

HKBM7000

Approaches to Research and Academic Communications

Day 2 (27 June 2020)

Research Designs

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Topics

- Research Design
- Research Methods
 - Qualitative Research Methods
 - Quantitative Research Methods
 - Descriptive Research Methods
 - Correlational Research Methods
 - Experimental Research Methods
 - Choosing a Research Method
- Cross-Sectional vs. Longitudinal Designs
- Errors in Research
- Research Proposal

[2]

RESEARCH DESIGN

Research Design: Definition

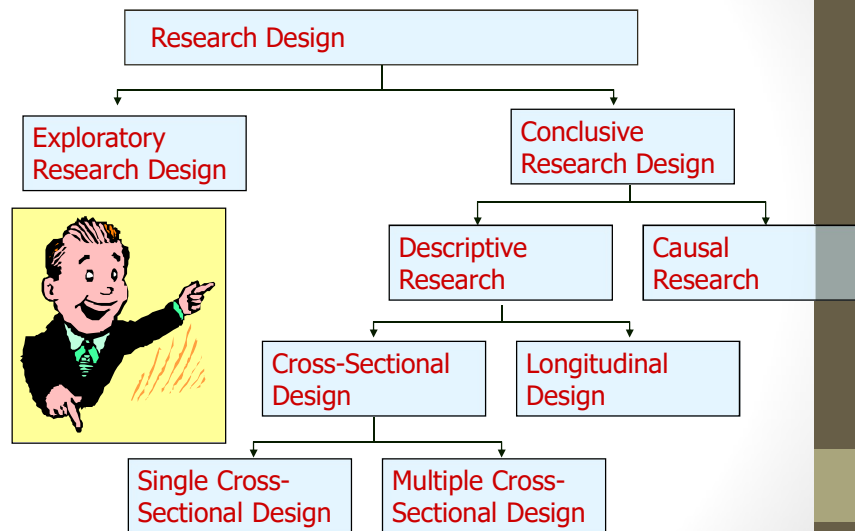
- A **research design** is a framework or blueprint for conducting the research project. It details the procedures necessary for obtaining the information needed to structure or solve marketing research problems.

Components of a Research Design

- Define the information needed
- Design the exploratory, descriptive, and/or causal phases of the research
- Specify the measurement and scaling procedures
- Construct and pretest a questionnaire (interviewing form) or an appropriate form for data collection
- Specify the sampling process and sample size
- Develop a plan of data analysis

RESEARCH METHODS

A Classification of Research Designs



Types of Research Methods

- Qualitative (mostly exploratory and inductive)
- Quantitative (mostly deductive)
 - Descriptive methods
 - Correlational methods
 - Experimental methods

Research Method	Basic Purpose	How Conducted	What is Manipulated	Possible problems
Descriptive	To observe and record behavior	Do case studies, surveys or naturalistic observation	Nothing	Atypical sample biased observations
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical association, sometimes among survey responses	Nothing	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts

http://www.grin.com/object/document.184283/d5bd17160524c09011561ca844c42bf_LARGE.png

QUALITATIVE RESEARCH METHODS

Qualitative Research

- To gain insights about how the respondent thinks and feels
- Often used in exploratory studies that lead to larger-scale quantitative research
- Sometimes resulting in so-called “grounded theory”

General Principles of Qualitative Research Design

- Naturalistic
 - No reduction during data collection
- Validity
 - Allows participants to challenge the researcher’s assumptions
 - Collects data in the settings with high ecological validity
 - Ensure reflexivity
- Reliability
 - Only if generalization is of concern
 - Replications are possible for appropriate and vigorous methods
- Representativeness
 - Only if generalization is of concern
 - Accumulative techniques
- Role of participants
 - Feminist approach: can contribute to the analysis of their data
 - Memory work: researchers are the participants
 - Conversation analysis: participants do not involve in the analysis

Reflexivity

- Addresses how the background of the researcher may influence the interpretation of the research
- Addresses how the research has changed the researcher's way of thinking the subject matter
- Presented in footnotes

Research Questions

- Qualitative research is often guided by one or more research questions
 - Research questions are open-ended
 - Hypotheses are claims that can be tested by empirical data
- Tends to be process-oriented
 - How and Why

Major Data Collection Methods

- Semi-structured interviewing
 - Familiarize with the cultural milieu, be aware of linguistic variability, develop rapport
 - Includes descriptive, structural, contrast, and evaluative questions
 - Recording and transcription of the interview
- Participant observation
 - Observe what is happening
 - Feel what it is like to be in that situation
 - Jane Goodall: A Retrospective (5:55)
 - <http://www.youtube.com/watch?v=LKyrLFyOi04>

Major Data Collection Methods (cont.)

- Diaries
 - Difficulty: commitment to maintain a record
 - Can be more or less structured
 - Frequency, medium, content, time period
 - Strengths: Get Information that is hard to obtain, temporally ordered, less recall bias, less reactivity
 - Weaknesses: Suffers from poor recruitment and high drop-out rate
- Focus group
 - Mobilizes participants to comment and challenge another's contributions
 - With higher ecological validity
 - Not more than 6 participants
 - Typical groups: homogeneous or heterogeneous, pre-existing or new, concerned or naive
 - Not suitable for personal and sensitive issues
- Projective techniques

Depth Interview Techniques: Laddering

In **laddering**, the line of questioning proceeds from **product characteristics** to **user characteristics**. This technique allows the researcher to tap into the consumer's network of meanings.

Wide body aircrafts (product characteristic)



I can get more work done



I accomplish more



I feel good about myself (user characteristic)

Advertising theme: You will feel good about yourself when flying our airline. "You're The Boss."

Depth Interview : Hidden Issue Questioning

In **hidden issue questioning**, the focus is not on socially shared values but rather on personal "sore spots;" not on general lifestyles but on deeply felt personal concerns.

fantasies, work lives, and social lives

historic, elite, "masculine-camaraderie," competitive activities



Advertising theme: communicate aggressiveness, high status, and competitive heritage of the airline.

Depth Interview Techniques: Symbolic Analysis

Symbolic analysis attempts to analyze the symbolic meaning of objects by comparing them with their opposites. The logical opposites of a product that are investigated are: non-usage of the product, attributes of an imaginary “non-product,” and opposite types of products.

“What would it be like if you could no longer use airplanes?”

↓
“Without planes, I would have to rely on e-mails, letters and long-distance calls.”

Airlines sell to the managers face-to-face communication.

Advertising theme: The airline will do the same thing for a manager as Federal Express does for a package.

