

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 _c
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

Example: Manhattan Bail Project

- Bernard Botein, 1965, “The Manhattan Bail Project: Its Impact in Criminology and the Criminal Law Process,” Texas Law Review 43:319-331.
- Initiated by Vera Institute, NYC
- Examining whether people could be safely released from jail prior to trial *without* bail
- Would they show up for trial?

Manhattan Bail Project: methods

- Restricted to people accused of felonies and misdemeanors (nothing more serious)
- NYU law students and Vera staff members evaluated defendants' records with respect to employment, family, residence, references, current charges, and previous records
- Randomly split *those recommended* into experimental and control groups
- Experimental group: recommended for pretrial release *without* bail
- Control group: released only *with* bail

Manhattan Bail Project: methods

$X=?$

$Y=?$

Hypo: $X \implies Y?$

Pygmalion in the Classroom

- Robert Rosenthal and Lenore Jacobson, 1968, *Pygmalion in the Classroom: Teacher Expectation and Pupils' Intellectual Development*, New York: Holt, Rinehart and Winston.
- Central idea: others' expectations may change behavior; self fulfilling prophecy?

Pygmalion in the Classroom: methods

- Sampled students in public elementary schools in lower class community (Oak School K-5th grades)
- Administered standard tests of intelligence
- Gave results to teachers, identifying 20% as "*intellectual bloomers*"
- **Reality:** 20% were randomly assigned to experimental group; rest to control group
- End of year: standard tests of intelligence again

Pygmalion in the Classroom: methods

- “Harvard Test of Inflected Acquisition”:
- Alias for standardized, relatively nonverbal test of intelligence: Flanagan’s Tests of General Ability (TOGA)
- Designed to measure basic learning ability (verbal ability and reasoning)
- Called them “IQ tests”

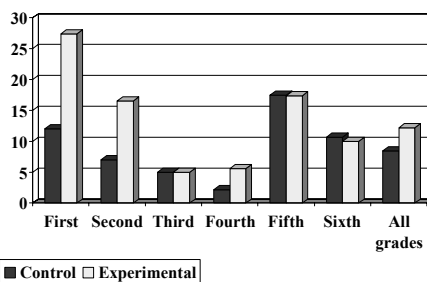
Pygmalion in the Classroom: methods

$X=?$

$Y=?$

Hypo: $X \Rightarrow Y?$

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



Use of control group

- Why use control group: “ $R \quad O_3 \quad O_4$ ”
- Separate effects of independent variable (experimental stimulus) from effect of test itself (e.g., teachers’ expectations vs. IQ test)
- Hawthorne test: effect of test itself

Hawthorne Effect

Fritz Roethlisberger and William Dickson,
1939, Management and the Worker,
Cambridge, MA: Harvard University Press.

Internal validity:
problems in experiments

Did the independent
variable really *cause* the
dependent variable?

Internal validity:

12 problems leading to internal invalidity

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

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

- Classic experimental design is weak on external validity (generalizability)
- Handle via Solomon 4-Group Design
- Described as useful for:
 - 1) Addressing generalizability
 - 2) Addressing external validity
 - 3) Addressing the effects of the pretest

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:

- ✓ O₂-O₅ (experimental group with and without pretest)
- ✓ O₄-O₆ (control group with and without pretest)

Solomon 4-group design: Example (hypothetical)

X = horror movie
O = observation on fear
stimulation scale (stress test)

Solomon 4-group design (hypothetical)

<u>Solomon 4-group design</u>		Time $\longrightarrow$		
		<u>Pretest</u>		<u>Posttest</u>
Experimental group I	R	$O_1=3$	X	$O_2=10$
Control group I	R	$O_3=3$		$O_4=5$
Experimental group II	R		X	$O_5=8$
Control group II	R			$O_6=3$

Solomon 4-group design: Example

Michael Robinson, 1976, "Public Affairs Television and the Growth of Political Malaise: The Case of the Selling of the Pentagon." American Political Science Review 70:409-432.

Michael Robinson: "The Selling of the Pentagon"

- Up to 1960's, political scientists believed television and mass media had little effect on attitudes and behaviors
- With the growth of TV journalism, shift in attitude: TV could have major impact on beliefs
- **Hypothesis:** TV fosters cynicism and feelings of helplessness

“The Selling of the Pentagon”: Methods

- Applied the Solomon 4-group design
- Tested impact of a CBS documentary, “The Selling of the Pentagon”
- Opinions about the behavior and credibility of social and public institutions, public officials, private citizens, and news organizations via public opinion questionnaires
- Pretest to two experimental groups: November, 1971
- Posttest to all four groups: December, 1971

Solomon 4-group design

X = CBS documentary

Y = public opinion about
behavior and credibility of
social institutions

Solomon 4-group design

Solomon 4-group design		Time →		
		Pretest		Posttest
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

“The Selling of the Pentagon” Conclusions

- ✓ CBS documentary changed people’s beliefs about the behavior of the American military
- ✓ Program reduced support for the military
- ✓ Program increased belief in governmental misconduct