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An Introduction to Longitudinal Dyadic Analyses

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Examples of Over-Time Dyadic Data

- Daily diary reports of relationship experiences from both dating partners
- Assessments of distress from metastatic breast cancer survivors and spousal caregivers at diagnosis, 3 months, and 6 months.
- Mother and adolescent child ratings of conflict with one another over a three-year period
- In HIV concordant and discordant couples, husbands and wives report on their sexual behavior before and after an intervention

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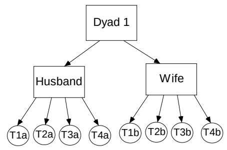
Basic Data Structure

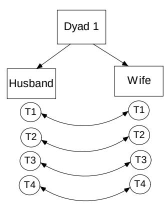
- The three-level nested misconception: Time is nested within person and persons are nested within dyad



- Three-level nested **only** if the four time points differ such that T1a ≠ T1b, T2a ≠ T2b, etc.

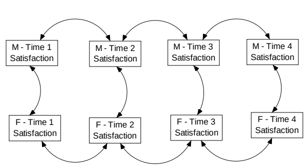
Basic Data Structure

In most cases the two dyad members are measured at the same time points, so Time is crossed with Person, not nested.



Basic Data Structure

This two-level crossed structure results in observations that may be correlated across both dyad members and time



Basic Data Structure

- Across-Dyad residual correlation
  - Time-specific similarity in the part of Y that isn't explained by the predictors for the two partners (the "parking lot effect")
- Across-Time residual correlation
  - Observations that are closer in time are more similar to each other than are observations separated by longer intervals
  - Autoregressive model
- All of the models we discuss today handle these sources of nonindependence, but they do so in different ways

Distinguishability

- Can dyad members be distinguished from one another based on a meaningful factor?
  - **Distinguishable dyads:** e.g., gender in married heterosexual couples, birth order of siblings, family role
  - **Indistinguishable dyads:** e.g., gay and lesbian couples, twins, same-sex friends
    - There is no systematic or meaningful way to order the two scores
- Distinguishability is both theoretical and empirical
  - Do the scores really differ in nature (e.g., mean differences, differences in variability)?

What is the role of Time in your research?

- Systematic change as a function of time?
- The past affects/predicts the present – stability and reciprocity of behavior?
- Consistency in an X-Y association over time?
- What questions do you anticipate being able to answer?
- What data analytic approach will allow you to answer these questions?

What is your model of time?

- Do you expect linear changes from one time point to the next?
- Is there an intervening event (an intervention, birth of baby)?
- If there is an intervening event, do you expect systematically increasing change or return to baseline?
- Are the intervals between observations reasonable?
- Is there enough time to expect change and/or are observations close enough in time to expect "lagged" effects?
- Does time simply offer a replication of a repeating process (e.g., the impact of one day to the next over multiple daily diary entries)?

Data Structures for Overtime Dyadic Data

Dyad Overtime Data Sets

- Each row contains data for a dyad (i.e., BOTH individuals' predictor and outcome variables)
- Some variables are "time-varying"
  - Each person has a separate score for the variable at each time point
  - e.g., Man SexSat T1, Woman SexSat T1, Man SexSat T2,…
- Some variables are "time-invariant"
  - Each dyad member has same score on variable across waves
  - Would be represented by a single column for each dyad member
  - e.g., Man NegEmo, Woman NegEmo

Dyad Overtime Data Sets
Often used in SEM applications

DyadID	Man SexSat T1	Woman SexSat T1	Man SexSat T2	Woman SexSat T2	Man Neg Emo	Woman Neg Emo
1	5	2	9	8	7	4
2	6	4	3	6	2	5
3	3	9	6	7	4	3

Person-Period Pairwise Data Sets – Used for MLM with Actor and Partner effects

- Each row contains data for both the individual and her/his partner at a particular time point
- Two sets of variables: one for the respondent (actor) and the other for her/his partner (partner)
  - Individual serves as "actor" for half of cases, and "partner" for other half (e.g., men as actors and women as partners for one half of data set, and men as partners and women as actors for the other half of data set); thus, data for individuals is essentially entered in twice