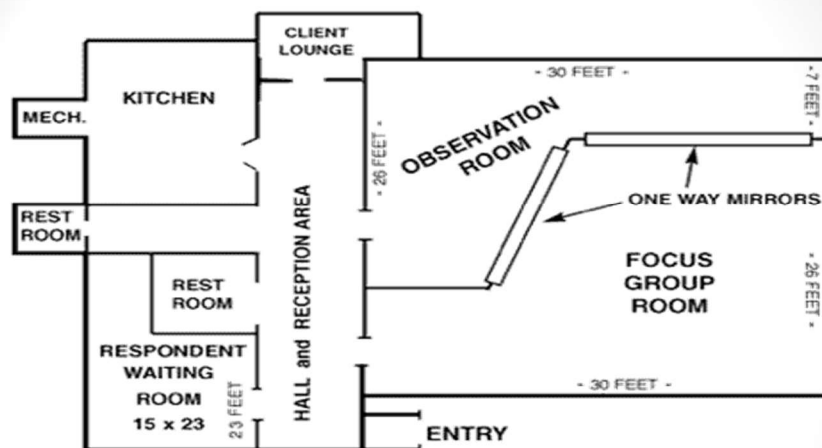
A Focus Group



Characteristics of Focus Groups

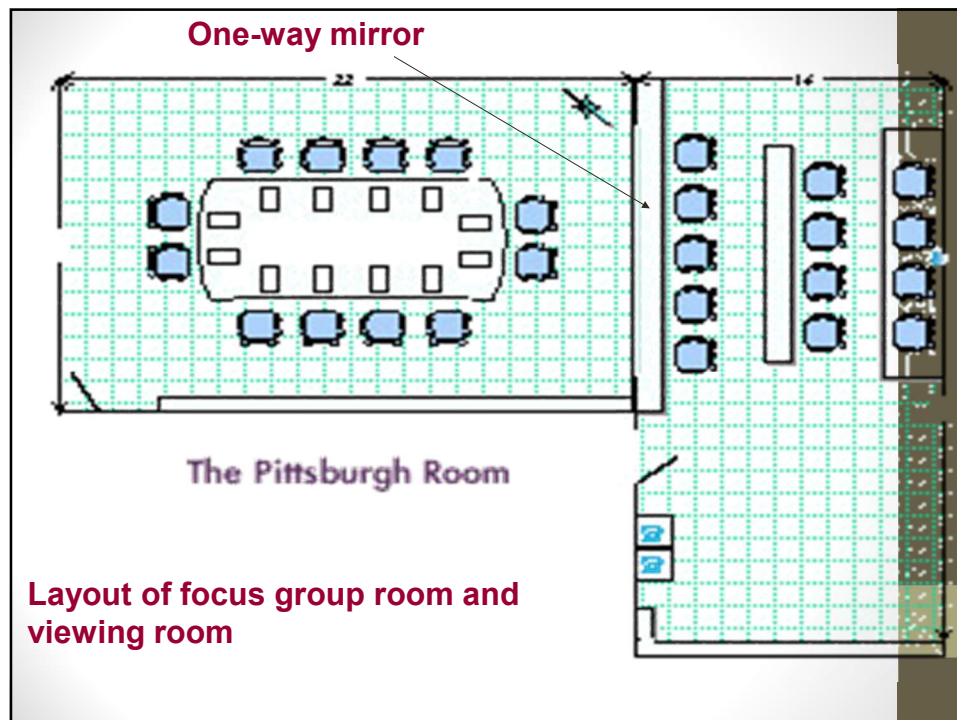
Group Size	8-12
Group Composition	Homogeneous, respondents, prescreened
Physical Setting	Relaxed, informal atmosphere
Time Duration	1-3 hours
Recording	Use of audiocassettes and videotapes
Moderator	Observational, interpersonal, and communication skills of the moderator

BALTIMORE RESEARCH SUITE #140



Baltimore Research: Facility Overview.

Source http://www.baltimoreresearch.com/marketing_research_facility.php?sPage=Facility



Viewing room looking into the focus group room through one-way mirror



Source: www.campos.com/focusgs.htm

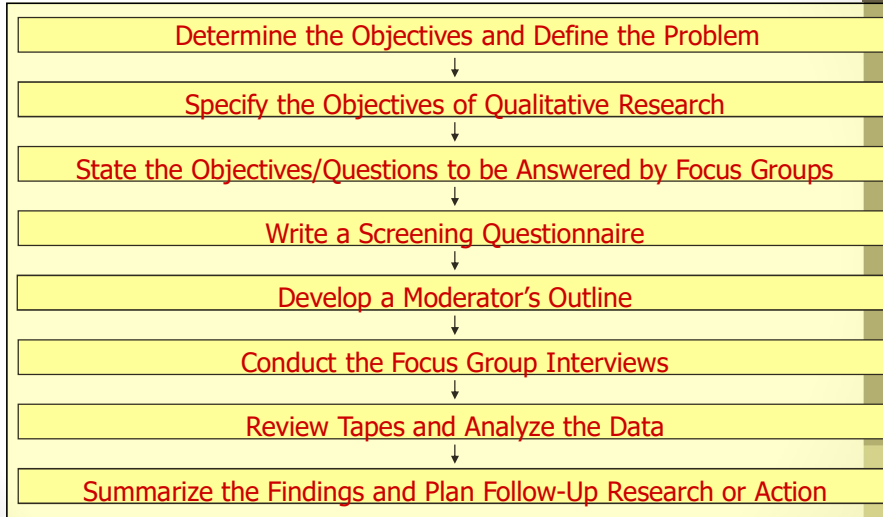
Key Qualifications of Focus Group Moderators

1. **Kindness with firmness:** The moderator must combine a disciplined detachment with understanding empathy so as to generate the necessary interaction.
2. **Permissiveness:** The moderator must be permissive yet alert to signs that the group's cordiality or purpose is disintegrating.
3. **Involvement:** The moderator must encourage and stimulate intense personal involvement.
4. **Incomplete understanding:** The moderator must encourage respondents to be more specific about generalized comments by exhibiting incomplete understanding.

Key Qualifications of Focus Group Moderators

5. **Encouragement:** The moderator must encourage unresponsive members to participate.
6. **Flexibility:** The moderator must be able to improvise and alter the planned outline amid the distractions of the group process.
7. **Sensitivity:** The moderator must be sensitive enough to guide the group discussion at an intellectual as well as emotional level.

Procedure for Planning and Conducting Focus Groups



Variations in Focus Groups

- **Two-way focus group.** This allows one target group to listen to and learn from a related group. For example, a focus group of physicians viewed a focus group of arthritis patients discussing the treatment they desired.
- **Dual-moderator group.** A focus group conducted by two moderators: One moderator is responsible for the smooth flow of the session, and the other ensures that specific issues are discussed.
- **Dueling-moderator group.** There are two moderators, but they deliberately take opposite positions on the issues to be discussed.

Variations in Focus Groups

- **Respondent-moderator group.** The moderator asks selected participants to play the role of moderator temporarily to improve group dynamics.
- **Client-participant groups.** Client personnel are identified and made part of the discussion group.
- **Mini groups.** These groups consist of a moderator and only 4 or 5 respondents.
- **Telesession groups.** Focus group sessions by phone using the conference call technique.
- **Online focus groups.** Focus groups conducted online over the Internet.

