

Institute of Education Sciences Summer Research Training Institute: Single-Case Intervention Design and Analysis

- When:** June 18 - 22, 2019
- Length:** 4.5 days
- Location:** Madison, Wisconsin
- Instructors:** John Ferron, Ann Kaiser, Tom Kratochwill, Joel Levin, Wendy Machalicek, James Pustejovsky
- Attendees:** Early and mid-career researchers
- Purpose:** The purpose of the training institute is to increase the capacity of education researchers to conduct high-quality single-case intervention research by: (a) improving the rigor of the design of the studies; and (b) applying contemporary visual and statistical analysis procedures to single-case data. In addition, the training institute will introduce single-case researchers to effect size options in single-case designs and examine relationships between single-case intervention designs and conventional group intervention designs. The training institute will build on selected readings and web-based instructional modules that have been developed to provide a foundation for various topics on single-case design. Participants should have reviewed those readings and modules identified in the assigned reading list prior to attendance.
- Daily Schedule:** 9:00 AM to 5:00 PM on Tuesday, June 18th and 8:00 AM to 5:00 PM thereafter, with breaks and 75 minutes for lunch; 8:00 AM to 1:00 PM on Saturday, June 22nd.

Group Activity: The Group Activity assignment is designed to provide attendees with an opportunity to gain experience in applying the concepts and strategies that are presented in the various instructional sessions. With the assistance of the instructors, the activity will mimic the process of developing a feasible and technically sound proposal to conduct a single-case intervention study. Each group will formulate an intervention strategy in a substantive area of its choosing, decide on the type of single-case design that is most appropriate, articulate the theory of action, and specify intervention and design options. As the sessions progress, the group will have an opportunity to apply the design, sampling, measurement, and data-analysis concepts that are discussed in the instructional sessions. Continuous feedback and resources will be made available to assist in the development of the study's design and analysis. On the last day of the training institute, each group will present their final design and proposed analysis to the full assembly.

Consultation: A portion of each day will be allocated for the instructors to consult with Institute participants on the design and analysis of their ongoing and planned single-case intervention research projects.

Day 1 (Tuesday, June 18, 2019)

- 9:00-9:30 AM** **Introductions and General Overview (Tom Kratochwill)**
- 1. Welcome and Introduction of Instructors and Participants**
 - 2. Goals and Objectives of the Single-Case Design Institute**
 - 3. Schedule and Logistics of the Meeting**
 - 4. Group Activity Sessions and Individual Project Consultation Options**
 - 5. Resources on Single-Case Design and Analysis**
- 9:30-10:00 AM** **Single-Case Intervention Research Opportunities at IES (Joan McLaughlin, National Center for Special Education Research)**

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- 10:00-10:30 AM** **Logic and Foundations of Credible Intervention Research**
- 1. Brief Review of the Principles of Scientifically Credible Intervention Research and Transition to Single-Case Intervention Research (Joel Levin)**
- 10:30-10:45** **BREAK**
- 10:45-11:45** **1. Options for Single-Case Designs in Intervention Research (Tom Kratochwill)**
- 2. Purposes and Fundamental Assumptions of Single-Case Intervention Research Methods (Tom Kratochwill)**
 - 3. Distinction between Experimental and Clinical Case Study Designs (Tom Kratochwill)**
- 11:45-12:00 PM** **Questions and Discussion**
- 12:00-1:15 PM** **LUNCH BREAK**
- 1:15-2:15 PM** **Constructing Single-Case Designs Based on Research Questions and Logic Models (Wendy Machalicek)**
- 1. The Importance of Theory of Change and Logic Models in Research**
 - 2. Example of Logic Models in Single-Case Research Design Research**
- 2:15-3:30 PM** **Appraisal Guidelines for Single-Case Designs (Tom Kratochwill)**
- 1. Rationale for Appraisal Guidelines**
 - 2. Summary of Current Guidelines**
 - 3. Applications of Single-Case Design *Standards* in Literature Reviews**
 - a. Example applications**
 - b. Advantages and limitations of the What Works Clearinghouse *Standards***
 - c. Criteria for design credibility**
 - d. Criteria for evidence credibility**
 - 4. Negative Results and Publication Bias**

- a. Negative results
- b. Publication bias

- 5. Replication Research
 - a. The importance of replication research
 - b. Direct replication
 - c. Systematic replication
 - d. Clinical replication

