

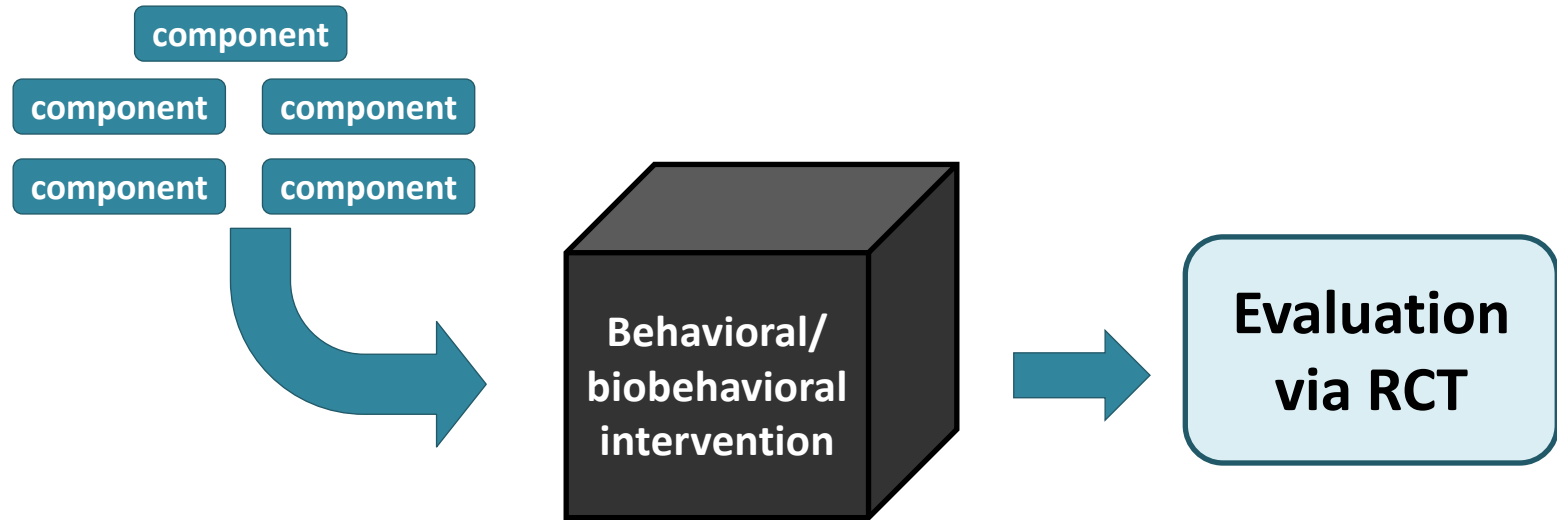
An Overview of Design of Optimization Trials