Advantages of Focus Groups

1. Synergism
2. Snowballing
3. Stimulation
4. Security
5. Spontaneity
6. Serendipity
7. Specialization
8. Scientific scrutiny
9. Structure
10. Speed

Disadvantages of Focus Groups

1. Misuse
2. Misjudge
3. Moderation
4. Messy
5. Misrepresentation

Online Versus Traditional Focus Groups

Characteristic	Online Focus Groups	Traditional Focus Groups
Group size	4-6	8-12
Group composition	Anywhere in the world	Drawn from the local area
Time duration	1-1.5 hours	1-3 hours
Physical setting	Researcher has little control	Under the control of the researcher
Respondent identity	Difficult to verify	Can be easily verified
Respondent attentiveness	Respondents can engage in other tasks	Attentiveness can be monitored

Online Versus Traditional Focus Groups (cont.)

Respondent recruiting	Easier. Can be recruited online, e-mail, panel, or by traditional means	Recruited by traditional means (telephone, mail, mail panel)
Group dynamics	Limited	Synergistic, snowballing (bandwagon) effect
Openness of respondents	Respondents are more candid due to lack of face-to-face contact	Respondents are candid, except for sensitive topics
Nonverbal communication	Body language cannot be observed. Emotions expressed by using symbols	Body language and emotions observed
Use of physical stimuli	Limited to those that can be displayed on the Internet	A variety of stimuli (products, advertising demonstrations, etc.) can be used

Online Versus Traditional Focus Groups

Table 5.3, cont.

Transcripts	Available immediately	Time consuming and expensive to obtain
Observers' communication with moderator	Observers can communicate with the moderator on a split-screen	Observers can manually send notes to the focus group room
Unique moderator skills	Typing, computer usage, familiarity with chat room slang	Observational
Turnaround time	Can be set up and completed in a few days	Takes many days for setup and completion
Client travel costs	None	Can be expensive
Client Involvement	Limited	High
Basic focus group costs	Much less expensive	More expensive: facility rental, food, taping, transcript preparation

Advantages of Online Focus Groups

- Geographical constraints are removed and time constraints are lessened.
- Unique opportunity to re-contact group participants at a later date.
- Can recruit people not interested in traditional focus groups: doctors, lawyers, etc.
- Moderators can carry on side conversations with individual respondents.
- There is no travel, videotaping, or facilities to arrange so the cost is much lower.

Disadvantages of Online Focus Groups

- Only people that have access to the Internet can participate.
- Verifying that a respondent is a member of a target group is difficult.
- There is lack of general control over the respondent's environment.
- Only audio and visual stimuli can be tested. Products can not be touched (e.g., clothing) or smelled (e.g., perfumes).

Focus Groups Versus Depth Interviews

Characteristic	Focus Groups	Depth Interviews
Group synergy and dynamics	+	-
Peer pressure/group influence	-	+
Client involvement	+	-
Generation of innovative ideas	+	-
In-depth probing of individuals	-	+
Uncovering hidden motives	-	+
Discussion of sensitive topics	-	+

Focus Groups Versus Depth Interviews

Characteristic	Focus Groups	Depth Interviews
Interviewing competitors	-	+
Interviewing professional respondents	-	+
Scheduling of respondents	-	+
Amount of information	+	-
Bias in moderation and interpretation	+	-
Cost per respondent	+	-
Time (interviewing & analysis)	+	-

Note: A + indicates a relative advantage over the other procedure, a - indicates a relative disadvantage.

Definition of Projective Techniques

- An unstructured, indirect form of questioning that encourages respondents to project their underlying motivations, beliefs, attitudes or feelings regarding the issues of concern.
- In projective techniques, respondents are asked to interpret the behavior of others.
- In interpreting the behavior of others, respondents indirectly project their own motivations, beliefs, attitudes, or feelings into the situation.

A stimulus in the Rorschach Test, the first projective test



A stimulus in the Thematic Apperception Test (TAT), which has inspired most recent applications of the projective technique in marketing



Word Association

In **word association**, respondents are presented with a list of words, one at a time, and asked to respond to each with the first word that comes to mind. The words of interest, called test words, are interspersed throughout the list which also contains some neutral, or filler words to disguise the purpose of the study. Responses are analyzed by calculating:

- (1) the frequency with which any word is given as a response;
- (2) the amount of time that elapses before a response is given; and
- (3) the number of respondents who do not respond at all to a test word within a reasonable period of time.

Word Association

EXAMPLE

STIMULUS

washday
fresh
pure
scrub
filth
bubbles

family
towels

MRS. M

everyday
and sweet
air
don't; husband does
this neighborhood
bath

squabbles
dirty

MRS. C

ironing
clean
soiled
clean
dirt
soap and
water
children
wash

Completion Techniques

In **sentence completion**, respondents are given incomplete sentences and asked to complete them. Generally, they are asked to use the first word or phrase that comes to mind.

A person who shops at Sears is _____

A person who receives a gift certificate good for Sak's Fifth Avenue would be

J. C. Penney is most liked by _____

When I think of shopping in a department store, I _____

A variation of sentence completion is paragraph completion, in which the respondent completes a paragraph beginning with the stimulus phrase.

Completion Techniques

In **story completion**, respondents are given part of a story – enough to direct attention to a particular topic but not to hint at the ending. They are required to give the conclusion in their own words.

Construction Techniques

With a **picture response**, the respondents are asked to describe a series of pictures of ordinary as well as unusual events. The respondent's interpretation of the pictures gives indications of that individual's personality.

In **cartoon tests**, cartoon characters are shown in a specific situation related to the problem. The respondents are asked to indicate what one cartoon character might say in response to the comments of another character. Cartoon tests are simpler to administer and analyze than picture response techniques.

A Cartoon Test



Expressive Techniques

In **expressive techniques**, respondents are presented with a verbal or visual situation and asked to relate the feelings and attitudes of other people to the situation.

Role playing. Respondents are asked to play the role or assume the behavior of someone else.

Third-person technique. The respondent is presented with a verbal or visual situation and the respondent is asked to relate the beliefs and attitudes of a third person rather than directly expressing personal beliefs and attitudes. This third person may be a friend, neighbor, colleague, or a "typical" person.

Advantages of Projective Techniques

- They may elicit responses that subjects would be unwilling or unable to give if they knew the purpose of the study.
- Helpful when the issues to be addressed are personal, sensitive, or subject to strong social norms.
- Helpful when underlying motivations, beliefs, and attitudes are operating at a subconscious level.

Disadvantages of Projective Techniques

- Suffer from many of the disadvantages of unstructured direct techniques, but to a greater extent.
- Require highly-trained interviewers.
- Skilled interpreters are also required to analyze the responses.
- There is a serious risk of interpretation bias.
- They tend to be expensive.
- May require respondents to engage in unusual behavior.

Guidelines for Using Projective Techniques

- Projective techniques should be used because the required information cannot be accurately obtained by direct methods.
- Projective techniques should be used for exploratory research to gain initial insights and understanding.
- Given their complexity, projective techniques should not be used naively.

