Quasi experimental and Nonexperimental Designs

Quasi-experimental Design

▸ Often, we cannot manipulate a variable of interest

▸ Quasi-independent variables:
  ◦ Participant variable = individual characteristic used to select participants to groups
  ◦ Natural treatment = exposure in the "real world" defines how participants are selected

Nonexperimental vs. Quasi-Experimental Strategies

▸ Resemble experiments but contain some threat such as a confounding variable that can not be completely eliminated so can not infer causation
▸ Researcher has even less control over the independent variable, and seldom can specific levels of the independent variable be precisely established or quantified
  ◦ Serious limitations in terms of internal validity
▸ QE – make some attempt to minimize threats to Int. V.
▸ NE – do not

Types of Quasi-experimental Design

▸ Between
  ◦ Nonequivalent-control-group designs
    · Experimental and comparison groups that are designated before the treatment occurs and are not created by random assignment
▸ Within
  ◦ Post-test only
  ◦ Pretest and posttest but no comparison group
    · Cannot rule out time related confounding variables

Between Designs
Nonequivalent-Control-Group

- Random assignment cannot be used to create groups
- Confounds related to equivalency of groups cannot be eliminated
- Often high in external validity
  - Particularly ecological validity

Posttest-Only Non-equivalent Control Group Design

- Also called static group comparison
- Applied settings when pre-testing not possible
- Measure effectiveness of treatment with pre-existing participants
- Similar but nonequivalent participants used as control condition

Control	No Treatment	Post-test
Experimental	Treatment	Post-test

Pretest – Posttest Non-equivalent Control Group Design

- Stronger version of posttest only design
- Both control (C) and experimental (E) groups measured prior to treatment and again after E group receives treatment
- Shows if groups are similar on the DV before manipulation of IV
- Also controls for time related changes in DV indep. of IV
- Reduces threat of both assignment bias and time related threats

O   IV   O   Exp. Grp.
O   O   Control

But...

- Doesn't eliminate all threats to Int. V.
- E.g., differential history effects
  - History differs between groups
- Differential instrumentation, differential testing, differential maturation or differential regression

Differential Research Design

- Also called ex post facto research
- Experimental and comparison groups that are not created by random assignment
  - Individuals may decide whether to enter the treatment or control group
  - Selection bias is a significant issue
- E.g., shyness scores from single child vs. child with siblings
- Existence and description of relationships
- Similar to correlational design but different data and analysis
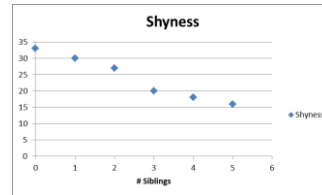
Correlational

	Siblings		
Differential	0	1-2	>3
	33	28.5	18

Within-Subjects
NE and QE Pre-Post Designs

- One group of participants measured before and after an event or treatment
- Impossible to counterbalance order of treatments
- Useful for studies of interventions that are experienced by virtually every case in some population
- No comparison group
- Time Related Threats to Int. V.
  - History, instrumentation, testing effects, maturation, & statistical regression

Preexperimental Designs

- One-shot case study
  - X-O (X=exposure to event, O=observation)
  - No comparison to those not exposed to event
  - No way to know person's response before intervention

One-Group Pretest – Posttest Design

‣ One pre and one post-test measurement
‣ E.g., voter's confidence in electoral candidate before and after televised debate
‣ O   X   O

‣ Cannot rule out uncontrolled events between O and O

Time Series Design

DV Observed to Establish Baseline	→	Manipulation Introduced Or Occurs	→	DV Observed to Examine Effects of IV

Goal is to have sufficient numbers of observations so that researcher can rule out the possibility that observed changes following treatment are not due to naturally occurring cycles or trends

Time Series Design

‣ Treatment *is* manipulated by researcher
‣ Series of observations for each participant before and after treatment or event
‣ E.g., Measures of stress weekly for 2 months preceding and following introduction of aromatherapy in workplace
‣ O   O   O   X   O   O   O