Linda M. Collins

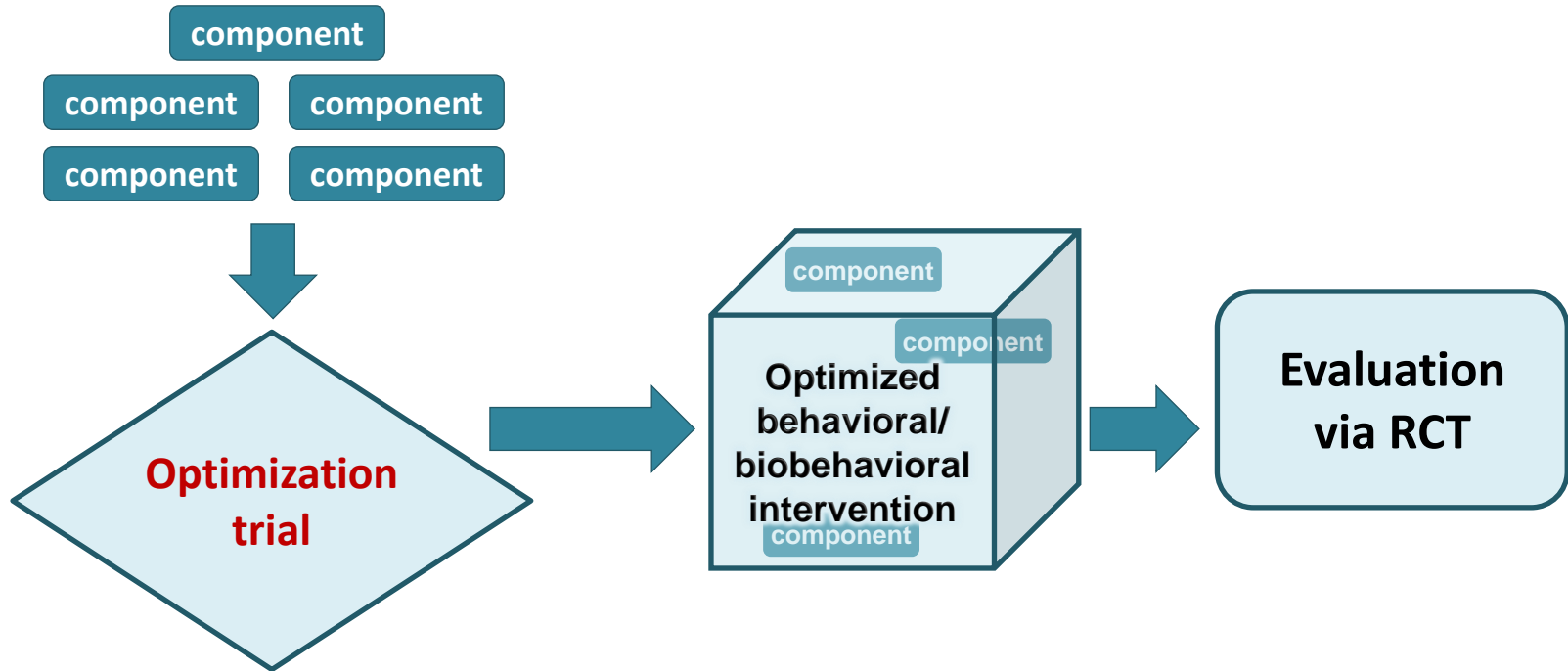
The Pennsylvania State University, USA



Classical treatment package approach



Multiphase optimization strategy (MOST)



Why conduct an optimization trial?

- You might want to develop an intervention that...
 - ...is not only effective, but also efficient, economical, and scalable
 - ...is made up of components that demonstrate a detectable effect
 - ...has been engineered to meet a particular criterion
- You might want to gain a sense of which components work for whom



What is wrong with evaluating a treatment package via an RCT?

Absolutely nothing!



Some differences between optimization and evaluation trials

An optimization trial

- Application: Developing an optimized intervention
- Purpose: Assess individual effect of components, and whether they interact
- Experimental design: Many possibilities (usually not RCT)

An evaluation trial

- Application: Evaluating an intervention
- Purpose: Assess whether intervention *as a package* outperforms comparison condition
- Experimental design: RCT



How do you select the design of an optimization trial?

- First, what kind of intervention are you optimizing?
 - Traditional fixed intervention



How do you select the design of an optimization trial?

- First, what kind of intervention are you optimizing?
 - Adaptive intervention
 - Matched
 - Time-varying; these range in intensity
 - Low-intensity
 - High-intensity up to just-in-time adaptive interventions

