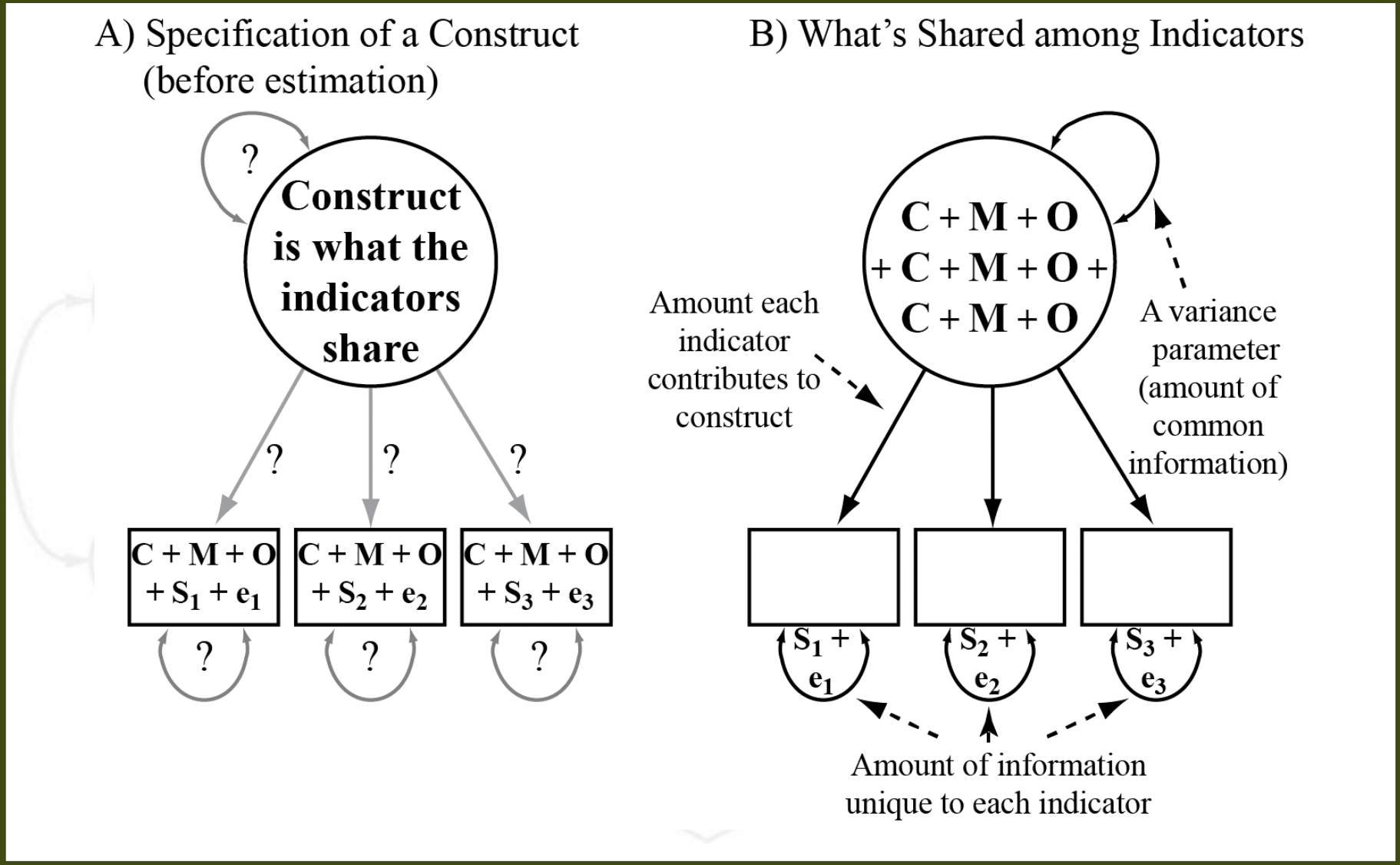
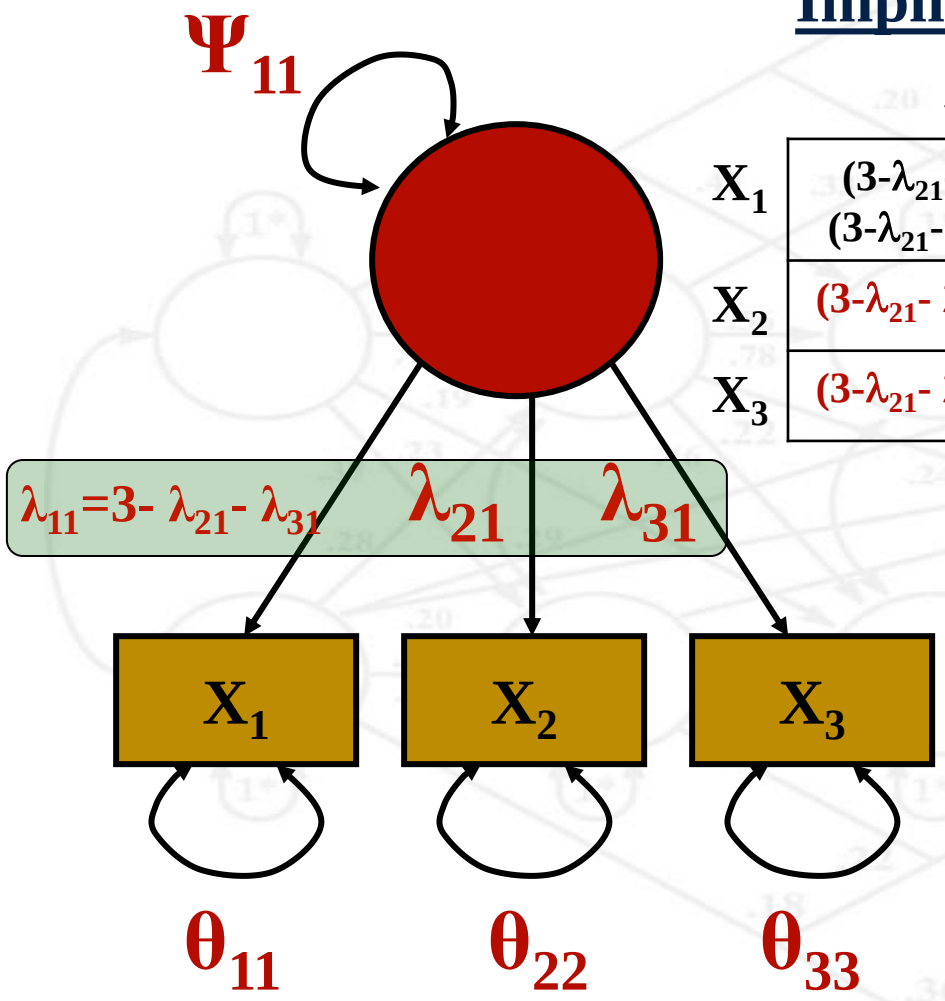
An Overview of SEM Basics

