

Quasi-Experimental Design

What You Should Learn

- How quasi-experimental designs differ from true experimental designs
- Basic characteristics of each of the quasi-experimental designs
- How rival hypotheses are ruled out in each of the quasi-experimental designs

Outline of the Lecture

- What is a quasi-experimental design
- Nonequivalent control group design
- Patterns of results and possible rival hypotheses
- Interrupted time-series design
- Multiple time-series design

Quasi-Experimental Design

- An experimental design that does not meet all requirements necessary for controlling influences of extraneous variables
- Often, random assignment of participants not possible
- Example, evaluation of quarterback skills trainer

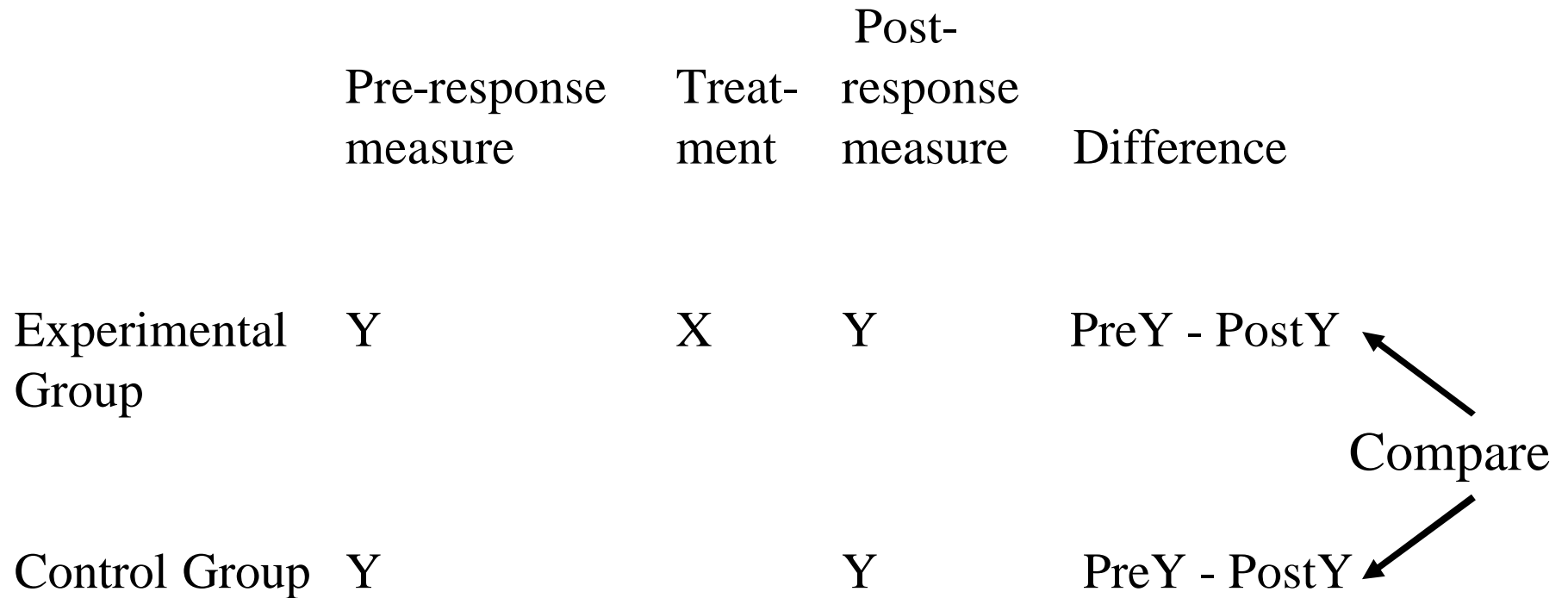
Can We Draw Causal Inferences?

- Explanations must be
 - plausible given circumstances
 - Consistent with data in situations where rival hypotheses shown to be implausible
- Identification of what is and is not plausible not always apparent
- Need to evaluate interpretation issues

Nonequivalent Control Group Design

- This kind of design includes at least an experimental (treatment) group and a control group.
- Participants are not randomly assigned to groups
 - Not equivalent on variables that may affect DV
 - These uncontrolled variables operate as rival hypotheses