Person-Period Pairwise Data Sets

DyadID	Time	Person	ASexSat	PSexSat	ANegEmo	PNegEmo
1	1	1	5	2	7	4
1	2	1	9	8	7	4
1	1	2	2	5	4	7
1	2	2	8	9	4	7
2	1	1	6	4	2	5
2	2	1	3	6	2	5

Person-Period Pairwise Data Sets

DyadID	Time	Person	ASexSat	PSexSat	ANegEmo	PNegEmo
1	1	1	5	2	7	4
1	2	1	9	8	7	4
1	1	2	2	5	4	7
1	2	2	8	9	4	7
2	1	1	6	4	2	5
2	2	1	3	6	2	5

Types of Over-Time Models

- Growth Models
  - Predicting systematic change over time, whether change over time is coordinated across dyad members, and whether actor and partner variables predict change
- Lagged Models
  - Predicting a person's current outcomes from the person's past and the partner's past
  - Two varieties:
    - Actor and Partner past predict present on the same variable
    - Actor and Partner past on one variable predict another variable

Dyadic Growth Models

Questions addressed by Dyadic Growth Models

- For each member of the dyad - does a variable change in a systematic way as a function of time?
- Is change over time coordinated across the two related individuals?
- Do other factors (e.g., characteristics of the person and the partner) moderate the degree of change over time for the person?

Example: Sexual satisfaction and negative emotionality in relatively long-term relationships

- 220 married or stable dating partners from the Family Transitions Project (PI: Rand Conger)
- Sexual satisfaction assessed 4 times from both partners: Target participant was approximately 23, 25, 27, 30
- Both partners also reported on their trait negative emotionality when the target participant was age 23

Caveat: Real datasets are used but these are for didactic purposes only!

Dyadic Growth Models

- Compute models for individuals
  - Intercept & slope for each person
- Model interdependence across the dyad
  - Estimate the correspondence between the growth parameters for each dyad member
  - Correlation between the intercepts indicates similarity in level of the outcome variable when Time = 0
  - Correlation between the slopes indicates similarity in trajectory or change over time
  - Correlation between the residuals indicates similarity in the time-specific outcome (the parking-lot effect)

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MLM Growth Equations: Distinguishable

$Y_{Mjk} = b_{0Mj} + b_{1Mj}T_{jk} + e_{Mjk}$

j = dyad number (j = 1…220)
k = time points (k = -5, -3, 1, 7)

$Y_{Wjk} = b_{0Wj} + b_{1Wj}T_{jk} + e_{Wjk}$

Intercepts:

b_{0Mj} = Predicted value of man's average sexual satisfaction for dyad j

b_{0Wj} = Predicted value of woman's average satisfaction for dyad j

These intercepts are "average values" because Time is Centered so Time Zero is the midpoint of the study

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MLM Growth Equations: Distinguishable

$Y_{Mjk} = b_{0Mj} + b_{1Mj}T_{jk} + e_{Mjk}$

j = dyad number (j = 1…220)
k = time points (k = -5, -3, 1, 7)

$Y_{Wjk} = b_{0Wj} + b_{1Wj}T_{jk} + e_{Wjk}$

Slopes:

b_{1Mj} = Average change in the man's sexual satisfaction for dyad j as time increases by 1 year

b_{1Wj} = Average change in the woman's sexual satisfaction for dyad j as time increases by 1 year

Residuals at each time point:

Man = e_{Mjk}
Woman = e_{Wjk}

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Random Effects

- Standard MLM specification
- There are 6 variances
  - 2 for intercepts
  - 2 for slopes of time
  - 2 for residuals
- There are 7 possible covariances
  - 6 for the intercepts and slopes
  - 1 for the residual

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Random Effects (continued)

- Covariance of the Intercepts
  - Overall, do women who have higher levels of satisfaction on average tend to have male partners who are also higher in satisfaction on average?
  - ***Is there a correspondence between the partners' average levels of sexual satisfaction?***
- Covariance of the slopes
  - Do women whose satisfaction changes over time tend to have male partners whose satisfaction also changes over time?
  - ***Is there a correspondence between the partners' degree of linear change in sexual satisfaction?***

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Random effects (continued)

- Covariances of slopes and intercepts
  - 2 within-person and 2 between-person
  - **Within Person:**
    - If a woman is highly satisfied on average, is her change in satisfaction steeper?
    - If a man is highly satisfied on average, is his change in satisfaction steeper?
  - **Between Person:**
    - If a woman is highly satisfied on average, is her partner's change in satisfaction steeper?
    - If a man is highly satisfied on average, is his partner's change in satisfaction steeper?