- Configural Conventions & Greek
- (Manifest & Latent) Test Theory
- Selecting Indicators
- Identification
- Model Fit
- Nested and non-nested comparisons
- Phantom Constructs

A Construct is What the Indicators Share



Effects Coding



Implied variance/covariance matrix

	X_1	X_2	X_3
X_1	$(3-\lambda_{21}-\lambda_{31})\ \psi_{11}$ $(3-\lambda_{21}-\lambda_{31})+\theta_{11}$		
X_2	$(3-\lambda_{21}-\lambda_{31})\ \psi_{11}\lambda_{21}$	$\lambda_{21}\psi_{11}\lambda_{21}+\theta_{22}$	
X_3	$(3-\lambda_{21}-\lambda_{31})\ \psi_{11}\lambda_{31}$	$\lambda_{21}\psi_{11}\lambda_{31}$	$\lambda_{31}\psi_{11}\lambda_{31}+\theta_{33}$

Three methods of setting scale

3) Constrain loadings to average 1

Evaluating Model Fit

Evaluating model fit is a ‘gestalt’ process, not all indices need to meet ‘criteria’ to conclude you have an adequate model

- New areas of study with new measures may not yield ‘great’ fit at first until the measures are refined and the area of study is better understood.
- Check to see if the stem and leaf plot of the standardized residuals is approximately normal and if no modifications will improve model fit. In this situation, a ‘poor’ fitting model my be the best given newness of the study and measures.

Each fit index has ‘problems’:

- TLI/NNFI does not do well with small sample sizes
- RMSEA does not perform well in small models, especially in small models with very large sample sizes (the NCP is based on the chi-square)
- SRMR is good for 1-group 1-time-point models.

Building Parcels

- Theory – Know thy S and the nature of your items
- Random assignment of items to parcels (e.g., fMRI)
  - Use Sterba's calculator to find allocation variability when sampling error is high
- Balancing technique
  - Combine items with higher loadings with items having smaller loadings [Reverse serpentine pattern]
- Using a priori designs (e.g., CAMI)
  - Develop new tests or measures with parcels as the goal for use in research

Factorial Invariance

[a.k.a. Metric invariance, measurement equivalence]

Assumed when comparing groups, time points (ANOVA)

Establish equivalence of measurement (i.e., Are we measuring the same constructs in each group?)