Comparison of Focus Groups, Depth Interviews, and Projective Techniques

Criteria	Focus Groups	Depth Interviews	Projective Techniques
1. Degree of Structure	Relatively high	Relatively medium	Relatively low
2. Probing of individual respondents	Low	High	Medium
3. Moderator bias	Relatively medium	Relatively high	Low to high
4. Interpretation bias	Relatively low	Relatively medium	Relatively high
5. Uncovering subconscious information	Low	Medium to high	High
6. Discovering innovative information	High	Medium	Low
7. Obtaining sensitive information	Low	Medium	High
8. Involve unusual behavior or questioning	No	To a limited extent	Yes
9. Overall usefulness	Highly useful	Useful	Somewhat useful

Analysis of Qualitative Data

- 1) **Data reduction** – Select which aspects of the data are to be emphasized, minimized, or set aside for the project at hand.
- 2) **Data display** – Develop a visual interpretation of the data with the use of such tools as a diagram, chart, or matrix. The display helps to illuminate patterns and interrelationships in the data.
- 3) **Conclusion drawing and verification** – Consider the meaning of analyzed data and assess its implications for the research question at hand.

Respondent:	(a) Past Communications	(b) Most Effective	(c) Why
A	- E-mail - Informal interchanges - Telephone	E-mail	News is communicated in almost “real time”
B	- E-mail - Student newspaper - Campus web page	- E-mail - Campus web page	Easy to keep a record of the news for future reference
C	- Informal interchanges - Telephone - Campus mail	Campus mail	- Work on campus - Do not have Internet access at home

Content Analysis

- Analyze a written or spoken record
- Archival sources
- Similar to observational approach
 - Define categories
 - Quantifying behavior

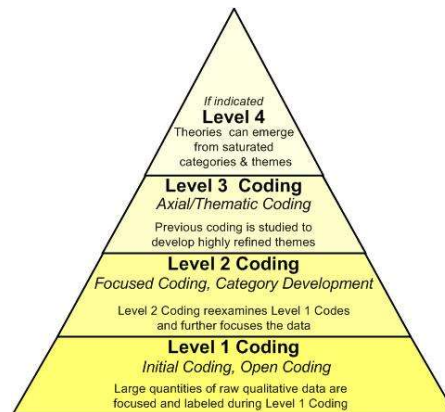
(55)

Major Issues

- Procedure
 - Test administrator's skills
 - Influences of implicit cues
- Data-coding paradigm for content analysis
 - Use a well-defined coding method, or
 - Let substantive codes emerge from the data (grounded theory)

Grounded Theory

- A systematic method that discovers theories by analyzing the data



<http://qrtps.com/faq/Coding%20Level%20Pyramid.jpg>

International Marketing/Management Research

- Qualitative research is crucial
- The moderator should be familiar with the language, culture, and patterns of social interaction
- Nonverbal cues (voice intonations, inflections, gestures) are important
- The size of the focus group could vary across cultures
- Focus groups may not be appropriate in some cultures

International Marketing/Management Research

- Equivalence of meaning of stimuli across cultures should be established.
- Line drawings subject to fewer problems of interpretation than photographs.

Limitations of Qualitative Research

- Limitations:
 - Interpreter bias
 - Low reliability
 - Lack of generalizability (low internal and/or external validity)
- Because of these limitations, it is not safe for a researcher to rely solely on qualitative research. Therefore, qualitative research is often used for exploratory purposes.

QUANTITATIVE RESEARCH METHODS

Features of quantitative research

- Hypothesis-testing approach
- Known response categories (e.g., 5-point Likert scale)
- Record only those responses that fall into one or another of the known response categories

Advantages of quantitative research

- Allow the researcher to quantify respondents' responses
- Allow the researcher to record in large quantity, that is, large sample size

Types of Quantitative Research

- Observation
 - Refers literally to observing overt, nonverbal behavior.
- Survey
 - A way of communication between the researcher and the respondent. In a survey, the researcher asks the respondent a number of questions, and the respondent answers these questions by choosing one answer from several options.
- Experiment
 - A data-collection method specially designed for confirming causal effects.

DESCRIPTIVE RESEARCH METHODS

Descriptive Research Methods

- Observation
- Case Study
- Survey

Naturalistic Observation

- A descriptive method of gathering data that involves the systematic notation of an animal's behaviors and their frequency
- Ethology
 - The study of naturally occurring behavior, which often takes place in the wild
- Ethogram
 - An inventory of behaviors performed by one species of animal
- Interobserver reliability
 - Refers to the degree of consistency in the categorization of behavior across observers, as indicated by a correlation coefficient

Example

Table 1
Definitions and Examples of Coding Categories for Maternal Responsive Actions

Modality of maternal response	Definition and examples
Vocal/verbal	The first utterance with or without lexical content, such as a vocal sound (e.g., a laugh or "goo"), a word (e.g., "Yes."), a phrase (e.g., "Good girl."), or a sentence (e.g., "You are funny!") vocalized by the mother
Nonverbal	
Facial expression	The mother displayed a smile (i.e., facial movement involving the action of the zygomatic major around the mouth) or a mock surprised face (i.e., raised eyebrows, widened eyes, and mouth open with a jaw drop).
Touch	Maternal touch actions mediating sensations through the receptors of temperature and/or equilibrium were identified, including vestibular actions (e.g., rocking and bouncing), kinesthetic movements (e.g., bicycling exercise of infant's legs and "so big" movements with arms), and tactile contacts (e.g., caressing, massaging, and tickling).
Head movements	Exaggerated head bobbing, shaking, and/or nodding.

http://psycnet.apa.org/journals/dev/39/6/images/dev_39_6_976_tbl1a.gif

Example

- **The bystander effect (3:36)**
 - <http://www.youtube.com/watch?v=OSsPfbup0ac>
 - Indeed, this is an experiment using observation to measure the dependent variable

Observational Studies: Developing Behavioral Categories

- Example: Do blondes have more fun?
- Define and develop system of observation
 - Blond
 - Fun

- Interrater reliability



$N = 2$

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The Complexity of Observation



Systematic
Recording
Amid Chaos

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Observational Study: Aggression in Boys vs Girls

- Location - School
 - Playground
 - In classroom
 - Cafeteria
- Operationalize
 - Relational aggression
 - Physical aggression



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Observational Studies: Who to watch

- Focal Sampling
 - Select subject
 - Observe behavior for given period (e.g., 30 seconds)
 - Shift subjects and repeat
- Scan Sampling
 - Select one behavior
 - Record all instances
 - Repeat after selected time interval



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Observational Studies: When to watch

- Situation Sampling
 - Include different settings (e.g., lunch, classroom, playground)
- Time Sampling
 - How frequent (e.g., once a week, month, etc.)
 - When (times of day)



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Observational Studies: What to look for

- Frequency Method
 - Frequency within time period
- Duration Method
 - Length of behavior
- Intervals Method
 - Does behavior occur?



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Observation Methods

Structured Versus Unstructured Observation

- For **structured observation**, the researcher specifies in detail what is to be observed and how the measurements are to be recorded, e.g., an auditor performing inventory analysis in a store.
- In **unstructured observation**, the observer monitors all aspects of the phenomenon that seem relevant to the problem at hand, e.g., observing children playing with new toys.

