For Module 10, we will review longitudinal models (i.e., repeated measures with time in the model).

The data used in the module are a simplified version of the data from Casto, K.V., & Edwards, D.A. (2016). Before, during, and after: How phases of competition differentially affect testosterone, cortisol, and estradiol levels in women athletes. Adaptive Human Behavior and Physiology, 2, 11-25. <https://doi.org/10.1007/s40750-015-0028-2>.

Dr. Kathleen Casto gave us permission to use these data for teaching purposes; any other use requires additional permission from Dr. Casto.

These data include hormones levels of female athletes in a competition setting (soccer game), if they played in the game or not, what position they played, how long they played, and if they were taking birth control. We will focus on testosterone, if they played, and if they were taking birth control for this example.

The basic descriptive statistics are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | | |
|  | N | Minimum | Maximum | Mean | Std. Deviation |
| Testosterone | 73 | 24.91 | 118.94 | 59.9899 | 21.08431 |
| HormonCont | 73 | 0 | 1 | .63 | .486 |
| Played | 73 | 0 | 1 | .70 | .462 |
| Valid N (listwise) | 73 |  |  |  |  |

1. Load in the data and the libraries we will use for this module: dplyr, ggplot2, lme4, and lmerTest.
2. Take a look at the dataset, what are some possible L1 and L2 predictors?
3. Look at the trend for testosterone across time, does it appear linear?
4. Look at the trend for testosterone across time by if they played in the game or not, does this look like an important predictor of intercepts or slopes?
5. Look at the trend for testosterone across time by if they are taking birth control, does this look like an important predictor of intercepts or slopes?
6. Run a null model for testosterone. Calculate the ICC.
7. Add time0 as a predictor at L1 with a random slope effect, write the model out and count the possible parameters
8. Interpret the intercept and slope
9. Calculate a 95% plausible values range for the intercept and slope, do athletes seems to vary in their initial levels of testosterone and how they change over time?
10. What are some other ways we could visualize the variability in intercepts and slopes for these data?
11. Carry out a deviance test for the slope variance. What does this test conclude?
12. Estimate a profile likelihood confidence interval for the estimates, what does the C.I. for the slope conclude?
13. Should we retain the slope variance, why or why not?
14. Write out a model with if she played or not as a predictor of intercepts and slopes, what questions can this model answer?
15. Run the model and interpret the parameters
16. How much intercept and slope variance did we explain by adding this predictor?
17. Should we retain the conditional random effects?
18. Write out a model with birth control as an additional predictor of intercepts and slopes, how many parameters can we estimate in this model?
19. Run the model and interpret all of the parameters
20. How much additional variance in the intercepts and slopes was explained by adding birth control to the model?