Four levels of invariance:

1) Configural invariance: Same pattern of fixed & free parameters

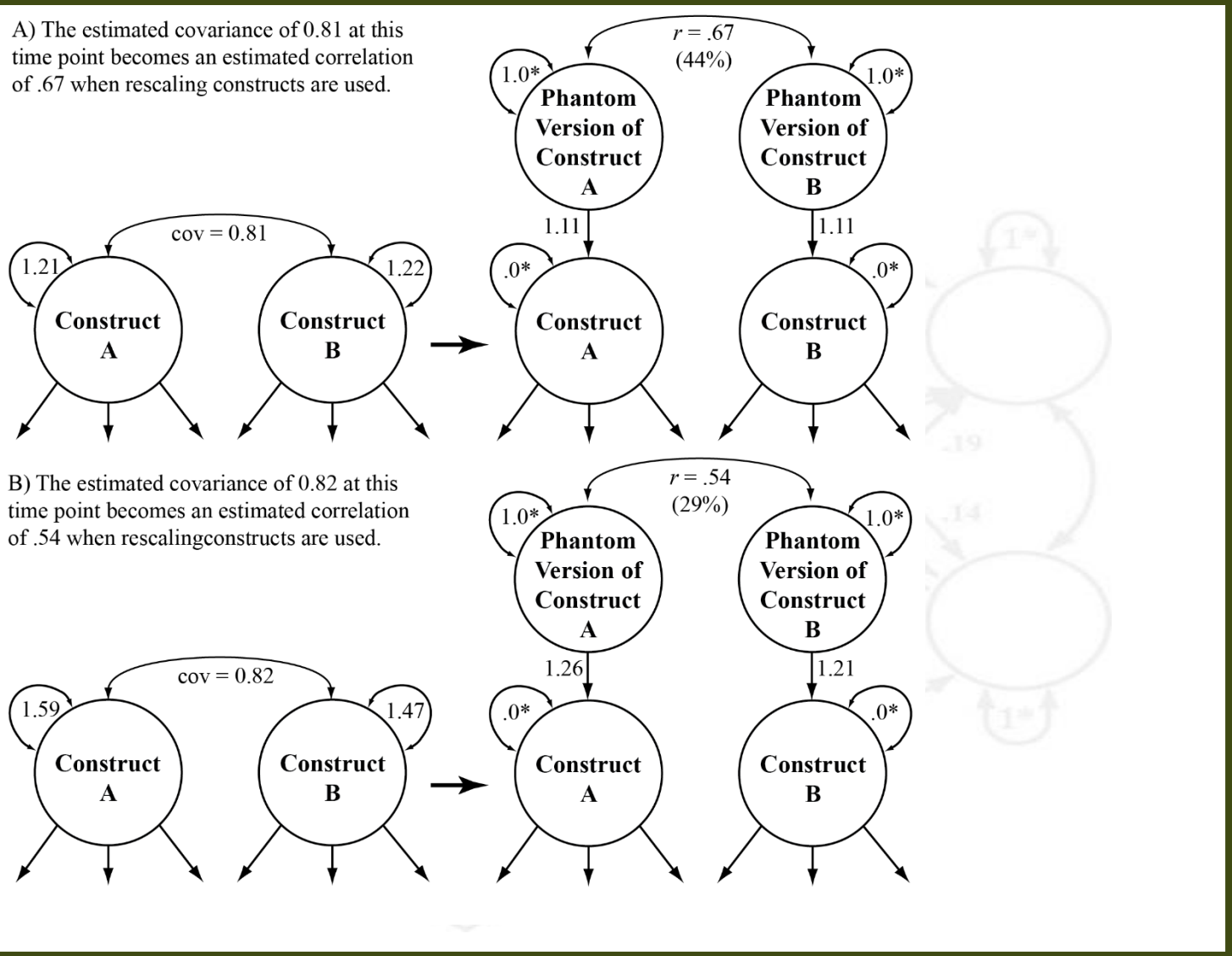
2) Weak factorial invariance: Corresponding factor loadings are equal across groups

3) Strong factorial invariance: Corresponding indicator means are equal across groups

---

4) Strict factorial invariance: Corresponding indicator residuals are equal across groups
(this level is not recommended)

Phantom Constructs – Reason for Them



Missing Data Key Considerations

- **Recoverability**
  - Is it possible to recover what the *sufficient statistics* would have been if there was no missing data?
    - (sufficient statistics = means, variances, and covariance)
  - Is it possible to recover what the *parameter estimates* of a model would have been if there was no missing data.
- **Bias**
  - Are the sufficient statistics/parameter estimates systematically different than what they would have been had there not been any missing data?
- **Power**
  - Do we have the same or similar rates of power (1-Type II error rate) as we would without missing data?