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Random effects (continued)

- Covariance of the residuals
  - If the man reports more sexual satisfaction at a particular wave than would be expected given the overall effect of time, does the woman also report more satisfaction for that wave?

The two-intercept model

```
MIXED
 ASexSat  WITH man woman yearC
 /FIXED = man woman man*yearC woman*yearC | NOINT
 /PRINT = SOLUTION TESTCOV
 /RANDOM man woman man*yearC woman*yearC |
        SUBJECT(DYADID)   COVTYPE(UN)
 /REPEATED = personid | SUBJECT(DYADID*year) COVTYPE(CSH) .
```

- Important notes:
  - Intercept is suppressed (**NOINT**) in the Fixed effects model
  - Make sure the SUBJECT part of the REPEATED statement has **DYADID*year** in syntax

Caveat…

- We are introducing the **two intercept model** first for pedagogical reasons – it is most directly linked to the MLM equations.
- This two-intercept approach is really a “simple slopes” model that would be estimated only if the **interaction model** (to be introduced shortly) showed significant differences as a function of the distinguishing variable, which is gender in this case.

Specification of interdependence

- Because the statement is ordered:
  - /RANDOM man woman man*yearC woman*yearC

	Man Intercept	Woman Intercept	Man Time Slope	Woman Time Slope
Man Intercept	U(1,1)			
Woman Intercept	U(2,1)	U(2,2)		
Man Time Slope	U(3,1)	U(3,2)	U(3,3)	
Woman Time Slope	U(4,1)	U(4,2)	U(4,3)	U(4,4)

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Key Variances and Covariances: The Random statement

- U(1,1) = Variance of intercepts for men
  - How much do men vary in average satisfaction?
- U(2,2) = Variance of intercepts for women
  - How much do women vary in average satisfaction?
- **U(2,1) = Covariance between the men's and women's intercepts**
  - **Are dyad members similar in their average level of sexual satisfaction?**

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Key Variances and Covariances: The Random statement (continued)

- U(3,3) = Variance of slopes for men
  - How much do men vary in their trajectories of satisfaction over time?
- U(4,4) = Variance of slopes for women
  - How much do women vary in their trajectories of satisfaction over time?
- **U(4,3) = Covariance between the men's and women's slopes**
  - **Are dyad members similar in their trajectories of sexual satisfaction over time?**

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Key Variances and Covariances: The REPEATED statement

- Models the nonindependence of the residuals
  - The part of sexual satisfaction scores that is not explained by the intercept or slope for time.
- CSH = heterogeneous compound symmetry
  - Men and women can have different residual variances (set to be the same at each time point)
  - The covariance between the two partners' residuals is the same across time (i.e., the time-specific correlation between sexual satisfaction scores is the CSH rho)

SPSS output: The two intercept model fixed effects

Fixed Effects

Men: Predicted Satisfaction = 3.37 - .020*YearC

Women: Predicted Satisfaction = 3.37 - .026*YearC

We now know that the TIME slopes for men and women are both significantly different from zero – Sexual satisfaction decreases over time.

What we don't know at this point is whether the fixed effects (i.e., intercepts and slopes) differ for men and women – they look very similar

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Random effects results

Random Effects - Variances

For Men:

Var of Intercepts: UN(1,1) = .234*

Var of Slopes: UN(3,3) = .0054*

Var of residuals: VAR $_{[person=1]}$ = .150*

For Women:

Var of Intercepts: UN(2,2) = .231*

Var of Slopes: UN(4,4) = .0047*

Var of residuals: VAR $_{[person=2]}$ = .168*

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Random effects results (continued)

Random Effects – Dyadic Covariances

Intercepts: UN(2,1) = .143*

$$rho = \frac{.143}{\sqrt{.234 * .231}} = .615*$$

So the partners' average sexual satisfaction was correlated

Slopes: UN(4,3) = .0040*

$$rho = \frac{.0040}{\sqrt{.0054 * .0047}} = .794*$$

So partners' trajectories of sexual satisfaction were similar

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Random effects results (continued)

Correlation between the residuals

CSH rho = .532*

So even after the general level of sexual satisfaction and the change in satisfaction over time are taken into account, there is still considerable similarity in satisfaction for the two partners at each wave.