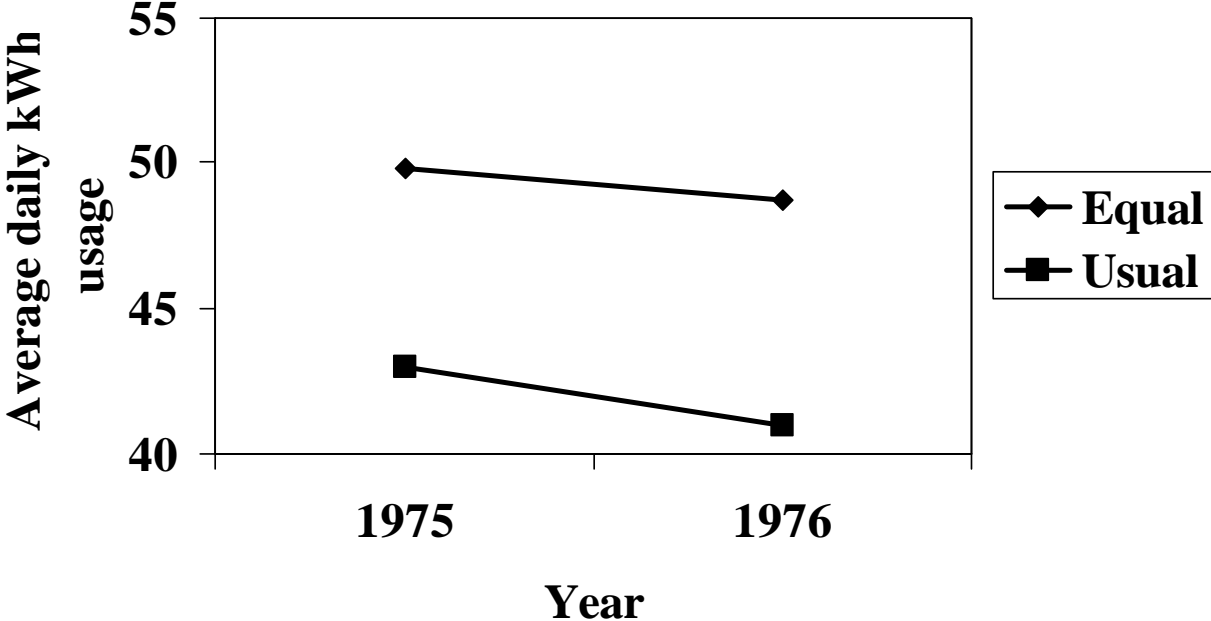
“Nonequivalent Control Group” Design



Design of the Becker et al. study

	Pre-test Response	Treatment Conditions	Post-test Response
Experimental Group	Magnitude of electricity consumed	Equal Monthly payment plan	Magnitude of electricity consumed
Control Group	Magnitude of electricity consumed	Conventional payment plan	Magnitude of electricity consumed

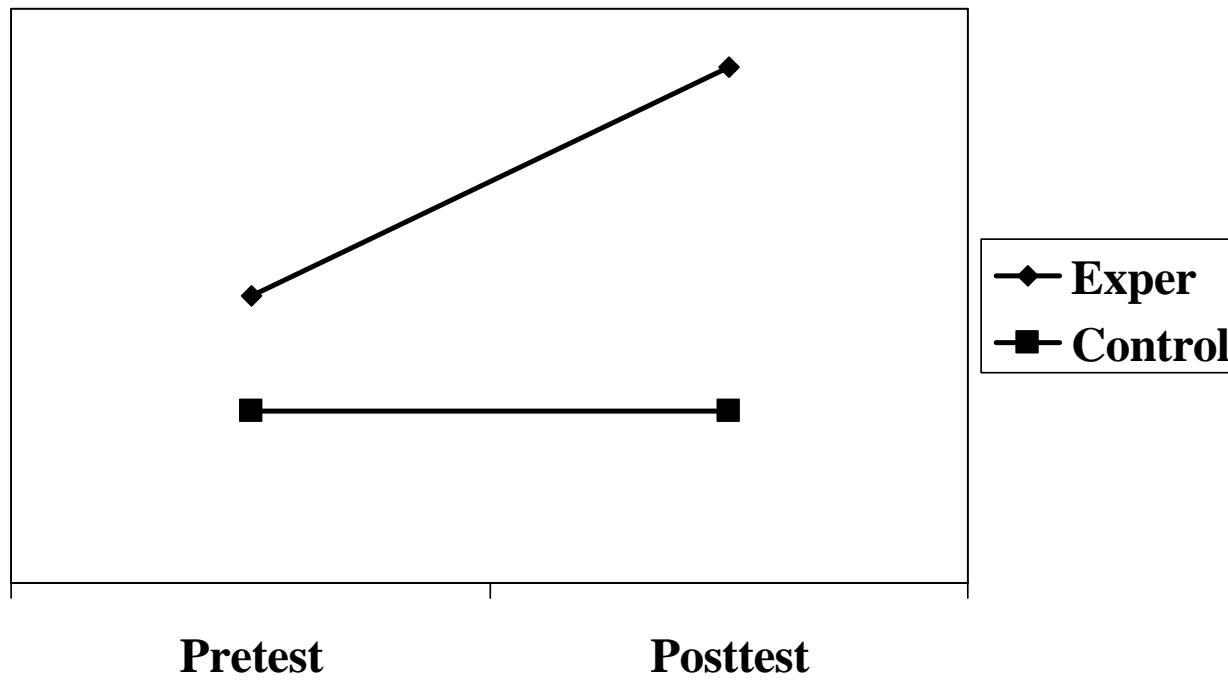
Results of Becker et al. Study



Rival Hypotheses with Quasi-Experimental Designs

- Rival hypotheses in situations such as encountered by Becker et al . tend to be directly related to the pattern of results obtained
- The patterns we will explore are:
 - Increasing treatment effect only, control group worse
 - Increasing treatment and control group performance
 - Increasing treatment effect only, control group better
 - Crossover effect

Increasing Treatment Effect



Selection-Maturation Effect

- Selection-maturation effect: The result of selecting one of two groups in such a way that its participants develop faster than those in the other group.
- To eliminate, many researchers try to match participants across the groups, one must do this very carefully.

Statistical Regression

- Can increase differences between two groups (on the matched factor) at post-test.
- Consider study examining a pre-school program on later school performance.
 - We consider mother's attitude to be important so we match to control for this influence.