Observation Methods

Disguised Versus Undisguised Observation

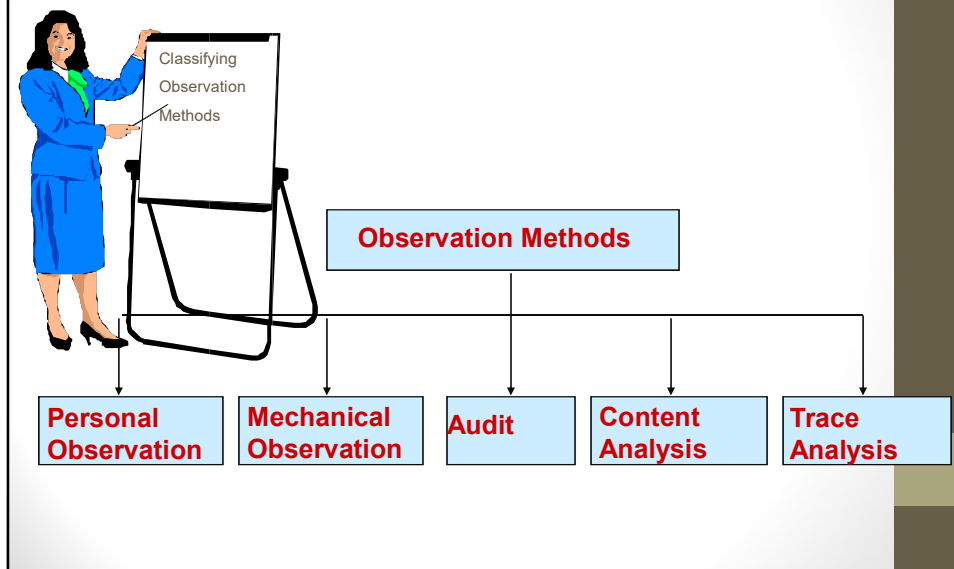
- In **disguised observation**, the respondents are unaware that they are being observed. Disguise may be accomplished by using one-way mirrors, hidden cameras, or inconspicuous mechanical devices. Observers may be disguised as shoppers or sales clerks.
- In **undisguised observation**, the respondents are aware that they are under observation.

Observation Methods

Natural Versus Contrived Observation

- **Natural observation** involves observing behavior as it takes place in the environment. For example, one could observe the behavior of respondents eating fast food at Burger King.
- In **contrived observation**, respondents' behavior is observed in an artificial environment, such as a test kitchen.

A Classification of Observation Methods



Observation Methods: Personal Observation

- A researcher observes actual behavior as it occurs.
- The observer does not attempt to manipulate the phenomenon being observed but merely records what takes place.
- For example, a researcher might record traffic counts and observe traffic flows in a department store.

Observation Methods: Mechanical Observation

Do not require respondents' direct participation.

- The AC Nielsen audimeter
- Turnstiles that record the number of people entering or leaving a building.
- On-site cameras (still, motion picture, or video)
- Optical scanners in supermarkets

Do require respondent involvement.

- Eye-tracking monitors
- Pupilometers
- Psychogalvanometers
- Voice pitch analyzers
- Devices measuring response latency

Observation Methods: Audit

- The researcher collects data by examining physical records or performing inventory analysis.
- Data are collected personally by the researcher.
- The data are based upon counts, usually of physical objects.
- Retail and wholesale audits conducted by marketing research suppliers were discussed in the context of syndicated data in Chapter 4.

Observation Methods: Content Analysis

- The objective, systematic, and quantitative description of the manifest content of a communication.
- The unit of analysis may be words, characters (individuals or objects), themes (propositions), space and time measures (length or duration of the message), or topics (subject of the message).
- Analytical categories for classifying the units are developed and the communication is broken down according to prescribed rules.

Observation Methods: Trace Analysis

Data collection is based on physical traces, or evidence, of past behavior.

- The selective erosion of tiles in a museum indexed by the replacement rate was used to determine the relative popularity of exhibits.
- The number of different fingerprints on a page was used to gauge the readership of various advertisements in a magazine.
- The position of the radio dials in cars brought in for service was used to estimate share of listening audience of various radio stations.
- The age and condition of cars in a parking lot were used to assess the affluence of customers.
- The magazines people donated to charity were used to determine people's favorite magazines.
- Internet visitors leave traces which can be analyzed to examine browsing and usage behavior by using cookies.

A Comparative Evaluation of Observation Methods

Criteria	Personal Observation	Mechanical Observation	Audit Analysis	Content Analysis	Trace Analysis
Degree of structure	Low	Low to high	High	High	Medium
Degree of disguise	Medium	Low to high	Low	High	High
Ability to observe in natural setting	High	Low to high	High	Medium	Low
Observation bias	High	Low	Low	Medium	Medium
Analysis bias	High	Low to Medium	Low	Low	Medium
General remarks	Most flexible	Can be intrusive	Expensive	Limited to communications	Method of last resort



Relative Advantages of Observation

- They permit measurement of actual behavior rather than reports of intended or preferred behavior.
- There is no reporting bias, and potential bias caused by the interviewer and the interviewing process is eliminated or reduced.
- Certain types of data can be collected only by observation.
- If the observed phenomenon occurs frequently or is of short duration, observational methods may be cheaper and faster than survey methods.

Relative Disadvantages of Observation

- The reasons for the observed behavior may not be determined since little is known about the underlying motives, beliefs, attitudes, and preferences.
- Selective perception (bias in the researcher's perception) can bias the data.
- Observational data are often time-consuming and expensive, and it is difficult to observe certain forms of behavior.
- In some cases, the use of observational methods may be unethical, as in observing people without their knowledge or consent.

It is best to view observation as a complement to survey methods, rather than as being in competition with them.

Case Study

- A detailed examination of the behavior of one individual (or, alternatively, a small number of individuals)
- Effective when the topic of interest is either rare or idiosyncratic

Case Studies

Example: Phineas Gage



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Phineas Gage

The equilibrium or balance, so to speak, between his intellectual faculties and animal propensities, seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom A child in his intellectual capacity and manifestations, he has the animal passions of a strong man. Previous to his injury, although untrained in the schools, he possessed a well-balanced mind, and was looked upon by those who knew him as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation. In this regard his mind was radically changed, so decidedly that his friends and acquaintances said he was "no longer Gage."

Harlow, John Martyn (1868)

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Case Studies

Example: Li Ka Shing



- What can we learn from him?

