# *Unmasking Decaying Intervention Effects Using Latent Change Score Modeling*

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**BACKGROUND: How do we assess fading intervention effects when modeling growth?**
Linear growth curve models (**LGCM**) fix slopes of change to a constant (*t*) across treatment intervals. Latent change score models (**LCSM**) augment LGCMs by inspecting the constant and proportional (residualized) change. LCSMs assess if change *differs* between time intervals while LGCMs do not.

The Families and Schools Together (**FAST**) is an afterschool family-engagement intervention intended to *empower parents* through enhancement of a student's family social capital (**SC**).

- Seeks to increase *shared expectations, relational trust, and intergenerational closure* among student and parent social networks

## METHODS

1. Data collected from first-grade student, parent, and teacher self-reports, administrative records from 52 schools (*N* = 3,084) in Phoenix and San Antonio elementary schools (Gamoran, 2019).
   - Schools cluster-randomized to treatment (*n* = 26) or control (*n* = 26) conditions.
   - FAST program employed in treatment condition; control conducted learning-as-usual.
2. A univariate LCSM examined change from baseline to end of year three.
   - SC violated tau equivalence ∴ modeled as latent
   - Good fit across all measurement models (CFI > .95, RMSEA < .08, SRMR < .05).
   - Partial strong longitudinal measurement invariance attained over the four time points.
   - Fit of linear > quadratic > level & shape model.

## FINDINGS

- ***Growth in SC only significantly differed between conditions during baseline to end of year 1.***
- Three covariates significantly negatively predicted growth of SC between baseline to year 1.

# Differences in social capital growth attributed to treatment ***disappeared after year 1*** of implementation.

***Blue*** effects represent significant and positive loadings

Dotted lines indicate non-significance, s represent phantom variables.

***Red*** effects represent significant and negative loadings

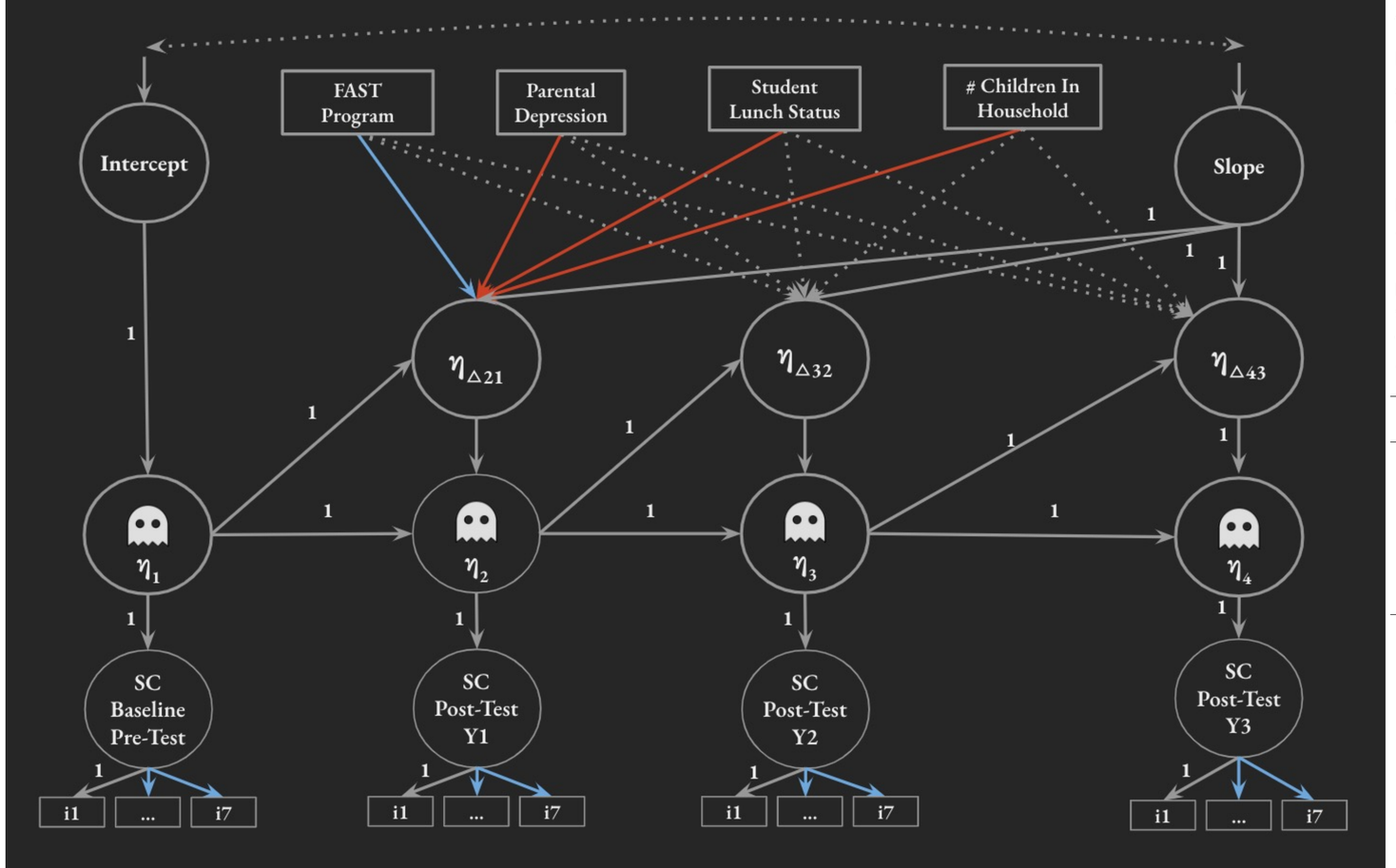


**Table 1**
*Indicators of Social Capital*

| Domain | Item | Responses |
|---|---|---|
| Inter-generational Closure | Number of parents of your child's friends you know. | 0 = None<br>1 = One<br>...<br>6 = Six or more |
| Shared Expectations | Other parents shared your expectations | 1 = Not at all<br>2 = A little<br>3 = Somewhat<br>4 = A lot |
| Relational Trust | Other parents help with babysitting, shopping | 1 = Not at all<br>2 = A little<br>3 = Somewhat<br>4 = A lot |
| | Other parents listen to your problems | |
| | Other parents invite you to school activities. | |
| | You help others babysitting, shopping | |
| | You listen to others' problems | |
| | You invite others to school activities. | |

**Autoregressive paths** defined by coefficients fixed at 1.

**Residualized change** is change beyond the model's expectation, often seen in ANCOVAs, $\varepsilon_i = y_{2i} - \hat{y}_{2i}$

- When raw scores are used, measurement error in T1 and T2 measures are compounded in difference scores.

**Phantom variables** are latent variables with no indicator

- $\eta_2 = \eta_1 + \eta_{\Delta 21}$

**Non-significant covariance** between Intercept and Slope suggests that baseline SC did not impact growth.

**Table 2**
*Time-Varying Covariate Coefficients*

| Parameter | Coefficient | SE | *p* |
|---|---|---|---|
| FAST → $\eta_{\Delta 21}$ | 0.272 | 0.061 | < .001 |
| Depression → $\eta_{\Delta 21}$ | -0.072 | 0.027 | .007 |
| Lunch Status → $\eta_{\Delta 21}$ | -0.150 | 0.068 | .027 |
| # Kids in Home → $\eta_{\Delta 21}$ | -0.60 | 0.027 | .025 |

**GitHub for code, data, tables of coefficients, and references**