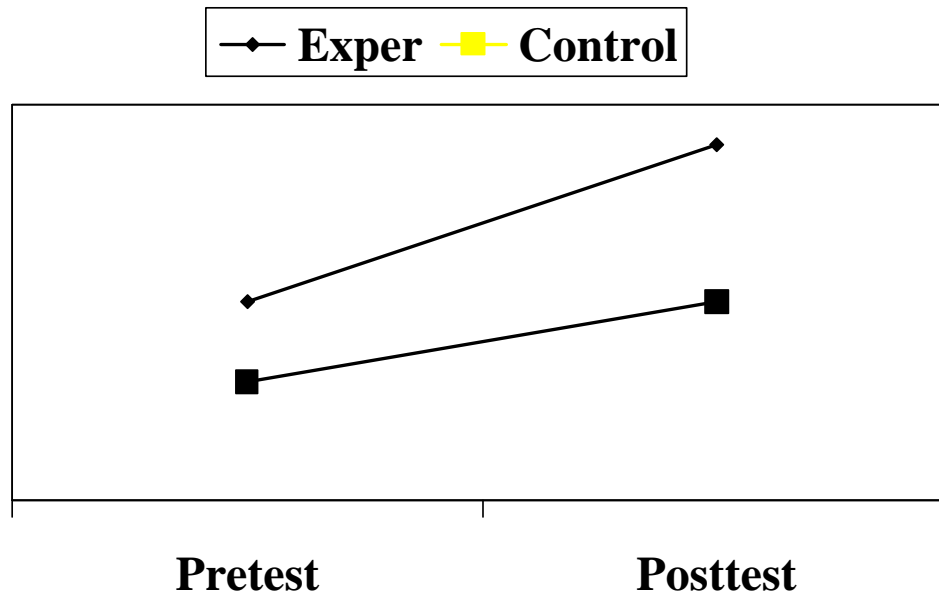
Hypothetical Attitude Scores

Head Start Ps	Pretest Attitudes H-S Moms	Posttest Attitudes H-S Moms	Non-H Start Ps	Pretest Attitudes NonH-S	Posttest Attitudes Non H-S
S1	5		S13	25	28
S2	7		S14	27	30
S3	9		S15	29	32
S4	11		S16	31	34
S5	15		S17	33	36
S6	17		S18	39	
S7	19		S19	43	
S8	25	22	S20	45	
S9	27	24	S21	47	
S10	29	26	S22	49	
S11	31	28	S23	51	
S12	33	30	S24	53	

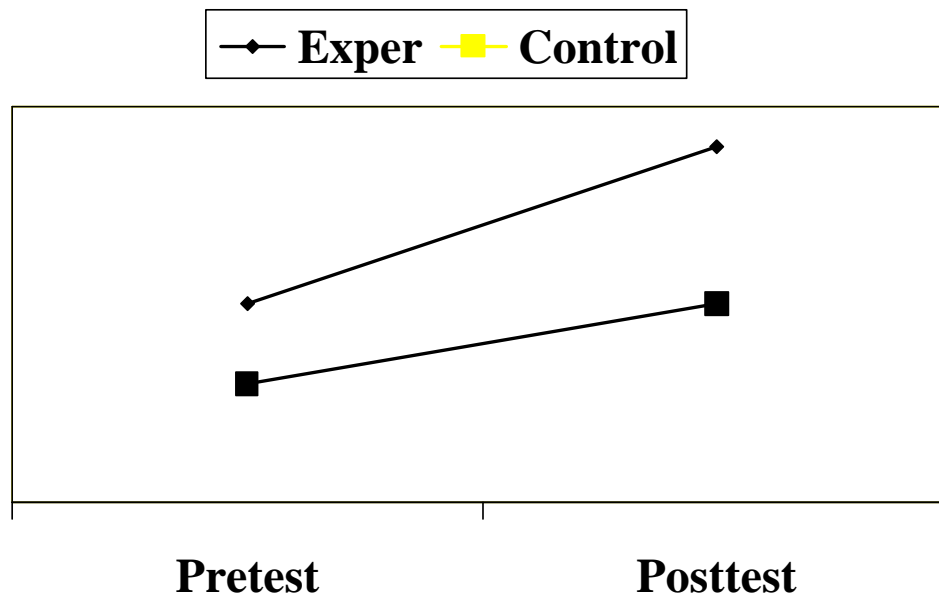
Local History Effect

- A second rival explanation of the increasing treatment effect.
- Occurs when some event affects either the treatment or the control group but not both.