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Case Studies - Advantages

- Flexibility
- In depth view
- Develop hypotheses
 - Causes of disorders
 - Success stories – what works?
- Provide external validity

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Case Studies - Disadvantages

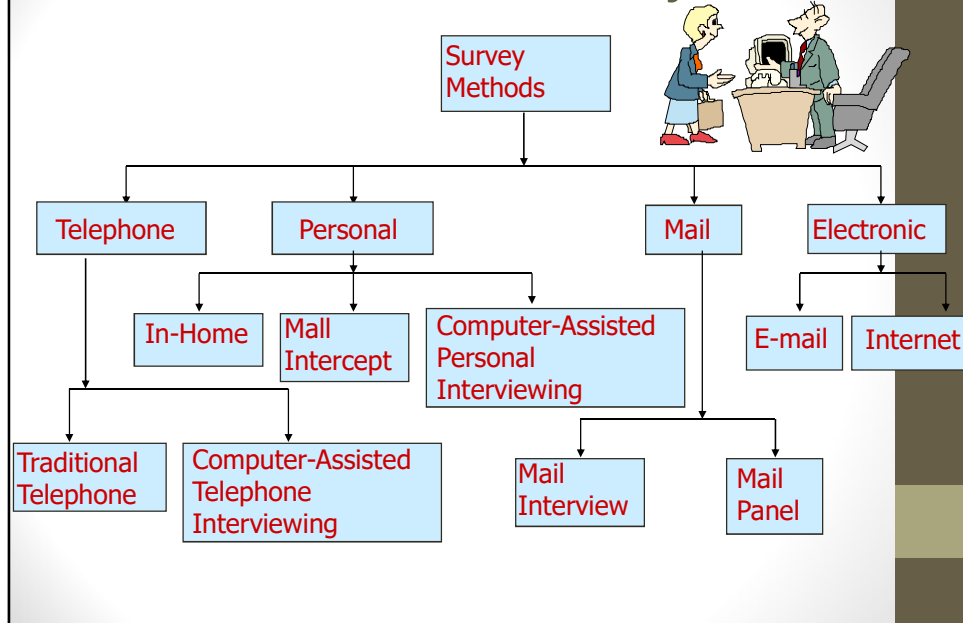
- Can't draw causal conclusions
- Lack of generalizability
- Potential for observer bias
 - Harlow's bias re: Phineas Gage

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Survey

- A way of communication between the researcher and the respondent. The researcher asks the respondent a number of questions, and the respondent answers these questions by choosing one answer from several options.
- Needs representative samples
 - Random sample: each member of a population has an equal likelihood of being selected for participation

A Classification of Survey Method



Some Decisions Related to the Mail Interview Package

Outgoing Envelope

Outgoing envelope Size, color, return address

Postage Method of addressing

Cover Letter

Sponsorship

Personalization

Type of appeal

Signature

Postscript

Questionnaire

Length

Size

Layout

Format

Content

Reproduction

Color

Respondent anonymity

Return Envelope

Type of envelope Postage

Incentives

Monetary versus non-monetary

Prepaid versus promised amount



Sample Mailing Lists

List Title	Number on List	Price
Advertising agencies	3892	\$45/M
Banks, branches	11089	\$85/M
Boat owners	4289601	\$50/M
Chambers of Commerce	6559	\$45/M
Personal computer owners	2218672	Inquire
Families	76000000	Inquire
Hardware wholesalers	7378	\$45/M
Magazines, consumers	4119	\$45/M
Photographic, portrait	33742	\$45/M
Sales executives	190002	\$55/M
Wives of professional men	1663614	\$60/M
YMCA's	1036	\$85

* Price shown is per 1000 names (/M), except where noted.



Criteria for Evaluating Survey Methods

TASK FACTORS

Diversity of Questions and Flexibility of Data Collection

- The flexibility of data collection is determined primarily by the extent to which the respondent can interact with the interviewer and the survey questionnaire. The diversity of questions that can be asked in a survey depends upon the degree of interaction the respondent has with the interviewer and the questionnaire, as well as the ability to actually see the questions.

Use of Physical Stimuli

- The ability to use physical stimuli such as the product, a product prototype, commercials, or promotional displays during the interview.

Criteria for Evaluating Survey Methods

Sample Control

- Sample control is the ability of the survey mode to reach the units specified in the sample effectively and efficiently.

Quantity of Data

- The ability to collect large amounts of data.

Response Rate

- Survey response rate is broadly defined as the percentage of the total attempted interviews that are completed.

Random Digit Directory Designs

Adding a Constant to the Last Digit

An integer between 1 and 9 is added to the telephone number selected from the directory. In plus-one sampling, the number added to the last digit is 1.

Number selected from directory: 404-953-3004 (exchange-block). Add one to the last digit to form 404-953-3005. This is the number to be included in the sample.



Randomizing the r Last Digits

Replace the r ($r = 2, 3, \text{ or } 4$) last digits with an equal number of randomly selected digits.

Number selected from directory: 404-881-1124. Replace the last four digits of the block with randomly selected numbers 5, 2, 8, and 6 to form 404-881-5286.

Random Digit Directory Designs

Two-Stage Procedure

The first stage consists of selecting an exchange and telephone number from the directory. In the second stage, the last three digits of the selected number are replaced with a three-digit random number between 000 and 999.



Cluster 1

Selected exchange: 636

Selected number: 404-636-3230

Replace the last three digits (230) with randomly selected 389 to form 404-636-3389.

Repeat this process until the desired number of telephone numbers from this cluster is obtained.

Criteria for Evaluating Survey Methods

SITUATIONAL FACTORS

Control of the Data Collection Environment

- The degree of control a researcher has over the environment in which the respondent answers the questionnaire.

Control of Field Force

- The ability to control the interviewers and supervisors involved in data collection.

Criteria for Evaluating Survey Methods

Potential for Interviewer Bias

- The extent of the interviewer's role determines the potential for bias.

Speed

- The total time taken for administering the survey to the entire sample.

Cost

- The total cost of administering the survey and collecting the data.

Criteria for Evaluating Survey Methods

RESPONDENT FACTORS

Perceived Anonymity

- Perceived anonymity refers to the respondents' perceptions that their identities will not be discerned by the interviewer or the researcher.

Social Desirability/Sensitive Information

- Social desirability is the tendency of the respondents to give answers that are socially acceptable, whether or not they are true. With some exceptions, obtaining sensitive information is inversely related to social desirability.

Criteria for Evaluating Survey Methods

Low Incidence Rate

- Incidence rate refers to rate of occurrence of persons eligible to participate in the study.

Respondent Control

- Methods that allow respondents control over the interviewing process will solicit greater cooperation and are therefore desirable.

A Comparative Evaluation of Survey Methods

Criteria	Telephone/ CATI	In-Home Interviews	Mall Intercept Interviews	CAPI	Mail Surveys	Mail Panels	E-Mail	Internet
TASK FACTORS								
Diversity of questions and flexibility	Low to moderate	High	High	Moderate to high	Moderate	Moderate	Moderate	Moderate to high
Use of physical stimuli	Low	Moderate to high	High	High	Moderate	Moderate	Low	Moderate
Sample Control	Moderate to high	Potentially high	Moderate	Moderate	Low	Moderate to high	Low	Low to moderate
Quantity of data	Low	High	Moderate	Moderate	Moderate	High	Moderate	Moderate
Response rate	Moderate	High	High	High	Low	High	Low	Very low

A Comparative Evaluation of Survey Methods								
Criteria	Telephone CATI	In-Home Interviews	Mall- Intercept Interviews	CAPI	Mail Surveys	Mail Panels	E-Mail	Internet
SITUATIONAL FACTORS								
Control of data collection environment	Moderate	Moderate to high	High	High	Low	Low	Low	Low
Control of field force	Moderate	Low	Moderate	Moderate	High	High	High	High
Potential for interviewer bias	Moderate	High	High	Low	None	None	None	None
Speed	High	Moderate	Moderate to high	Moderate to high	Low	Low to moderate	High	Very high
Cost	Moderate	High	Moderate to high	Moderate to high	Low	Low to moderate	Low	Low