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What about the intercept-slope covariances?

- They are all small and n.s. So let's do a deviance test to see if we can drop them as a set.
- Re-estimate model using ML (/METHOD = ML). Two runs each with different random statements:

Run 1:

/RANDOM **man woman man*yearC woman*yearC** | SUBJECT(DYADID) COVTYPE(UN)

Run 2:

/RANDOM **man woman** | SUBJECT(DYADID) COVTYPE(UN)

/RANDOM **man*yearC woman*yearC** | SUBJECT(DYADID) COVTYPE(UN)

Keep the same REPEATED statement

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Deviance test to drop intercept-slope covariances

- Full Model
  - Deviance = 2471.11
  - 17 parameters
- Reduced Model
  - Deviance = 2479.22
  - 13 parameters
- Chi-square: $\chi^2(4) = 8.11$, $p = .088$. So dropping the covariances does not significantly worsen model fit

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Two-intercept vs. Interaction

- **Two-intercept model:** Estimating separate fixed effect parameters for Men and Women
  - Dummy variables represent man & woman in both the fixed effects and random effects specifications
  - Provides estimates and tests of fixed effect parameters separately for men and women
- **Interaction model:** Estimating a model that specifically tests whether the gender differences in the fixed effects are statistically significant
- Random effects stay the same

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SPSS syntax: The Interaction Model

```
MIXED
 ASexSat  WITH man woman yearC gender
 /FIXED = gender yearC gender*yearC
 /PRINT = SOLUTION TESTCOV
 /RANDOM man woman |SUBJECT(DYADID) COVTYPE(UN)
 /RANDOM man*yearC woman*yearC | SUBJECT(DYADID) COVTYPE(UN)
 /REPEATED = personid | SUBJECT(DYADID*year) COVTYPE(CSH) .
```

- RANDOM and REPEATED statements are same as before
- FIXED statement has the main effects of gender and time, and the interaction between gender and time.
  - **NOTE: The Intercept is not suppressed in this syntax.**

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SPSS output: Dyadic Growth Model (interaction approach)

Fixed Effects

Parameter	Estimate
Intercept	3.37
Gender	.002 n.s.
Time	-.023*
Gender*Time	.003 n.s.

- So here we see that there are no significant gender differences in the fixed effects.
- We see that there is a negative trajectory of sexual satisfaction over time – and that this trajectory is not significantly moderated by gender

Two-intercept vs. Interaction

- These two models are ultimately identical because you can derive the two-intercept model estimates directly from the interaction model estimates
- If you use /METHOD = ML, the log likelihood values are identical for the two models.
- Main advantage is the statistical tests. In some sense, the two-intercept model is a follow-up to the interaction model given that it allows you to estimate the “simple slopes” of time separately for men and women.

Adding Upper-Level Predictors

- Dyadic growth models can also be used to assess whether individual or dyadic variables predict the level (i.e., intercept) or trajectory (i.e., slope) of an outcome.
  - These “Z” variables go into the FIXED statement
  - The RANDOM and REPEATED statements remain the same
  - Consider adding Actor and Partner negative emotionality

Interpretation of Actor and Partner effects

- Given that Time and both the Actor and Partner negative emotionality variables are grand-mean centered…
  - **ActNegEmo effect** measures whether individuals who are higher in negative emotionality tend to report lower (or higher) sexual satisfaction
  - **PartNegEmo effect** measures whether individuals whose partners are higher in negative emotionality tend to report lower (or higher) sexual satisfaction

Interpretation of Actor and Partner effects (continued)

- **ActNegEmo*YearC** tells whether people who are higher in negative emotionality change in their satisfaction over time at a different rate than those who are lower in negative emotionality

- **PartNegEmo*YearC** tells whether people whose partners are higher in negative emotionality change in their satisfaction over time at a different rate than those who are lower in negative emotionality

