*insomnia\_severity.1 + 1.5\*insomnia\_severity.2 + 6\*insomnia\_severity.3  
  
#Quadratic Slope  
Qua =~ 0\*insomnia\_severity.1 + 2.25\*insomnia\_severity.2 + 36\*insomnia\_severity.3  
  
#Residuals (Equality constraints)  
insomnia\_severity.1 ~~ In\*insomnia\_severity.1  
insomnia\_severity.2 ~~ In\*insomnia\_severity.2  
insomnia\_severity.3 ~~ In\*insomnia\_severity.3  
  
#Intercept & slope means  
Inter~1  
Lin~1  
Qua~1  
  
#Intercept & slope variances  
Inter ~~ Inter  
Lin ~~ Lin  
Qua ~~ Qua  
Inter ~~ Lin  
Inter ~~ Qua  
Lin ~~ Qua  
'  
## Linear LGM with Group  
  
Llgm\_group <- '  
#Level/Intercept (all constraint to 1)  
Inter =~ 1\*insomnia\_severity.1 + 1\*insomnia\_severity.2 + 1\*insomnia\_severity.3;  
  
#Slope  
Slope =~ 0\*insomnia\_severity.1 + 1.5\*insomnia\_severity.2 + 6\*insomnia\_severity.3;  
  
#Residuals (Equality constraints)  
insomnia\_severity.1 ~~ In\*insomnia\_severity.1;  
insomnia\_severity.2 ~~ In\*insomnia\_severity.2;  
insomnia\_severity.3 ~~ In\*insomnia\_severity.3;  
  
#Intercept & slope   
Inter ~ 1 + randomization;  
Slope ~ 1 + randomization;  
  
#Intercept & slope variances  
Inter ~~ Inter;  
Slope ~~ Slope;  
Inter ~~ Slope  
'  
  
fit\_Llgm <- lavaan(Llgm, data=mydata2)  
fit\_Qlgm <- lavaan(Qlgm, data=mydata2)  
fit\_Llgm\_group <- lavaan(Llgm\_group, data=mydata2)  
  
# Relative model fit test  
# anova(fit\_Llgm, fit\_Qlgm, fit\_Llgm\_group)  
# Both Quadratic and Group models did not converge. Standard errors in these  
# models could not be estimated.