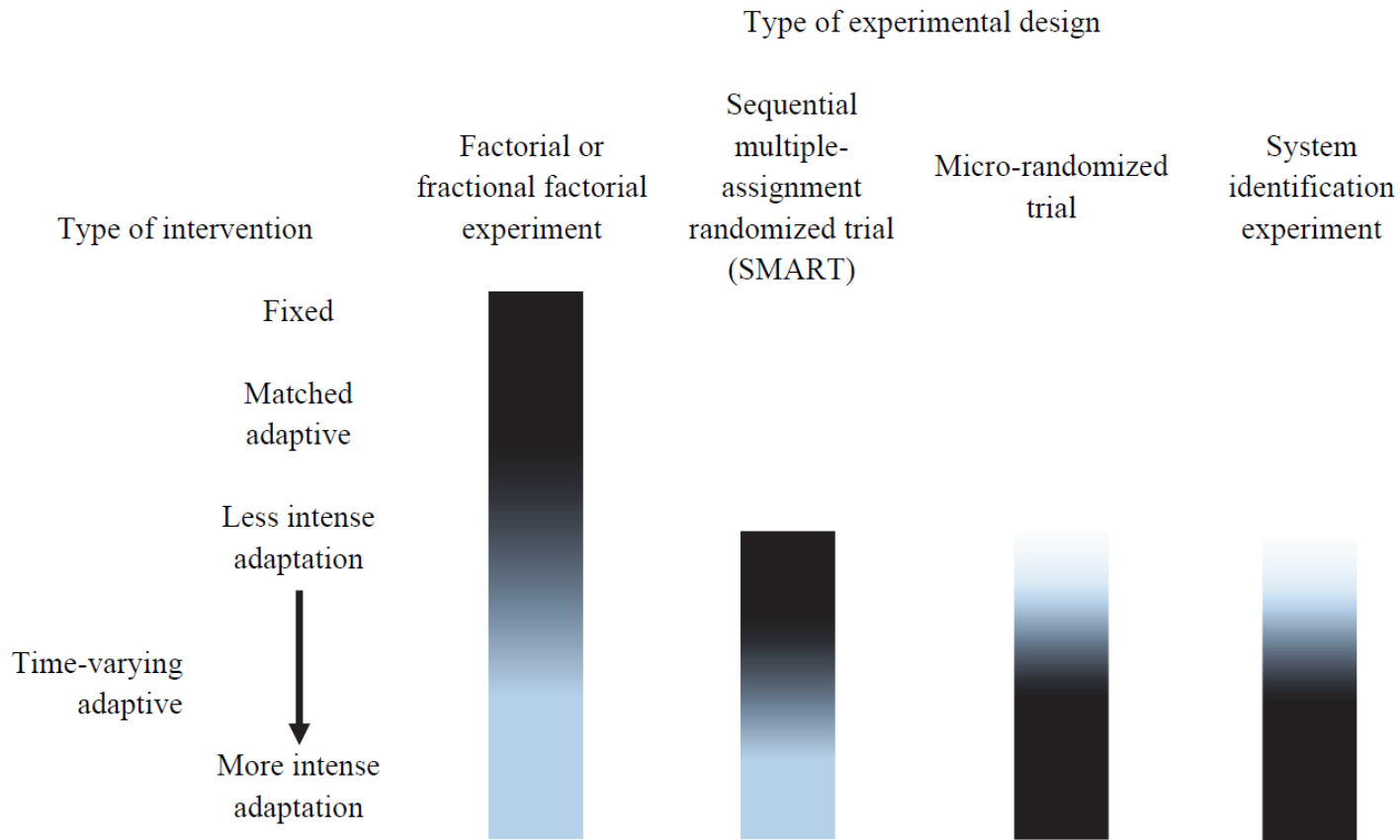


How do you select the design of an optimization trial?

- Second, use resource management principle
 - What do you need to find out?
 - What resources do you have to conduct the optimization trial?
 - Then, select design that will provide most information for resources available