Syntax to add Centered Actor and Partner negative emotionality

```
MIXED ASexSat WITH man woman yearC ActNegEmoC gender
  /CRITERIA=MXITER(200)
  /FIXED=gender ActNegEmoC PartNegEmoC yearC
         yearC*ActNegEmoC  yearC*PartNegEmoC  yearC*gender
         ActNegEmoC*gender PartNegEmoC*gender
         yearC*ActNegEmoC*gender yearC*PartNegEmoC*gender
 /PRINT=SOLUTION TESTCOV
 /RANDOM=man woman | SUBJECT(DYADID) COVTYPE(UN)
 /RANDOM=man*yearC woman*yearC | SUBJECT(DYADID) COVTYPE(UN)
 /REPEATED=personid | SUBJECT(DYADID*year) COVTYPE(CSH).
```

Note that I had to increase the number of iterations for this model to converge:
/CRITERIA=MXITER(200)

Results

- Negative slope for time
- Significant negative Actor effect for negative emotionality: People higher in negative emotionality are lower in average sexual satisfaction
- Significant negative Partner effect for negative emotionality: People whose partners are higher in negative emotionality are lower in average sexual satisfaction.
- No effects of negative emotionality on slopes

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Omnibus test of distinguishability

- No fixed effects differences by gender, and highly similar variances across gender
- Re-run last model using ML
- Run a new model in which we drop gender and change COVTYPE to CS rather than CSH
- Full model
  - Deviance = 2442.075
  - 21 parameters
- Reduced model
  - Deviance = 2449.178
  - 12 parameters

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Test of distinguishability

- Chi-square test $\chi^2(9) = 7.103$, n.s.
- Final estimates
  - Intercept correlation = .60**
  - Slope correlation = .784**
  - Resid correlation = .534**

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Cross-Lagged Regression Models and models for Intensive Overtime Data

Example: Daily reports of conflict, support, and relationship satisfaction (Campbell et al., 2005)

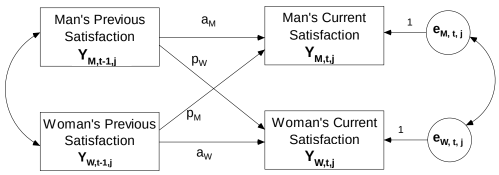
- 103 heterosexual dating couples
- Assessed once daily for 14 days
- Completed daily reports of relationship satisfaction and amount of conflict that day
  - Satisfaction and Conflict are time-varying
- Pretest data for attachment avoidance
  - Attachment avoidance is individual-level and so is "time invariant"

Lagged Models

- Predicting a person's current outcomes from the person's past and the partner's past
  - Example: tit-for-tat analyses of interpersonal communication between married partners
    - **Stability:** If the person is negative in the past, is he or she more likely to be negative in the future?
    - **Reciprocity (or Responsiveness):** If the person's partner is negative in the past, is the person more likely to be negative in the future?

Cross-Lagged Regression Models

In the cross-lagged model, a person's current outcomes are modeled to be a function of their own past outcomes and their partner's past outcomes



Actor and Partner effects

- **Actor:**
  - My previous day's satisfaction predicts my present day's satisfaction
  - If I was relatively high in satisfaction yesterday, what do I look like today?
- **Partner:**
  - My partner's satisfaction on the previous day predicts my present day's satisfaction
  - If my partner was relatively high in satisfaction yesterday, what do I look like today?

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Cross-lagged models (continued)

- Need to be sure to center the two lagged variables, $Y_{M,t-1,j}$ and $Y_{W,t-1,j}$ using the grand mean averaging over days and gender.
- Centering makes the intercepts interpretable: The average or typical value of Y.