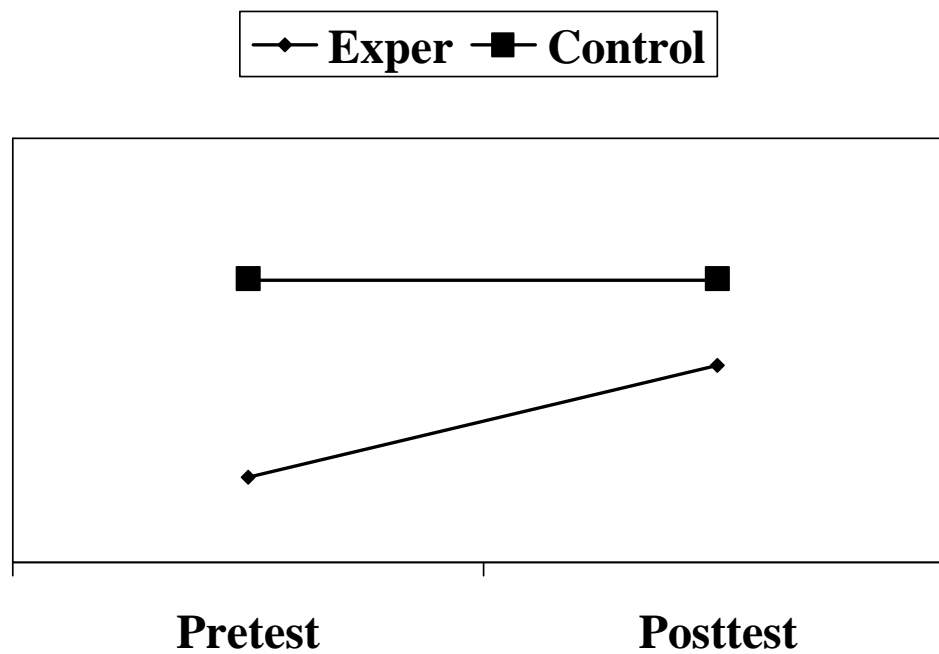
Increasing Treatment and Control Group



Increasing Treatment and Control Group



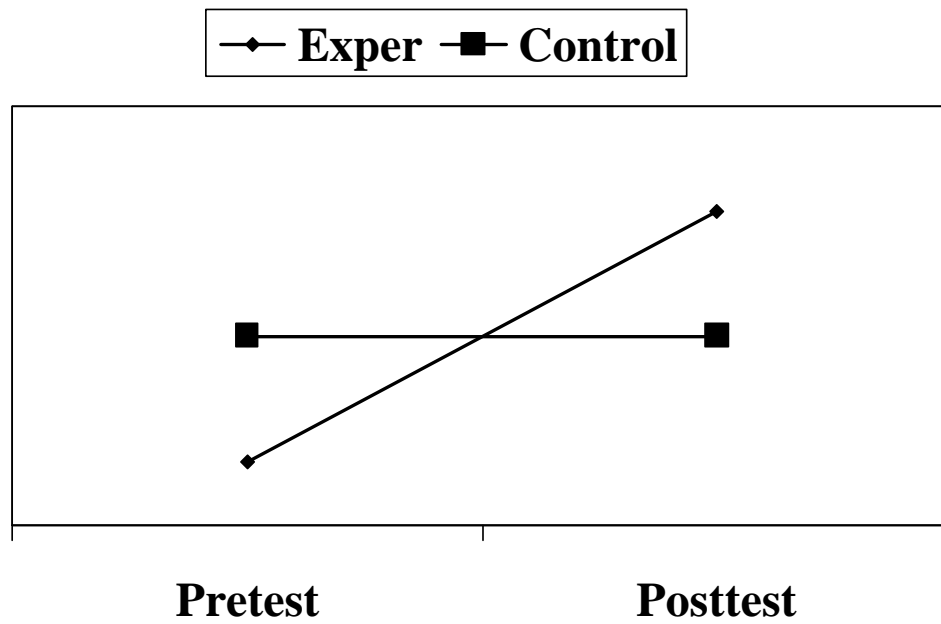
Increasing Treatment, Control Better



Possible Rival Hypotheses

- Many, including local history
- More likely, Statistical Regression
 - Regression artifact predicts increase if treatment group selected because of unusually poor scores
- Provide more than one assessment to evaluate this possible artifact

Crossover Effect



Control Strategies

- In many research situations difficult to find an equivalent control group
- To eliminate rival hypotheses think of control mechanisms, not just control group
- Control is achieved by a network of complementary control strategies
- We will discuss
 - Interrupted time-series design
 - Multiple time-series design

