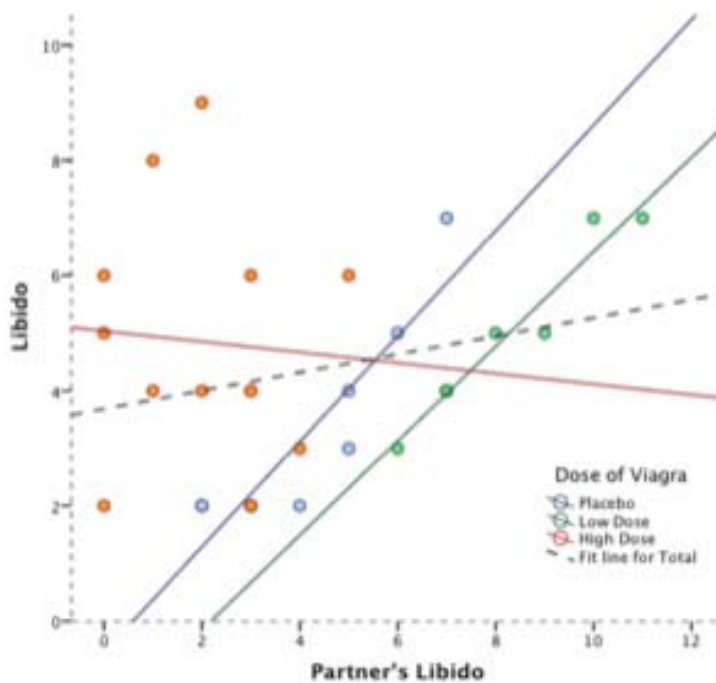


Chapter 19

1. A researcher was interested in the effects of information about exercises that relieve back pain delivered in two different ways by doctors. Doctors were recruited from different hospitals and each gave several patients the information. How many levels are there in this hierarchical data structure?
 - a. 1
 - b. 2
 - c. 3*
 - d. 4
2. A researcher had data collected at several schools measuring children's emotional intelligence, age, and academic performance. Which analysis should he perform to test whether academic performance is predicted by emotional intelligence when controlling for age?
 - a. Multilevel model*
 - b. Multiple regression.
 - c. Analysis of covariance.
 - d. Discriminant function analysis.
3. In a multilevel model in which an outcome was measured in children from different classrooms, a large intraclass correlation would imply that:
 - a. Children within a particular class behaved very differently
 - b. The outcome measure varied a lot across children within a classroom.
 - c. The outcome variable varied very little across children from different classrooms.
 - d. Children in different classes behaved very differently.*
4. Missing data pose the least of a problem for:
 - a. Analysis of variance.
 - b. Multiple regression.
 - c. Principal component analysis.
 - d. Multilevel linear models.*
5. In the context of multilevel models what do we mean by a fixed regression coefficient?
 - a. A regression coefficient that is assumed to be the same in the population and the sample.
 - b. A regression coefficient that is stable across different samples.

- c. A regression coefficient that is assumed not to vary across contexts.*
 - d. A regression coefficient that is always a fixed value and does not need to be estimated.
6. Which of the following descriptions best applies to the graph below?:
- a. Fixed slopes, fixed intercepts.
 - b. Fixed slopes, random intercepts.
 - c. Random slopes, fixed intercepts.
 - d. Random slopes, random intercepts.*



7. Why does it matter that data are hierarchical (or not)?
- a. Because the contextual variables in the hierarchy introduce dependency in the data*
 - b. Because if the data are hierarchical the residuals will be uncorrelated.
 - c. Because if the data are hierarchical, then missing data can be problematic.
 - d. Because if the data are hierarchical, then we must treat all variables as fixed effects.

8. The matrix below describes what kind of covariance structure in a multilevel model?

- a. Variance components.
- b. Diagonal.*
- c. AR(1).
- d. Unstructured.

$$\begin{pmatrix} \sigma_1^2 & 0 & 0 & 0 \\ 0 & \sigma_1^2 & 0 & 0 \\ 0 & 0 & \sigma_1^2 & 0 \\ 0 & 0 & 0 & \sigma_1^2 \end{pmatrix}$$

9. The matrix below describes what kind of covariance structure in a multilevel model?

- a. Variance components.
- b. Diagonal.*
- c. AR(1).
- d. Unstructured.

$$\begin{pmatrix} \sigma_1^2 & \sigma_{21} & \sigma_{31} & \sigma_{41} \\ \sigma_{21} & \sigma_2^2 & \sigma_{32} & \sigma_{42} \\ \sigma_{31} & \sigma_{32} & \sigma_3^2 & \sigma_{43} \\ \sigma_{41} & \sigma_{42} & \sigma_{43} & \sigma_4^2 \end{pmatrix}$$

10. What is a second-order polynomial also known as?

- a. A linear trend.
- b. A cubic trend.
- c. A quartic trend.
- d. A quadratic trend.*

11. The **R** output below shows:

- a. A model that predicts quality of life after surgery from the variables **Surgery**, **Base_QoL** and the intercept, with intercepts varying across clinics.
- b. A model that predicts post-surgery quality of life from only the intercept but also allows intercepts to vary across clinics.*
- c. The summary of the model that contains both random slopes and intercepts.
- d. A baseline model that includes only the intercept.

Linear mixed-effects model fit by maximum likelihood

Data: surgeryData
AIC BIC logLik
1911.473 1922.334 -952.7364

Random effects:

Formula: ~1 | Clinic
(Intercept) Residual
StdDev: 5.909691 7.238677

Fixed effects: Post_QoL ~ 1

	Value	Std.Error	DF	t-value	p-value
(Intercept)	60.08377	1.923283	266	31.24022	0

Standardized Within-Group Residuals:

Min	Q1	Med	Q3	Max
-1.8828507	-0.7606631	-0.1378732	0.7075242	2.8607949

Number of Observations: 276

Number of Groups: 10