3:30-3:45 PM	BREAK
3:45-5:00 PM	Overview of the Group Activity (Wendy Machalicek and Joel Levin) and Initial Meetings (All Instructors)
5:00-5:15 PM	Group “Share and Tell” Session
5:15-5:45 PM	Individual Project Consultations (All Instructors)
5:45 PM	Social Hour with the Instructors and Dinner on Your Own

Day 2 (Wednesday, June 19, 2019)

8:00-8:30 AM	Individual Project Consultations (All Instructors)
8:30- 8:45 AM	Recap of Day 1 Session and Overview of Day 2 Sessions (Wendy Machalicek)

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- 8:45-10:30 AM** **Complex Single-Case Intervention Designs Continued and Overview of Designs used in Drug Research (Wendy Machalicek and Tom Kratochwill)**
- 1. Complex and Unique Single-Case Designs**
 - a. Changing Criterion Designs and Examples**
 - b. Multiple-Probe Designs and Examples**
 - c. Complex Phase-Change Designs and Examples**
 - d. Combined Designs and Examples**
 - 2. Overview of Designs used in Drug Research**
 - a. Drug Design Options**
 - b. Placebo Controls**
 - c. Carryover Effects**
 - d. Single-and Double-Blind Assessments**
- 10:30-10:45 AM** **BREAK**
- 10:45-11:45 AM** **Randomized Single-Case Intervention Designs (Joel Levin)**
- 1. Rationale for randomization in single-case intervention research**
 - 2. Randomization variations in single-case intervention designs**
 - 3. Specific randomized single-case intervention designs**
- 11:45-12:00 PM** **Questions and Discussion**
- 12:00-1:15 PM** **LUNCH BREAK**
- 1:15-3:30 PM** **Visual Analysis of Single-Case Intervention Data (Wendy Machalicek and John Ferron)**
- 1. Overview of Visual Analysis of Single-Case Intervention Data (Wendy Machalicek)**
 - a. Research on visual analysis**
 - b. Advantages and limitations of visual analysis**
 - c. Training to improve the reliability and validity of visual analysis**
 - 2. Visual Analysis of Single-Case Intervention Data (Wendy Machalicek)**
 - a. Parameters associated with visual analysis of single-case data displays**

- i. The four steps of visual analysis**
- ii. The six features of visual analysis**
- iii. Data patterns in visual analysis**
- iv. Special considerations in visual analysis**

- 3. Issues and New Developments in Visual Analysis (John Ferron)**
 - a. Response-guided research designs**
 - b. Use of randomization in visual analysis**
 - c. Masked visual analysis and practice in their application**

3:30-3:45 PM	BREAK
3:45-4:45 PM	Group Activity (All Instructors)
4:45-5:00 PM	Group “Share and Tell” Session
5:00-5:30 PM	Individual Project Consultations (All Instructors)
6:30 PM	Group Dinner at the downtown Great Dane, Madison, Wisconsin

Day 3 (Thursday, June 20, 2019)

8:00-8:30 AM	Individual Project Consultations (All Instructors)
8:30-8:45 AM	Recap of Day 2 and Overview of Day 3 Sessions (Wendy Machalicek)
8:45-9:45 AM	Using Single-case Designs to Build Programs of Scholarship (Ann Kaiser) <ul style="list-style-type: none"> 1. Multiple, yet related, research questions 2. Using results from one study to guide future studies 3. Early intervention as an example of a content area that has benefitted from programmatic scholarship 4. Combining group and single-case design within a study <ul style="list-style-type: none"> a. Practical constraints
9:45-10:00 AM	BREAK
10:00-11:45AM	Statistical analysis and effect size measures for single data series (John Ferron and James Pustejovsky)

1. **Organizing data for statistical analysis (James Pustejovsky)**
2. **Non-Overlap Measures Derived from Visual Analysis (James Pustejovsky and John Ferron)**
 - a. **Overview and history**
 - b. **Selective, critical review**
 - c. **Effect size calculators**
 - d. **Recommendations**
3. **Statistical modeling for single data series (John Ferron)**
 - a. **Linear regression analysis**
 - b. **Single-case adaptations**
 - c. **Non-linear models**
4. **Within-Case Effect-Size Measures (James Pustejovsky and John Ferron)**
 - a. **Rationale**
 - b. **Within-case standardized mean difference**
 - c. **Percentage change and log-response ratio**
5. **Meta-analysis of cases within single studies (James Pustejovsky)**