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Computing Lagged values

- Center the variable on the grand mean
- Compute the lagged values – Note that on Day = 1 there is no "previous day"

```
IF (Day>1) ASatPrevC=LAG(AsatisfC).
IF (Day>1) PSatPrevC=LAG(PsatisfC).
```

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Cross-lagged equations

MLM equations:

$Y_{Mtj} = c_{Mj} + a_{Mj}Y_{M,t-1,j} + p_{Mj}Y_{W,t-1,j} + e_{Mtj}$
$Y_{Wtj} = c_{Wj} + a_{Wj}Y_{W,t-1,j} + p_{Wj}Y_{M,t-1,j} + e_{Wtj}$

- Six parameters are estimated for each dyad:

c_{Mj} = Intercepts for Men
c_{Wj} = Intercepts for Women

If the "Previous" variables are grand mean centered, these intercepts estimate the mean of the men's and women's satisfaction, respectively

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Cross-lagged equations (continued)

$Y_{Mtj} = c_{Mj} + a_{Mj}Y_{M,t-1,j} + p_{Mj}Y_{W,t-1,j} + e_{Mtj}$
$Y_{Wtj} = c_{Wj} + a_{Wj}Y_{W,t-1,j} + p_{Wj}Y_{M,t-1,j} + e_{Wtj}$

- Actor effects measure stability
  - a_{Mj}= actor effect for man
  - a_{Wj} = actor effect for woman
- Partner effects measure cross-partner influence, or in some contexts, reciprocity
  - p_{Mj} = partner effect for man (effect of Woman's past on the man)
  - p_{Wj} = partner effect for woman (effect of Man's past on the woman)

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Fixed and Random Effects

- Fixed Effects for this basic model
  - c_M, c_W, a_M, a_W, p_M, p_W
- Random Effects for this basic model
  - Eight variances:
    - Intercept variances for men and women
    - Actor effect variances for men and women
    - Partner effect variances for men and women
    - Residual variances for men and women
  - As many as 16 covariances (15 for the effects, 1 for errors)

Random Effects

	Int-M	Int-F	Act-M	Act-F	Part-M	Part-F	Res-M	Res- F
Int-M	σ^2_{IM}							
Int-F	$\sigma_{I\text{-}MF}$	σ^2_{IF}						
Act-M	$\sigma_{IM\text{-}AM}$	$\sigma_{IF\text{-}AM}$	σ^2_{AM}					
Act-F	$\sigma_{IM\text{-}AF}$	$\sigma_{IF\text{-}AF}$	$\sigma_{A\text{-}MF}$	σ^2_{AF}				
Part-M	$\sigma_{IM\text{-}PM}$	$\sigma_{IF\text{-}PM}$	$\sigma_{AM\text{-}PM}$	$\sigma_{AF\text{-}PM}$	σ^2_{PM}			
Part-F	$\sigma_{IM\text{-}PF}$	$\sigma_{IF\text{-}PF}$	$\sigma_{AM\text{-}PF}$	$\sigma_{AF\text{-}PF}$	$\sigma_{P\text{-}MF}$	σ^2_{PF}		
Resid-M							σ^2_{rM}	
Resid-F							$\sigma_{r\text{-}MF}$	σ^2_{rF}

```
/RANDOM man woman ASatPrevC*man ASatPrevC*woman
        PSatPrevC*man PSatPrevC*woman  |
        SUBJECT(DYADID) COVTYPE(UN)
/REPEATED = Person | SUBJECT(DYADID*day) COVTYPE(CSH) .
```


Key Covariances in Lagged Models

- Covariance between the two partners' intercepts = extent to which the two partners' average satisfaction is similar
- Covariance between the two partners' errors = extent to which the two partner's scores are especially similar at a particular point in time.
- Covariance between actor effects = similarity in stability
- Covariance between partner effects = similarity in reciprocity

Random Effects Variance-Covariance matrix

	Int-M	Int-F	Act-M	Act-F	Part-M	Part-F	Res-M	Res- F
Int-M	σ^2_{IM}							
Int-F	$\boldsymbol{\sigma}_{\mathbf{I\text{-}MF}}$	σ^2_{IF}						
Act-M			σ^2_{AM}					
Act-F			$\boldsymbol{\sigma}_{\mathbf{A\text{-}MF}}$	σ^2_{AF}				
Part-M					σ^2_{PM}			
Part-F					$\boldsymbol{\sigma}_{\mathbf{P\text{-}MF}}$	σ^2_{PF}		
Resid-M							σ^2_{rM}	
Resid-F							$\boldsymbol{\sigma}_{\mathbf{r\text{-}MF}}$	σ^2_{rF}

If both models run, you can conduct a deviance test to see whether simplifying the model by setting all these covariances to zero significantly worsens model fit.