A Comparative Evaluation of Survey Methods								
Criteria	Telephone / CATI	In-Home Interviews	Mall- Intercept Interviews	CAPI	Mail Surveys	Mail Panels	E-Mail	Internet
RESPONDENT FACTORS								
Perceived anonymity of the respondent	Moderate	Low	Low	Low	High	High	Moderate	High
Social desirability	Moderate	High	High	Moderate to High	Low	Low	Moderate	Low
Obtaining sensitive information	High	Low	Low	Low to moderate	High	Moderate to high	Moderate	High
Low incidence rate	High	Low	Low	Low	Moderate	Moderate	Moderate	High
Respondent control	Low to moderate	Low	Low	Low	High	High	High	Moderate to high

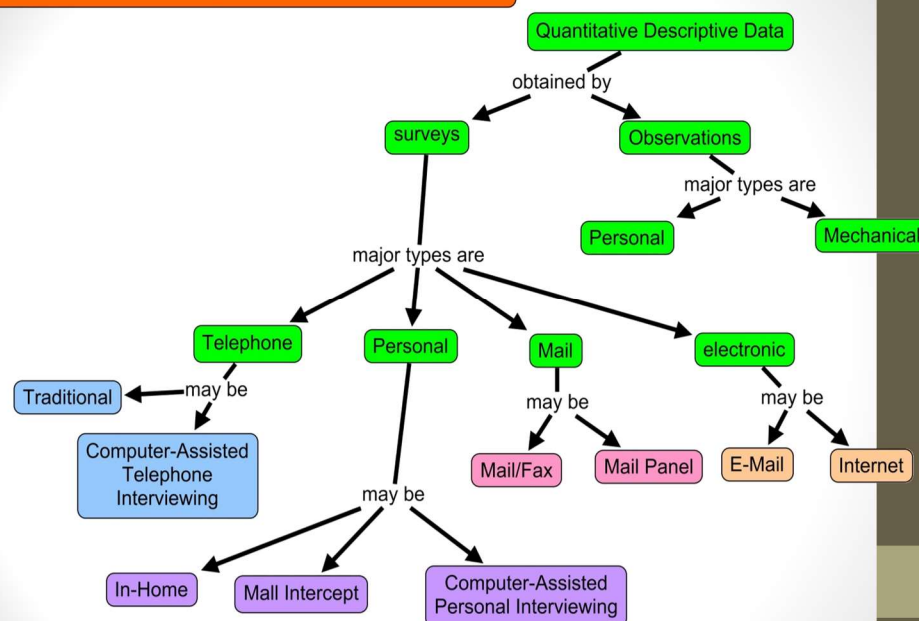
A Comparative Evaluation of Survey Methods for International Marketing Research

Criteria	Telephone	Personal	Mail	Electronic
High sample control	+	+	-	-
Difficulty in locating respondents at home	+	-	+	+
Inaccessibility of homes	+	-	+	+
Unavailability of a large pool of trained interviewers	+	-	+	+
Large population in rural areas	-	+	-	-
Unavailability of maps	+	-	+	+
Unavailability of current telephone directory	-	+	-	+
Unavailability of mailing lists	+	+	-	+
Low penetration of telephones	-	+	+	-
Lack of an efficient postal system	+	+	-	+
Low level of literacy	-	+	-	-
Face-to-face communication culture	-	+	-	-
Poor access to computers & Internet	?	+	?	-

Note: A (+) denotes an advantage, and a (-) denotes a disadvantage.



Figure 6.4 A Concept Map for Quantitative Descriptive Data



Advantages of Descriptive Research

- Extremely useful in an early stage of research
 - Provides an organized database of behaviors for subsequent, more highly controlled research
- Flexibility
 - Can be inexpensive, convenient, and relatively easy to do
- High ecological validity
 - refers to the degree to which the research setting reflects the critical characteristics of the corresponding situation in the real world, which will impact whether or not research results can effectively be argued to generalize

Limitations in Descriptive Research

- Does not provide an answer to a research question involving a causal effect
- Does not allow reproducibility (case study)
- Should be strictly descriptive rather than interpretive
- Suffers from participant reactivity

Reactivity

- Generally refers to the ways in which a participant could respond to the research setting that could influence, and potentially confound, results (also see *demand characteristics*)
- Naturalistic observation
 - Unobtrusive observations
 - Participant observations
 - Unobtrusive measures

Reactivity (cont.)

- Case Studies
 - Retrospective
 - Forgetting
 - Motivated forgetting
 - The active process of distorting memories to match one's current beliefs
- Surveys, interviews, and tests
 - Response style or response set
 - Response acquiescence
 - Response deviation
 - Social desirability
 - Force-choice test
 - Reduce social desirability
 - Volunteer problem

CORRELATIONAL RESEARCH METHODS

Nature of Correlational Research

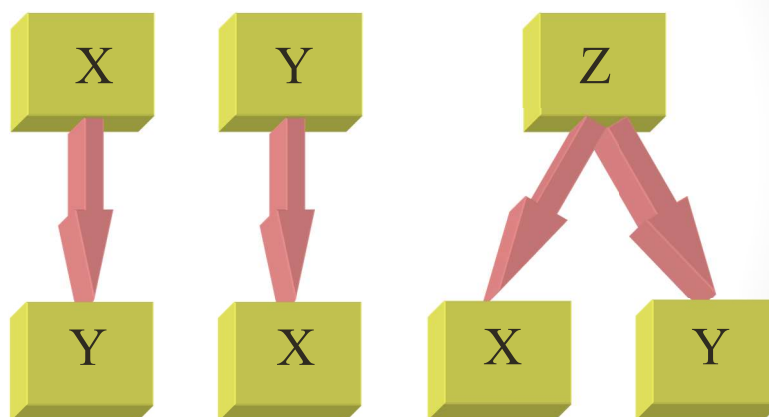
- Types of correlational research
 - Observation
 - Survey
- How variables co-vary

Correlation

- The extent to which two variables co-vary
- Correlation coefficient (r)
 - -1
 - 0
 - 1

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When X & Y are Correlated



EXPERIMENTAL RESEARCH METHODS

Causal Research

- To understand which variables are the cause (independent variables) and which variables are the effect (dependent variables) of a phenomenon
- To determine the nature of the relationship between the causal variables and the effect to be predicted
- METHOD: Experiments

Concept of Causality

A statement such as "X causes Y" will have the following meaning to an ordinary person and to a scientist.

<u>Ordinary Meaning</u>	<u>Scientific Meaning</u>
X is the only cause of Y.	X is only one of a number of possible causes of Y.
X must always lead to Y (X is a deterministic cause of Y).	The occurrence of X makes the occurrence of Y more probable (X is a probabilistic cause of Y).
It is possible to prove that X is a cause of Y.	We can never prove that X is a cause of Y. At best, we can infer that X is a cause of Y.

