

Classic experimental design

<u>Classic experimental design</u>		Time \longrightarrow			
		<u>Pretest</u>		<u>Posttest</u>	
Experimental group	R	O ₁	X	O ₂	O ₂ -O ₁ =d _e
Control group	R	O ₃		O ₄	O ₄ -O ₃ =d _c

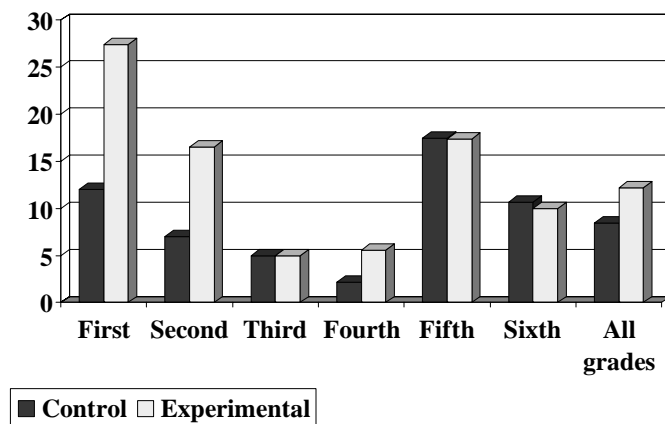
Definitions

- R = random assignment
- O = observation
- X = experimental stimulus (= independent var)
- **Randomization** is particularly important:
divides systematic biases between two groups

Decisions

- If $d_e > d_c$, then + relationship
- If $d_e < d_c$, then - relationship
- If $d_e = d_c$, then no relationship

Pygmalion in the Classroom: Gains in IQ points, by grade



Internal validity:

12 problems leading to internal invalidity

- | | |
|---------------------------|---|
| 1) history | 8) causal time order |
| 2) maturation | 9) diffusion or imitation of treatments |
| 3) testing and retesting | 10) compensation |
| 4) instrumentation | 11) compensatory rivalry |
| 5) statistical regression | 12) demoralization |
| 6) selection biases | |
| 7) experimental mortality | |

Internal validity

- Classic experimental design: guards against history, maturation, testing, instrumentation, statistical regression, selection bias, experimental mortality
- Rest (8-12) handled through careful administration of design (keep 2 groups separate)

External validity: problems in experiments

- **External validity:** can the results be generalized beyond experiment?
- Question: how representative is sample?
- Question: does the artificial nature of the experiment affect generalizability?

Solomon 4-group design

<u>Solomon 4-group design</u>		Time —————→		
		<u>Pretest</u>		<u>Posttest</u>
Experimental group I	R	O ₁	X	O ₂
Control group I	R	O ₃		O ₄
Experimental group II	R		X	O ₅
Control group II	R			O ₆

Solomon 4-group design

- Does the pretest have an independent effect?
- Does pretest sensitize people so that posttest gives different response, over and above the effect of experimental stimulus?

Decisions:

To judge effect of pretesting, compare:

- ✓ O_2-O_5 (experimental group with and without pretest)
- ✓ O_4-O_6 (control group with and without pretest)

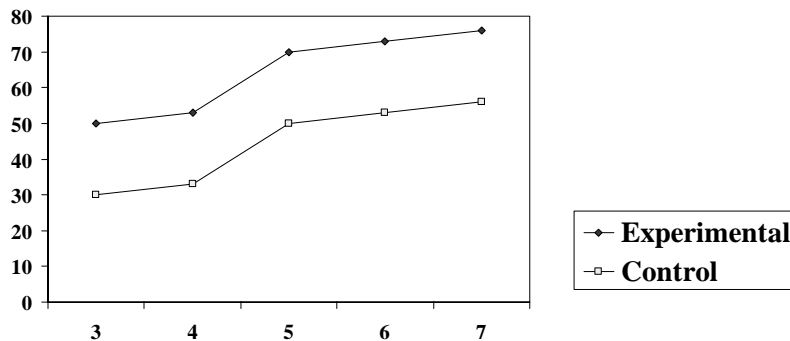
Pre-experimental designs: natural settings

- 1) One-shot case study: X O₁
- 2) Pretest-posttest design: O₁ X O₂
- 3) Posttest-comparison group design
(Schutt: ex post factor control group design)

$$\begin{array}{c} X \quad O_e \\ \hline O_c \end{array}$$

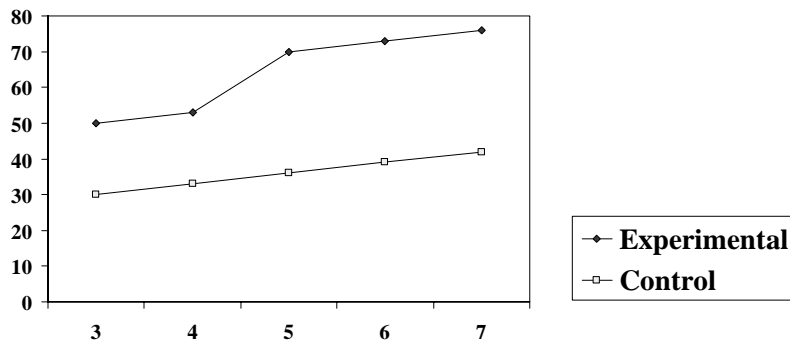
Contrasted groups design (Schutt: nonequivalent control groups)

Figure A: Reading scores by grade



Contrasted groups design (Schutt: nonequivalent control groups)

Figure B: Reading scores by grade



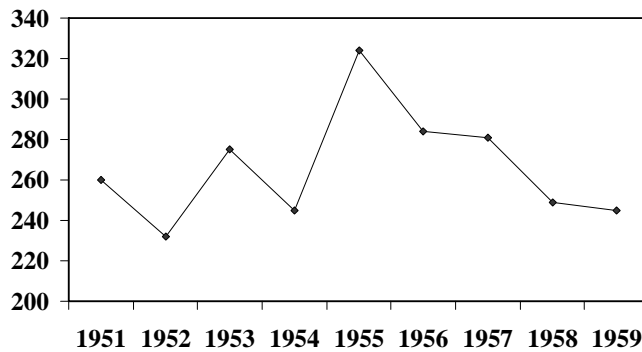
Time-series design

O1 O2 O3 X O4 O5 O6

- Multiple observations over time
- Example: Connecticut crackdown on speeding (1955)

Time-series design

Figure B: Number of fatalities, CT., 1951-59



Control-series design

(Schutt: multiple group before-and-after design)

Fatality Rates, 1951-59