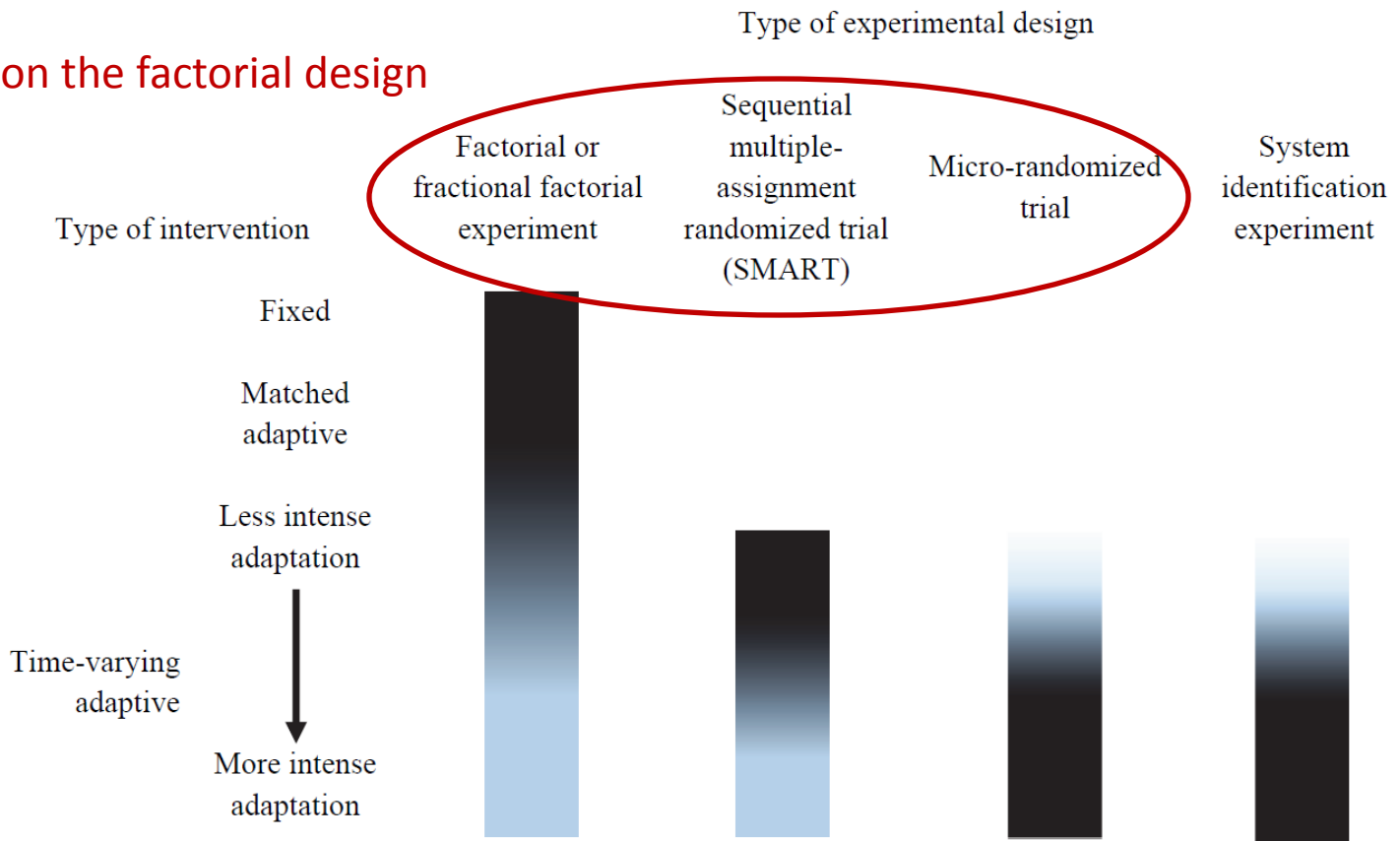


Likely relevance of various types of experimental designs for optimization of different types of interventions



Likely relevance of various types of experimental designs for optimization of different types of interventions

All variations on the factorial design



Experimental conditions in a 2^4 factorial experiment

Experimental condition	Factor A	Factor B	Factor C	Factor D
1	Off	Off	Off	Off
2	Off	Off	Off	On
3	Off	Off	On	Off
4	Off	Off	On	On
5	Off	On	Off	Off
6	Off	On	Off	On
7	Off	On	On	Off
8	Off	On	On	On
9	On	Off	Off	Off
10	On	Off	Off	On
11	On	Off	On	Off
12	On	Off	On	On
13	On	On	Off	Off
14	On	On	Off	On
15	On	On	On	Off
16	On	On	On	On

Example of choosing an experimental design: Comparison of options

Comparison of Features of Design Alternatives for Hypothetical Optimization Trial Examining 5 Components			
Design	Number of Subjects Needed to Maintain Power $\geq .8$ ($d = .3$)	Number of Experimental Conditions	Interactions
Individual Experiments	1,760	10	None can be estimated
Comparative Treatment	1,056	6	None can be estimated
Factorial (complete)	352	32	All can be estimated
Factorial (fractional)	352	16	Some can be estimated

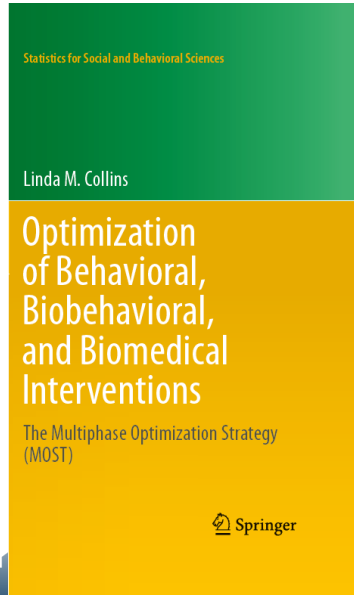
Some take-home points

- MOST is a framework for optimization and evaluation
- Optimization and evaluation are both valuable BUT DIFFERENT
- Optimization trials are NOT pilot studies
- Optimization trials are feasible
- Factorial designs are often an economical approach
- There is a world of experimental designs out there



Books – both available for FREE download via SpringerLink

- Available now



- Available sometime Fall 2018: Collins, L.M. & Kugler, K.C. (in press). *Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: Advanced Topics.*

<http://methodology.psu.edu>