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SPSS syntax: Lagged Model

```
MIXED
 ASATISF  WITH man woman ASatPrevC PSatPrevC
 /FIXED = man woman ASatPrevC*man ASatPrevC*woman
          PSatPrevC*man PSatPrevC*woman   | NOINT
 /PRINT = SOLUTION TESTCOV
 /RANDOM man woman ASatPrevC*man ASatPrevC*woman
           PSatPrevC*man PSatPrevC*woman   |
           SUBJECT(DYADID) COVTYPE(UN)
 /REPEATED = personid | SUBJECT(DYADID*day) COVTYPE(CSH) .
```

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SPSS Syntax: Lagged Model

- The NOINT option is used to suppress the intercept – so we get 2 intercepts, one for men and one for women
- TIME may be included in the fixed effects to control for trends
- Model does not run as it is specified – need to simplify the random component of the model and perhaps look at convergence criteria

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New random statements

```
/RANDOM man woman |  SUBJECT(DYADID)
     COVTYPE(UN)
/RANDOM ASatPrevC*man ASatPrevC*woman  |
          SUBJECT(DYADID) COVTYPE(UN)
/RANDOM PSatPrevC*man PSatPrevC*woman   |
          SUBJECT(DYADID) COVTYPE(UN)

/REPEATED = personid | SUBJECT(DYADID*day)
  COVTYPE(CSH) .
```

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Simplified Random Effects Variance-Covariance matrix

	Int-M	Int-F	Act-M	Act-F	Part-M	Part-F	Res-M	Res- F
Int-M	σ^2_{IM}							
Int-F	$\boldsymbol{\sigma_{I\text{-}MF}}$	σ^2_{IF}						
Act-M	0	0	σ^2_{AM}					
Act-F	0	0	$\boldsymbol{\sigma_{A\text{-}MF}}$	σ^2_{AF}				
Part-M	0	0	0	0	σ^2_{PM}			
Part-F	0	0	0	0	$\boldsymbol{\sigma_{P\text{-}MF}}$	σ^2_{PF}		
Resid-M							σ^2_{rM}	
Resid-F							$\boldsymbol{\sigma_{r\text{-}MF}}$	σ^2_{rF}

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Lagged Model Results- Fixed

- Cross-Lagged Regression Equation predicting today's satisfaction
- For Men:

  = 6.31 + .303(Man's satisfaction yesterday)
  +.090(Woman's satisfaction yesterday)

- For Women:

  = 6.39 + .306(Woman's satisfaction yesterday)
  + .065(Man's satisfaction yesterday)

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Fixed results (continued)

For Men:

- The Actor effect: b = 0.30, t(121) = 8.26, p < .001
- The Partner effect: b = 0.09, t(55) = 2.80, p = .007

- So there is evidence of stability for men: Holding the woman's satisfaction yesterday constant, a 1 point increase in the man's satisfaction yesterday corresponds to a .30 increase in the man's predicted satisfaction today
- The partner effect indicates that men whose partners were more satisfied yesterday tend to be more satisfied today, for each 1 point increase in the woman's satisfaction yesterday, the man's satisfaction today is predicted to increase by .09 points.

Fixed results (continued)

For Women:

- The Actor effect: b = 0.31, t(139) = 8.79, p < .001
- The Partner effect: b = 0.06, t(99) = 1.68, p = .097

- There is a evidence of stability for women
  - Holding the man's lagged satisfaction constant, a 1 point increase in the woman's satisfaction yesterday corresponds to a .31 increase in the woman's satisfaction today
- There is also some evidence that women are "influenced by" their male partners
  - Holding the woman's lagged satisfaction constant, a one-point increase in the man's satisfaction yesterday corresponds to a .065 increase in the woman's satisfaction today

Lagged Model – Random effects

- Variances:

	Intercept	Actor	Partner	Residual
Men	.130**	.028*	.011	.354**
Women	.081**	.015	.037*	.412**

Note. *p < .05, **p < .01

Example of interpreting variances

- Partner effect for the man's satisfaction on the woman
  - Fixed effect = .065
  - Variance = .037, SD = .192
  - So we see that on average, if the man was more satisfied yesterday, the woman's satisfaction today is typically a little higher. BUT this varies quite a bit. Assuming that the distribution of the slopes is approximately normal, 68% of slopes are between .065 ±.192 or between -.127 and .257

