

# THE NEBRASKA CENTER FOR RESEARCH ON CHILDREN, YOUTH, FAMILIES AND SCHOOLS

Is Pleased to Present the  
Fall, 2007- Spring 2008

## Research Methodology Series

The Research Methodology Series is an ongoing effort by the Nebraska Center for Research on Children, Youth, Families and Schools (CYFS) to provide information to social science researchers about important and cutting-edge research methodology and statistical approaches. Series presenters include personnel from the CYFS Statistics and Research Methodology Unit, along with invited guests.

### The CYFS Statistics and Research Methodology Unit

The CYFS Statistics and Research Methodology Unit provides support to CYFS Faculty Affiliates in the conceptualization of research designs and methodology and the selection and execution of data analyses. Unit personnel are experienced statisticians who specialize in experimental, quasi-experimental, and correlational design methodology; measurement; and cross-sectional, longitudinal, and correlational data analytic approaches (e.g., regression, analysis of variance, structural equation modeling, growth modeling, hierarchical linear modeling). For more information about CYFS or the CYFS Statistics and Research Methodology Unit, contact the CYFS Center Director, Dr. Susan Sheridan, at [ssheridan2@unl.edu](mailto:ssheridan2@unl.edu).

## *Latent Variable Approaches to Fitting Growth Curves*

Friday, September 7, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall

Jim Bovaird, PhD, Assistant Professor, Department of Educational Psychology and Director, CYFS Statistics & Research Methodology Unit

Kevin Kupzyk, MA, CYFS Methodological Consultant

Developmental and experimental research is largely concerned with the analysis of change. This talk will introduce latent variable models and how these can be used to model data from units measured over multiple time points. This is commonly referred to as a two-level framework with repeated measures (pre- and post-intervention assessments) nested within students. The use of latent variable models with longitudinal data affords the researcher greater flexibility than with traditional multilevel models, or random coefficients regression. Typical notation and graphics conventions will be discussed and applied examples of using structural models with repeated measures data will be presented to illustrate the utility of this method.

## *Crossed Hierarchical Effects*

Friday, October 5, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall

Lesia Hoffman, PhD, Assistant Professor, Department of Psychology

This talk will discuss a methodology for considering participants (level 1) who are simultaneously and jointly nested within more than one hierarchical structure (level 2) and participants who switch organizational units. A common example is students that are nested simultaneously within schools and neighborhoods, but in which not all students from the neighborhood attend the same school and vice-versa. Another example is a longitudinal study in which students change classrooms at each time point, and thus potentially cumulative or acute effects of classroom nesting would need to be accounted for across time.

## *Complex Modeling with Small Samples*

Friday, November 2, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall

Jim Bovaird, PhD, Assistant Professor, Department of Educational Psychology and Director, CYFS Statistics & Research Methodology Unit

Applied researchers are increasingly interested in formulating complex aims that require advanced multivariate statistical procedures, especially hypotheses involving mediation and/or moderation. Unfortunately, access to participants is often limited by the size of the population (as in special education research) or logistically difficult or expensive (as in school-based interventions). This results in a sample size that is less than ideal for traditional confirmatory factor analysis or structural equation modeling approaches. This talk will provide a conceptual overview of several alternative approaches that may be more appropriate when working with small sample sizes. Topics to be covered include ordinary least squares path analysis, re-sampling procedures, partial least squares, generalized structured component analysis, and Bayesian methods.

## *Exploratory Factor Analysis vs. Principal Components Analysis vs. Confirmatory Analysis*

Friday, December 7, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall

Michael Toland, MA, CYFS Methodological Consultant and Director, NEAR Center  
Kevin Kupzyk, MA, CYFS Methodological Consultant

Principal components analysis and exploratory and confirmatory factor analysis are three statistical methods that are structurally similar but each with a unique focus and place within educational research. Understanding the differences between and knowing when to apply each method is critical to the research process. This presentation will briefly introduce and discuss the advantages and disadvantages of each of these methods. Conceptual distinctions, necessary sample sizes, typical notation, graphical conventions, and uses of each method will be discussed. Applied examples of each method will be demonstrated to illustrate their utility in educational research.

## ***Power Analysis Alternatives for Atypical Research Designs***

**Friday, February 1, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall  
Kevin Kupzyk, MA, CYFS Methodological Consultant**

Statistical power plays an important role in research and is a requisite part of grant proposals. Conducting a power analysis accurately is not often a simple task. This presentation will begin with typical, straightforward means for calculating power and proceed to more advanced methods, focusing on empirical power analyses. There are several software packages available that will calculate power for multilevel designs that are common in educational research, such as students nested within classrooms. However, these programs make simplifying assumptions that may not hold in atypical research designs (e.g., unbalanced groups or classrooms, multiple overlapping cohorts, or multiple baseline designs). When software packages are used in these cases, power estimates may be biased due to over- or underestimating variance components. Examples will be provided to demonstrate the use of power programs and empirical power analyses.