Interrupted Time-Series Design

Pre-response measure

Y1 Y2 Y3 Y4 Y5

Treatment

X

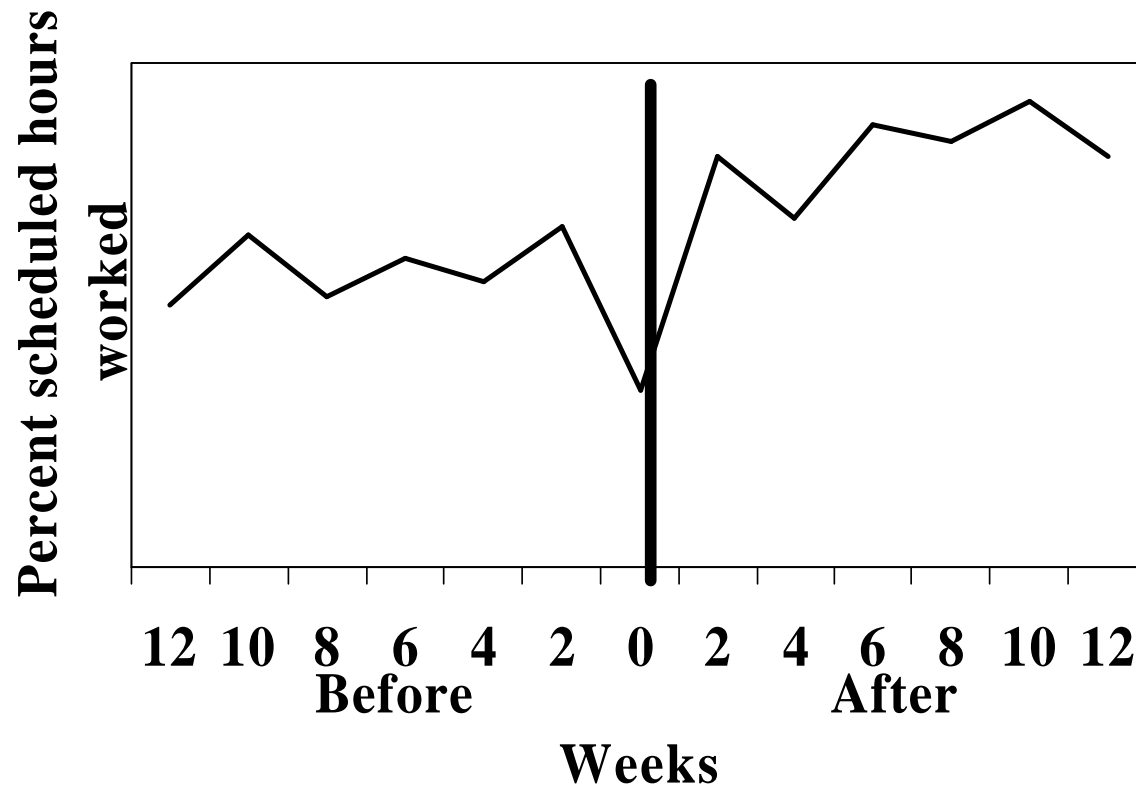
Post-response measure

Y6 Y7 Y8 Y9 Y10

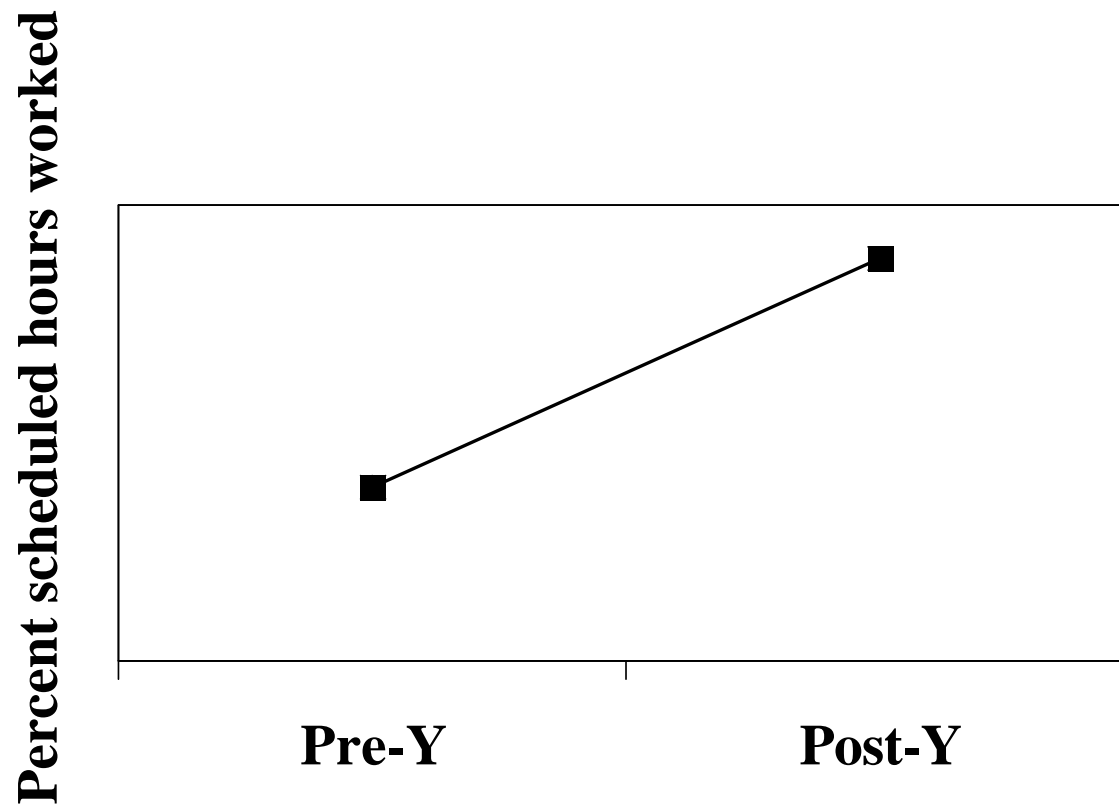
Employee Incentive

- Investigate benefit employees get from development and implementation of an employee incentive plan.
- Question: Employee developed incentive plan more effective than management dictated incentive plan?