Interrupted Time Series Design

‣ Treatment is *NOT* manipulated by researcher
‣ E.g., Depression measured monthly for 3 months before and after Christmas
‣ Works with predictable event like decriminalizing marijuana
‣ For unpredictable events like Katrina, rely on archival data
‣ Can see trends in data before treatment
‣ Can observe long-term changes following treatment
‣ But other changes can coincide with treatment
   ○ E.g., cold weather/snowfall and Christmas

Hurricane Katrina and Stress

Hurricane Katrina and Stress

Imagine a Study…

- "U Drive. U Text. U Pay."
- The state received $2.3 million in federal distracted-driving-prevention funds from the National Highway Traffic Safety Administration (NHTSA).
- North Haven Police received a grant for $10,125, Orange Police received $11,100, Branford received $11,325, and Derby also received a grant to carry out this enforcement mobilization.
- These funds, and similar disbursements to other towns, will go toward overtime staffing
- The DOT will also purchase advertising to inform the public of the enforcement campaign.
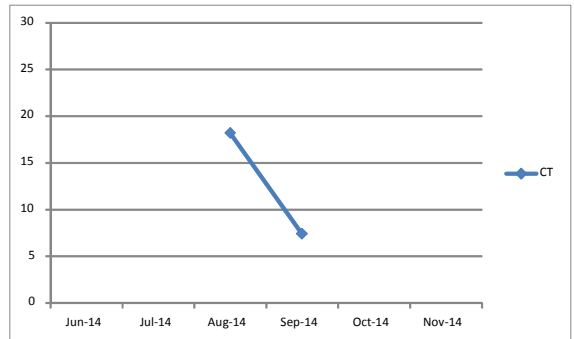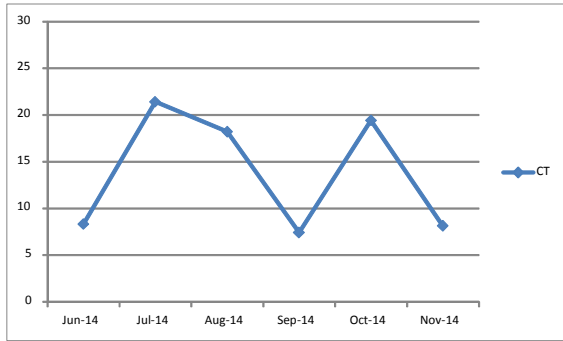 - Public awareness, pledge campaigns, laws

Imagine the Results…

Imagine the Results...2

Equivalent Time – Samples Design

▸ Treatment is repeatedly administered and removed during series of observations
▸ E.g., introducing music in the workplace – turning it on and off and measuring worker concentration at regular intervals weekly
▸ O   O   O   X   O   N   O   X   O
▸ Best used when treatment effect is expected to be temporary
▸ Hard to determine causality if treatment effect is permanent

TABLE 9.1   A Comparison of the Classical Experimental Design

DESIGN	RANDOM ASSIGNMENT	PRETEST	POSTTEST	CONTROL GROUP	EXPERIMENTAL GROUP
Classical	Yes	Yes	Yes	Yes	Yes
One-shot case study	No	No	Yes	No	Yes
One-group pretest/posttest	No	Yes	Yes	No	Yes
Static group comparison	No	No	Yes	Yes	Yes
Two-group posttest only	Yes	No	Yes	Yes	Yes
Time-series designs	No	Yes	Yes	No	Yes

Patched–Up Quasi Experiments

▸ Used when pretesting is not possible
▸ Control group is added to test for possible confounds after intervention has been implemented
  · "Patches over" holes in internal validity

  · E.g., does study abroad program increase maturity level of college students? No pre–test
    · Compare maturity level of returning students to those at same level that did not study abroad
    · Include as controls, individuals that applied for program but did not participate
    · Include second control from another university to minimize likelihood of one type of factor differentiating groups based on recruitment/selection