## ***Response Scales & Item Writing Guidelines for Attitudinal Measures***

**Friday, March 7, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall  
Michael Toland, MA, CYFS Methodological Consultant and  
Director, NEAR Center**

Attitudinal measures are an important piece of the research process and without a well developed attitudinal measure results may only reflect random measurement error. Writing clear, concise and non ambiguous items and choosing an appropriate response scale to go along with the items can be a challenging task. Various response scales can be assigned to a set of items, but matching items with an appropriate response scale is an important step in the scale development process. If an adequate amount of time and effort is put into the development of items and response scales, then less time can be spent salvaging or deleting items during an item analysis. This presentation will discuss a taxonomy of attitudinal item writing guidelines along with ways for choosing an appropriate response scale for your items. Examples will be discussed for identifying poorly written items and response scales and how to modify existing items and response scales so a measure reflects the intended attitudinal construct.

## ***The Impact of Research Design on Intervention Study Outcomes***

**Friday, April 4, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall  
Todd Glover, PhD, Research Assistant Professor, CYFS  
Jim Bovaird, PhD, Assistant Professor, Department of  
Educational Psychology and Director, CYFS Statistics & Research  
Methodology Unit**

Researchers are able to choose among a variety of methods for conducting investigations of interventions. Unfortunately, the type of research method used can influence a study's outcomes. The purpose of this presentation is to provide a demonstration of the impact of research design choice on intervention study outcomes. Findings will be provided from a unique simulation study that involved varying the type of research design (e.g., randomized group, matched group, single-case) used with a single student dataset. Differences in results and corresponding inferences will be highlighted. A practical discussion of the implications of this work for social science research, policy, and practice will be discussed.

## ***Moderation and Mediation with Structural Equation Models***

**Friday, May 2, 11:30 AM - 1:00 PM, 242 Mabel Lee Hall  
Jim Bovaird, PhD, Assistant Professor, Department of  
Educational Psychology and Director, CYFS Statistics & Research  
Methodology Unit**

Structural equation modeling (SEM) is a flexible multivariate analytic technique that allows researchers to test global hypotheses about competing theories as well as simultaneous testing of multiple specific hypotheses such as those usually tested with ANOVA and regression. Two important strengths of SEM are the capability to disattenuate the effects of measurement error and the capacity to test indirect and total effects in addition to simple direct effects. These strengths represent important advances over traditional general linear model approaches and have important implications in testing hypotheses involving mediation and moderation. This presentation will discuss how the methodological advances inherent to the SEM framework can be used specifically to better test hypotheses of mediation and moderation.

**Jim Bovaird** received his PhD in Quantitative Psychology from the University of Kansas in 2002. He is currently an Assistant Professor of Quantitative, Qualitative and Psychometric Methods in Educational Psychology at UNL and Director of the CYFS Statistics & Research Methodology Unit. His research interests involve determining the proper use of latent variable methods - including structural equation modeling, item response theory, and multilevel modeling - and applying these methods to advance substantive research in the social and behavioral sciences.

**Lesa Hoffman** obtained her PhD in Experimental Psychology from the University of Kansas in 2003. She is currently an Assistant Professor of Psychology at UNL. At the core of her research is the integration of advanced quantitative methods (e.g., multilevel, structural equation, and item response modeling) to the examination of psychological and developmental processes, particularly within the study of cognitive aging.

**Todd Glover** received his PhD in Educational Psychology from the University of Wisconsin-Madison in 2002. He is currently a Research Assistant Professor at CYFS where he conducts large-scale, federally-funded academic and behavioral intervention research.

**Michael Toland** obtained his master's degree in 2002, and is a doctoral student in Quantitative, Qualitative, and Psychometric Methods at the University of Nebraska-Lincoln. He is currently a methodological consultant for the CYFS SRM Unit and Director of the Nebraska Evaluation and Research Center. His research interests involve test development, item response theory, and statistical modeling.

**Kevin Kupzyk** received his master's degree in Quantitative Psychology from the University of Kansas in 2005. He is now a methodological consultant for the CYFS SRM Unit and a doctoral student in Quantitative, Qualitative, and Psychometric Methods in Educational Psychology at UNL. His research interests include educational measurement, multilevel modeling, and latent variable growth models.

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