Lawler and Hackman Data

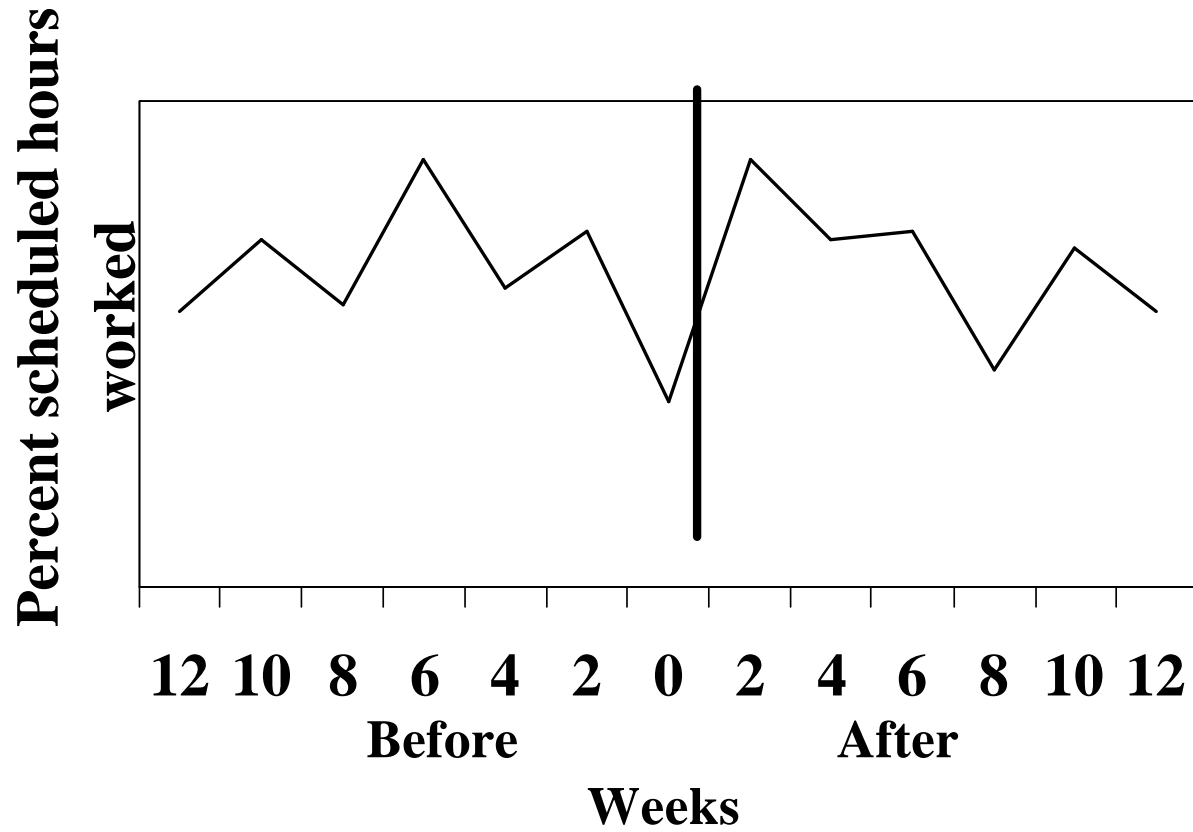


Lawler and Hackman Data Before After Only

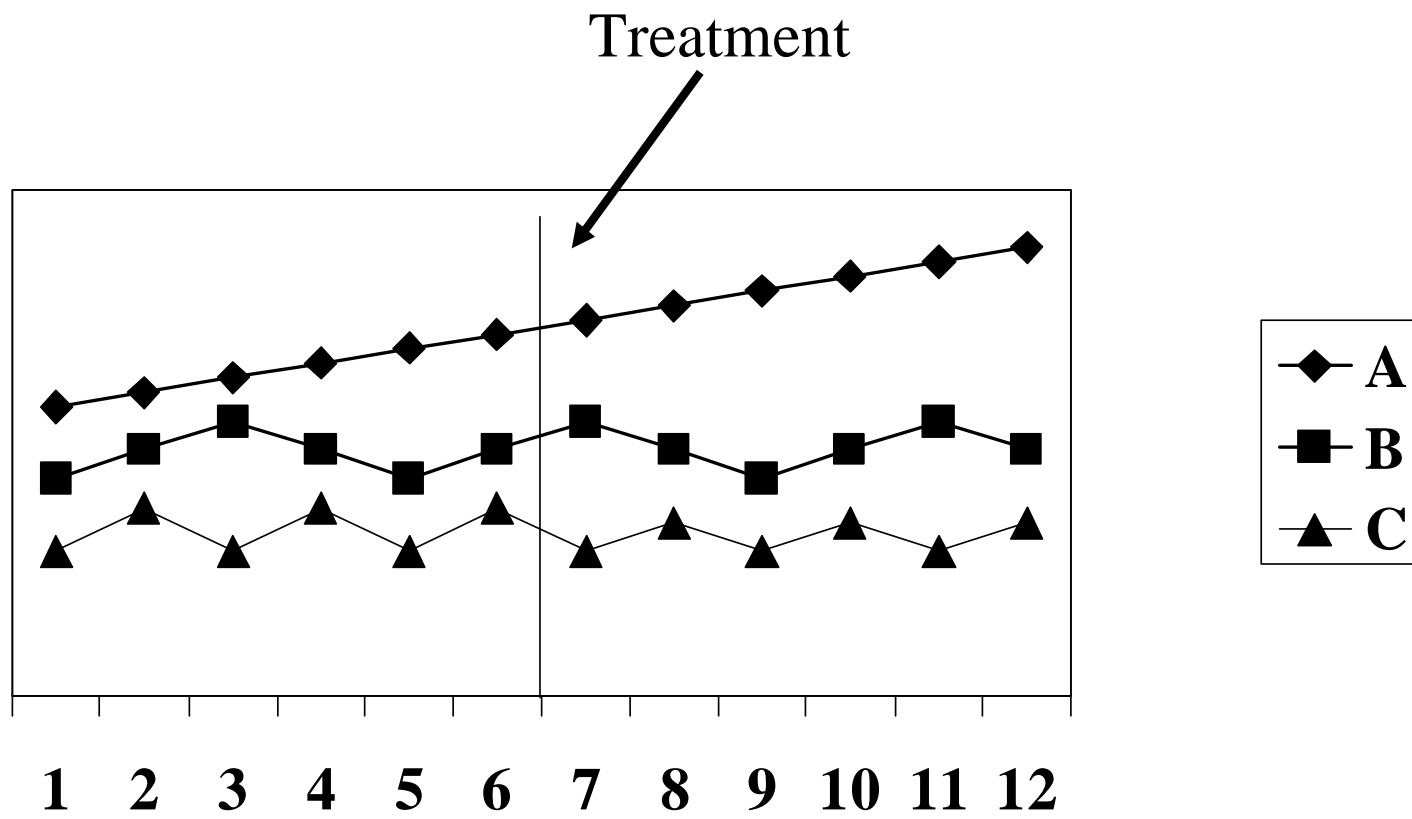


Interrupted Time-Series

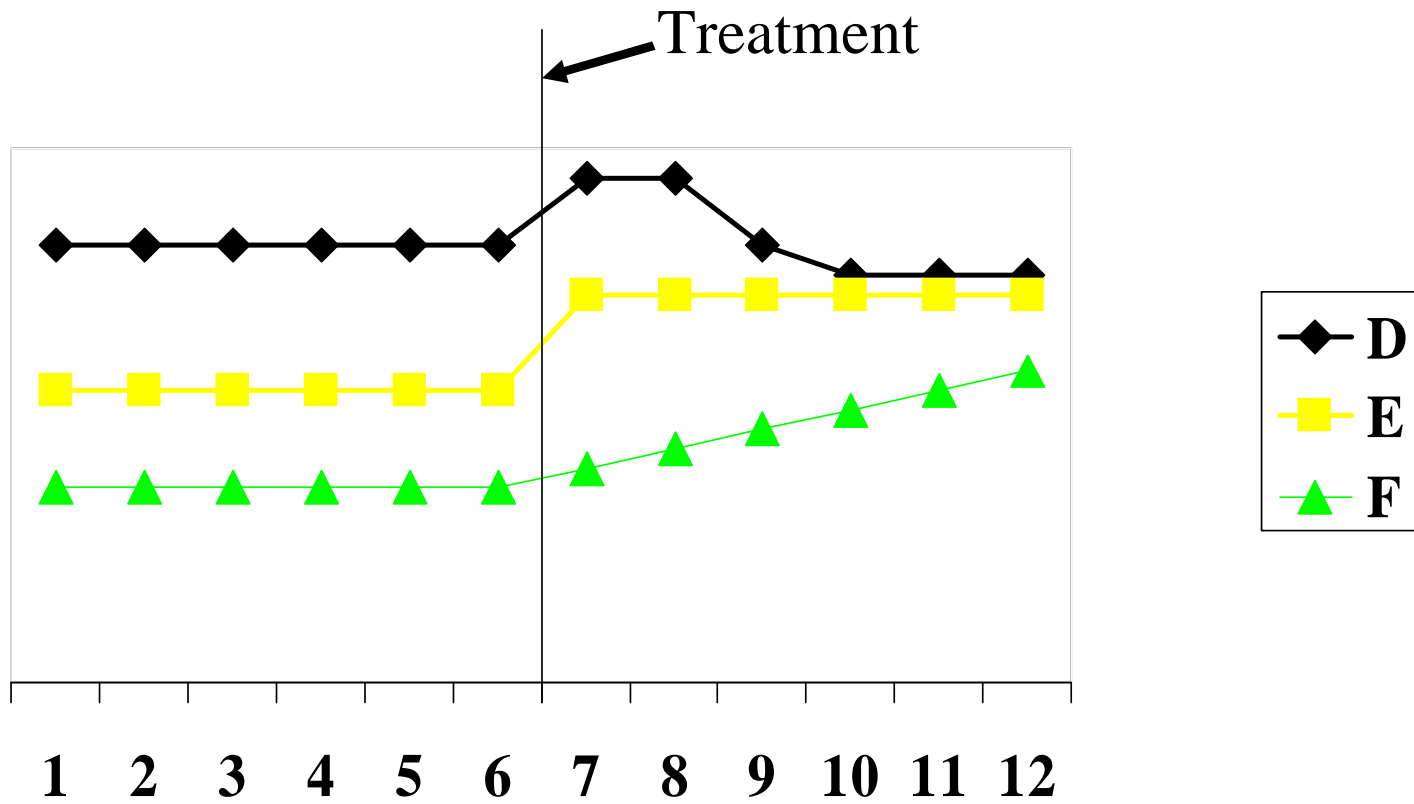
No Effect



**Possible Patterns
No TRUE Changes**



Patterns Showing True Changes



Single Group Interrupted Time Series Design: An Important Weakness

- There is an important weakness in the interrupted time-series design
 - The design's failure to control for effects of history.
- If an extraneous event occurs at about same time as treatment, such an event could change behavior.
- Investigator must consider all other events taking place at about same time as treatment and determine if they are rival hypotheses.
- Can also deal with potential history confound with a different time series design.