Focal Local Controls

A control group in a nonequivalent comparison group experiment that is similar to treatment group in
- locale
- characteristics, especially those most highly correlated with
  - selection into conditions
  - outcome of the investigation

Memories of 9/11

- Sharot, Martorella, Delgado, and Phelps (2007)
- Participants viewed word cues while in fMRI scanner
  - Words belonged to one of two categories: Sept. 2001 and summer 2001
- Participants also rated the word cues on a number of dimensions
- Participants were divided into groups (near the World Trade Center or far from the WTC) *ex post facto*

Scatter Diagram

Exhibit 8.7 Correlation scatter plot across all groups for enhancement in recollective experience, defined as the average differential scores on all subjective scales for 9/11 memories vs. summer memories, with participants' distance from the WTC defined by ranking participants from the individual closest to the WTC to the individual farthest from the WTC.
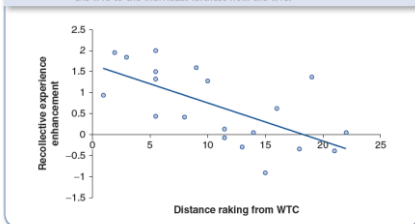
Source: From Sharot et al. 2007.

Pattern of fMRI activity

Exhibit 8.8 Mean percentage signal change from the peak active voxel in the left amygdala, revealing a two-way interaction of trial type (9/11 vs. summer) × group (Downtown vs. Midtown)
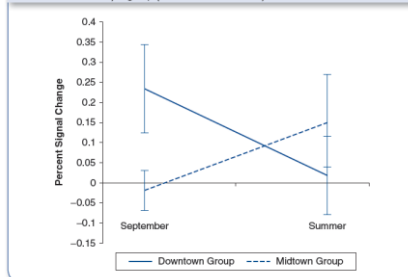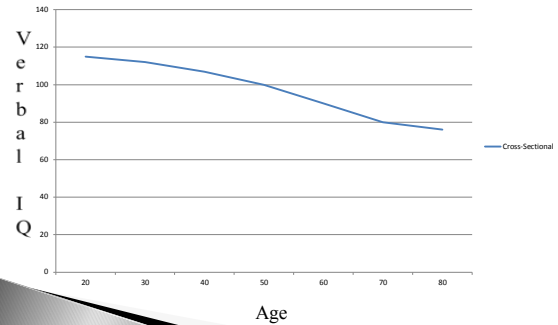
Source: From Sharot et al. 2007.

Cross-sectional Design

- Selects groups of people of different ages and then compares these age groups on psychological processes
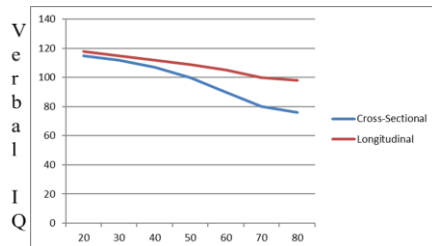
- Confounded by:
  - Cohort effects

Cohort Effects

Longitudinal Design

- Same research participants are followed over time

Cross-sequential Design

- Time-lag design = a researcher aims to determine the effects of time of testing while holding age constant
- Cross-sequential design = tests two or more age groups at two or more time periods
  - Avoids problems of both cross-sectional and longitudinal designs

Cross Sequential Design

		Year of Test				
		2000	2010	2020		
	1960	40	50	60	Longitudinal	
Year of Birth	1970	30	40	50		
	1980	20	30	40	Time Lag	
	1990	10	20	30		

Social Media Use as a function of time and age

Confidence in Results of Non-Equivalent Control Group Design

Increased by
- Use of ANCOVA or other methods to examine preexisting group differences
- Patched-up designs to rule out alternative explanations
- Replication in different circumstances
- Randomly assigning naturally occurring groups to condition (nested analysis of variance design)
  - Allows separation of the variance in the dependent variable due to IV and to the factor in which the IV is nested
- Research showing that results of quasi-experiments are generally similar to results of true experiments