Random Effects – Covariances between partners' key effects

- Intercept-Intercept: cov(2,1) = .072, r = .696, p < .01
- Actor-Actor: cov(2,1) = .012, r = .590, p = .070
- Partner-Partner: cov(2,1) =.021, r = .99, p = .012
- Resid-Resid: rho = .455, p < .01

Testing the gender differences

- For the fixed effects only
- RANDOM and REPEATED statements stay the same. Change the syntax for the first couple of statements to:

```
MIXED
 ASATISF  WITH man woman ASatPrevC PSatPrevC gender
 /FIXED = gender ASatPrevC ASatPrevC*gender
        PSatPrevC PSatPrevC*gender
```

Note that we are keeping man and woman in the first line for use in the random effects part of the analysis

Results

	Estimate
Intercept	6.35
gender	-.037*
Actor Prev Satisfaction	.305**
APrevSat*gender	-.001
Partner Prev Satisfaction	.077**
PPrevSat*gender	.013

So the only sex difference is in the intercepts. This suggests that the two-intercept model is probably a mistake… rerun the model without the gender Interactions in the fixed effects.

Can we simplify the model?

- In theory what we would do is to do 2 runs
  - Full model using ML (with gender main effect and gender interactions and the same random structure)
  - Reduced model using ML (drop gender from fixed effects and keep same random effects)
- Test model relative model fit using deviances
- BUT the full model won't run in ML.
- Given the small and n.s. gender differences in the fixed effects, I would not worry about the lack of a deviance test to back up the decision to simplify the model

Dropping sex diffs in Fixed effects

- End up with a nice clean APIM Lagged model:

Men's sat today = 6.314 + .304(AprevSatC) + .083(PprevSatC)
Women's sat today = 6.387 + .304(AprevSatC) + .083(PprevSatC)

Both actor and partner effects are significant. So there is evidence of both stability and "influence". My present satisfaction is a function of both my own past and my partner's past.

Other things to consider

- May want to include TIME to adjust for trends in the satisfaction scores over time.
- Can include Z-variables (i.e., dyad or person variables) as moderators of the stability and influence effects.

Concluding Comments/Issues

Methodological concerns about over-time research in relationships

- Is it reasonable to expect that the variable of interest will change over the data collection period?
  - Transitions (e.g., transition to parenthood)
  - Development (e.g., child behavior as babies and toddlers)
  - For growth modeling to make sense, the outcome MUST CHANGE over time
  - Need enough time-points to model change
  - If you want to see change, study period needs to be one during which change is expected.

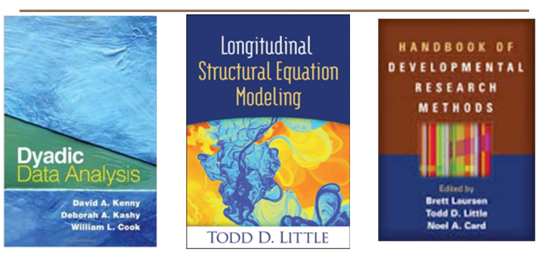
Methodological Concerns…

- Stability is a major issue that people do not take into account!
- What is the study length? What are the measurement intervals? Are these consistent with the phenomenon of interest?
- Are your measures reliable, and do they measure the same underlying construct at each time point (e.g., measures of young children's behavior)?

Further Readings

A few recommendations!

Recommended Texts



Some Chapters/Articles

- Kashy, D. A., & Donnellan, M. B. (2012). Conceptual and methodological issues in the analysis of data from dyads and groups. *The Oxford handbook of personality and social psychology*, 209-238.
  - Update coming soon!
- Gonzalez & Griffin (2012). Dyadic data analysis. *APA handbook of research methods in psychology*, *3*, 439-450.
  - http://www-personal.umich.edu/~gonzo/papers/gonzalez-griffin-2012-dyadic-ch.pdf
- Kashy, D. A., Donnellan, M. B., Burt, S. A., & McGue, M. (2008). Growth curve models for indistinguishable dyads using multilevel modeling and structural equation modeling: The case of adolescent twins' conflict with their mothers. *Developmental Psychology*, *44*, 316-329.

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