Multiple Time-Series Design

Two Groups, one receives treatment the other group does not receive the treatment, acts as the control group

Pre-response measure

Treatment

Post-response measure

Y1 Y2 Y3 Y4 Y5

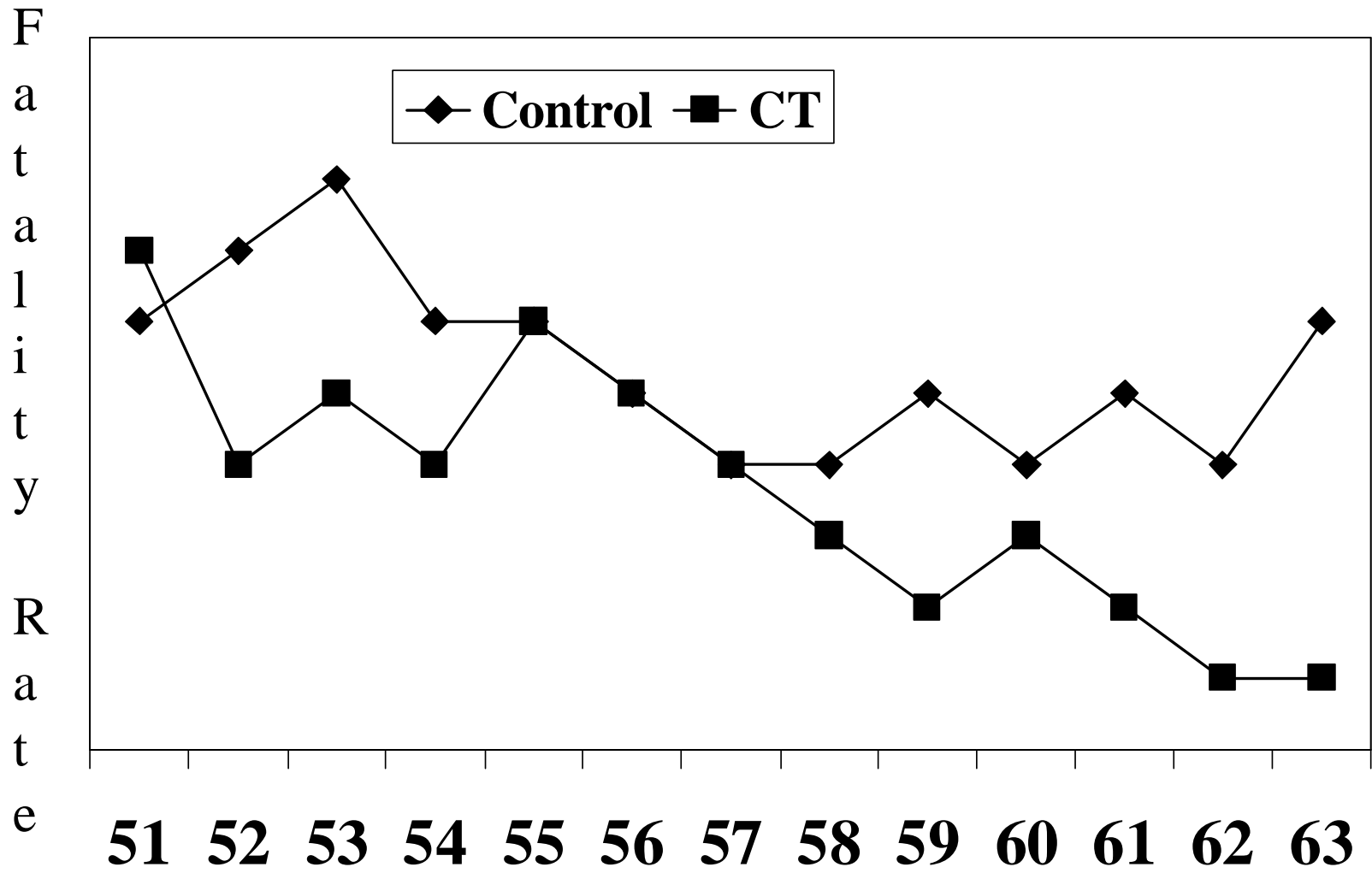
X

Y6 Y7 Y8 Y9 Y10

Y1 Y2 Y3 Y4 Y5

Y6 Y7 Y8 Y9 Y10

Connecticut Crackdown



Summary: Quasi-Experimental Designs

- We reviewed a few quasi-experimental designs
 - These designs approximate true designs
 - They do not allow complete control of extraneous variables
- Best type of design often available for field studies when causal inference desired

Summary: Quasi-Experimental Designs (Continued)

- Non-equivalent control group design most frequently used in this class of designs
 - Problems because different groups of participants
- Interrupted time-series design attempts to eliminate rival hypotheses without use of control group
- Multiple time-series design used to deal with history confounding

- ? Carefully evaluate your design
- ? Carefully evaluate the data you will collect
- ? Carefully evaluate your data after you collect it

- ? Be aware of potential sources of threats to internal validity
- ? Be careful but creative with your design

Choosing a Design

- Design is a series of trade-offs
- Never really a perfect design
 - Although that is the goal
- Strive to develop the Optimal Design