SREE Symposium Proposal

Panel Organizer: William Shadish (wshadish@ucmerced.edu)

Title: Analysis and Meta-Analysis of Single-Case Designs

Conference Session: 1st Choice is Research Methods
2nd Choice is Early Childhood Education

Presenters

Shadish, W.R., & Sullivan, K.J. Using generalized additive models to analyze single-case designs.

Rindskopf, D. Fully Bayesian Estimation of Data from Single Case Designs


Swaminathan, H., & Rogers, H.J. Effect size measure and analysis of single subject designs

Discussants

Rob Horner, Sam Odom.

Symposium Justification

Single-case designs (SCDs) are widely used to assess the effects of interventions, especially in cases where the problem of interest has a very low base rate so that large numbers of units are difficult to locate, or where the nature of the treatment requires a high degree of tailoring of treatment to the individual case. SCDs are short interrupted time series, typically applied to a single case like a child, that present and remove treatment sequentially, or at different points in time over different cases or outcomes, to see whether the level of the outcome is systematically related to the presence or absence of the treatment. However, evidence from SCDs has not been widely used in reviews about evidence-based practice. A key reason for that is the lack of widely accepted and well-developed statistical methods for the analysis of such designs. This symposium will review progress made by four groups of researchers who work on this problem. All four groups will apply their methods to the same example, a set of nine single-case ABAB designs from Lambert, Cartledge, Heward, and Yo (2006).

The first presentation by Shadish and Sullivan ("Using Generalized Additive Models to Analyze Single-Case Designs") will examine the extent to which nonlinearities in data from those designs might affect overall conclusions about treatment effectiveness. GAMs are semi-parametric
regression methods that allow the data to inform the choice of nonlinear trends allowed into the model. The presentation will include examples.

The second presentation by Rindskopf will show a fully Bayesian analysis using WinBUGS, and will do a comparison among three methods: (i) individual analyses of each time series separately using glm in R, (ii) empirical Bayes estimation using HLM, and (iii) fully Bayesian analysis. The analyses will take into account the binomial nature of the data (number of periods of disruption out of 10 per session).

The third presentation by Ferron, Van Den Noortgate, Beretvas, Moeyaert, Ugille, Petit-Bois and Baek ("Synthesis of Single-Case Experimental Data: A Comparison of Alternative Multilevel Approaches") presents a multilevel analysis of a previously published replicated ABAB design. They examine a series of multilevel modeling choices (e.g., whether or not to estimate autocorrelation, whether or not to include trends, whether to constrain the effect estimate for the second AB pair to be the same as that for the first AB pair, and alternative distributional assumptions). For each plausible combination of choices they estimate the effect (both raw score and standardized) and then examine the sensitivity of the estimates to choices made.

The fourth presentation by Swaminathan, and Rogers ("Effect size measure and analysis of single subject designs") shows how a regression analysis can be used to obtain a standardized effect size measure when there is both a level change and trend change in the phases, and that takes into account the autocorrelation. The authors present a Bayesian approach that overcomes the problem of estimating the autocorrelation in very short time series, and demonstrate how the Bayesian approach can be used to obtain a d-type effect size estimator when several subjects are available.

The discussants for this symposium are two experts in single-case design research:

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