11:45 AM-12:00 PM Questions and Discussion

12:00-1:15 PM LUNCH BREAK

1:15-2:00 PM Meta-Analysis Activity (John Ferron and James Pustejovsky)

2:00- 2:45 PM Inferential Statistical Analysis of Single-Case Intervention Data (Joel Levin and John Ferron)

1. **General Overview and History of Statistical Analysis of Single-Case Intervention Data (Joel Levin)**
 - a. **The “whys” and “whats” of statistical analysis**
 - b. **Early efforts, issues, and concerns**
 - c. **The statistical-conclusion validity of single-case data: The elephant in the room**

2:45-3:00 PM BREAK

3:00-4:30 PM 2. Statistical Randomization Techniques for Single-Case

	<p>Intervention Data (Joel Levin and John Ferron)</p> <ol style="list-style-type: none"> a. Primer on nonparametric randomization tests b. Overview of single-case applications of randomization tests c. Conceptual and procedural issues d. Specific randomization test procedures e. Research applications f. The <i>ExPRT</i> computer package
4:30-5:30 PM	Group Activity (All Instructors)
5:30-6:00 PM	Individual Project Consultations (All Instructors)
6:00 PM	Informal Group Dinner on the Memorial Union Terrace (weather permitting)

Day 4 (Friday, June 21, 2019)

8:00-8:30 AM	Individual Project Consultations (All Instructors)
8:30-8:45 AM	Recap of Day 3 Presentations and Overview of Day 4 Sessions (Joel Levin)
8:45-10:00 AM	<p>Statistical analysis and effect-size measures for multiple data series (John Ferron, James Pustejovsky, and Joel Levin)</p> <ol style="list-style-type: none"> 1. Hierarchical Linear Modeling (John Ferron) <ol style="list-style-type: none"> a. Regression analysis and introduction to HLM b. Single-case adaptations of these procedures c. Conceptual and procedural issues d. Research applications e. Microcomputer software 2. Between-Case Standardized Mean Differences (James Pustejovsky) <ol style="list-style-type: none"> a. Rationale b. Conceptual overview c. Limitations & future directions d. Software 3. Additional Comments and Examples (Joel Levin)

10:00-10:15 AM	BREAK
10:15-11:45 AM	Special Topics in Single-Case Intervention Research (Tom Kratochwill, Wendy Machalicek, and Joel Levin) <ol style="list-style-type: none">1. Measurement issues2. Treatment integrity and intensity3. Cost analysis4. Social validity in treatment research
11:45-12:00 PM	Questions and Discussion
12:00-1:15 PM	LUNCH BREAK
1:15-2:30 PM	Special Topics in Single-Case Intervention Research, Continued <ol style="list-style-type: none">5. Protocol registry6. Selected ethical issues
2:30-2:45 PM	BREAK
2:45-3:45 PM	Small-Group Presentation Planning (All Instructors)
3:45-4:45 PM	Moving from Single-Case to Conventional Group Intervention Designs, Vice Versa, Et cetera (Ann Kaiser) <ol style="list-style-type: none">1. Emergent Design Standards2. Guidelines for Randomization, Blinding, Fidelity, and Statistical Analysis of Data3. Additional Comments
4:45-5:00 PM	Questions and Discussion
5:00-5:30 PM	Individual Project Consultations (All Instructors)
5:30 PM	Dinner on Your Own

Day 5 (Saturday, June 22, 2019)

8:00-8:30 AM	Individual Project Consultations (All Instructors)
8:30-9:00 AM	Recap of Day 4 Presentations and Overview of Day 5 Session (Tom

Kratochwill and Joel Levin)

9:00-10:15 AM Group Presentations

10:15-10:30 AM BREAK

10:30-12:15 PM Group Presentations and Faculty Feedback

**12:15-12:45 PM Final Questions and Responses; Dissemination of Special Visual-
Analysis Tools for Single-Case Intervention Research; Consultations
with Instructors**

12:45-1:00 PM Participant Evaluation of the Training Institute

1:00 PM DEPART TRAINING INSTITUTE