Conditions for Causality

- **Concomitant variation** is the extent to which a cause, X, and an effect, Y, occur together or vary together in the way predicted by the hypothesis under consideration.
- The **time order of occurrence** condition states that the causing event must occur either before or simultaneously with the effect; it cannot occur afterwards.
- The **absence of other possible causal factors** means that the factor or variable being investigated should be the only possible causal explanation.

Definitions and Concepts

- **Independent variables** are variables or alternatives that are manipulated and whose effects are measured and compared, e.g., price levels.
- **Test units** are individuals, organizations, or other entities whose response to the independent variables or treatments is being examined, e.g., consumers or stores.
- **Dependent variables** are the variables which measure the effect of the independent variables on the test units, e.g., sales, profits, and market shares.
- **Extraneous variables** are all variables other than the independent variables that affect the response of the test units, e.g., store size, store location, and competitive effort.

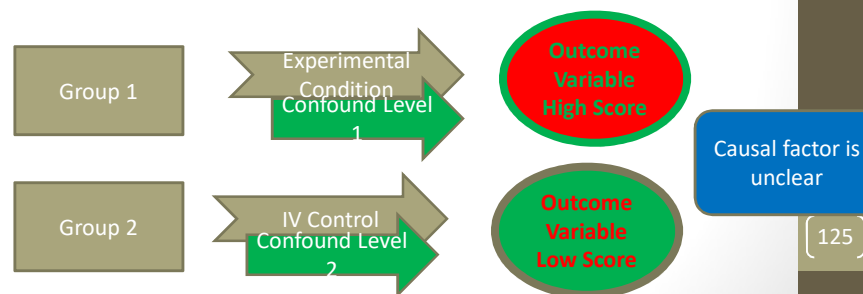
Experimental Design

An **experimental design** is a set of procedures specifying:

- the test units and how these units are to be divided into homogeneous subsamples,
- what independent variables or treatments are to be manipulated,
- what dependent variables are to be measured; and
- how the extraneous variables are to be controlled.

Confounding factors

- Differences between groups other than the IV
 - Interpreting Results?
 - Cause = IV? Or Cause = Confound



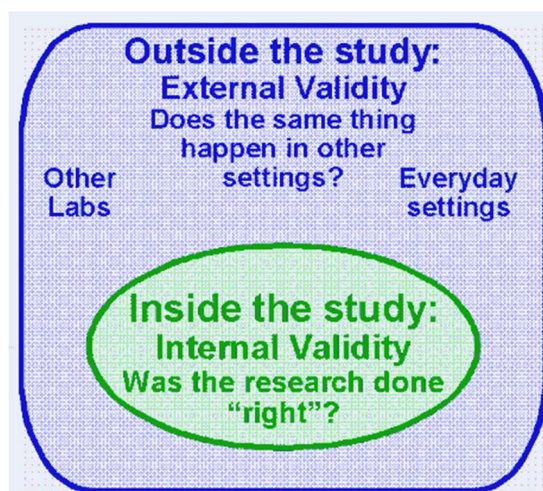
Experiment

- True Experiment
 - Manipulating Independent Variables (IVs)
 - Controlling or measuring extraneous variables (confounding variables)
 - Measuring Dependent Variable (DV)
- The logic
 - The change in the DV can only be attributed to the changes in the IVs and nothing else

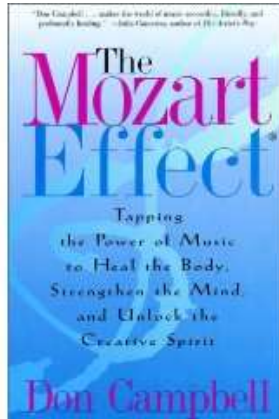
Validity in Experimentation

- **Internal validity** refers to whether the manipulation of the independent variables or treatments actually caused the observed effects on the dependent variables. Control of extraneous variables is a necessary condition for establishing internal validity.
- **External validity** refers to whether the cause-and-effect relationships found in the experiment can be generalized. To what populations, settings, times, independent variables, and dependent variables can the results be projected?

Focus on External Validity



Overgeneralization: A problem of external validity



- **Improves test scores**
- **Cuts learning time**
- **Calms hyperactive children and adults**
- **Reduces errors**
- **Improves creativity and clarity**
- **Heals the body faster**
- **Integrates both sides of the brain for more efficient learning**
- **Raises IQ scores 9 points (research done at University of California, Irvine)**

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The Documented Mozart Effect

- Rauscher, Shaw, and Ky (1993)
- IV – music type
- DV – spatial-temporal reasoning performance (paper folding & cutting questions)
- Results – temporary 8 or 9 pt. increase

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Media and External Validity

- New York Times, Alex Cross, 1994
 - "... listening to Mozart actually makes you smarter"
- Don Campbell's book, 1997
- Political Impact
 - Zell Miller, Governor of GA, 1998
 - Proposed funding for all children to have CD's
 - "No one questions that listening to music at a very early age affects the spatial-temporal reasoning that underlies math and engineering and even chess."

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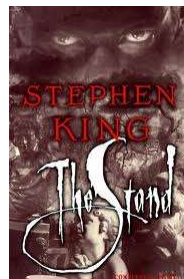
Challenges

- **Replication issues**
 - Meta-analysis – effect size decreases
- Limited music samples
- Limited task sample
- Limited population sample
- Limited time of effect
- Overgeneralization
 - Extent
 - Subject population

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Alternative explanations

- Positive Arousal
 - The Steven King argument



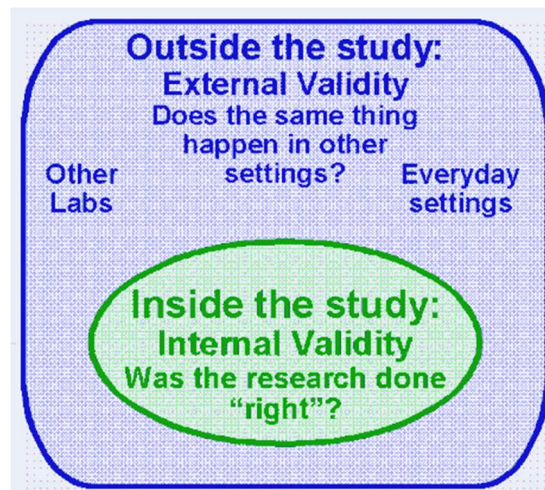
[133]

Rauscher's Response (1999)

- Our results on the effects of listening to Mozart's Sonata for Two Pianos in D Major K. 448 on spatial-temporal task performance have generated much interest but several misconceptions, many of which are reflected in attempts to replicate the research. The comments by Chabris and Steele et al. echo the most common of these: that listening to Mozart enhances intelligence. **We made no such claim.** The effect is limited to spatial-temporal tasks involving mental imagery and temporal ordering.

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Focus on internal validity



[135]

Threats to internal validity

Quasi experiments: lack control

- Independent variables
 - What is the treatment?
 - When does it start and end?
- Dependent variable
 - What is it?
- Extraneous environmental factors
- Participant characteristics
 - NO RANDOM ASSIGNMENT

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Threats to Internal Validity

- History (environmental change)
- Maturation (participant change)
- Testing (pretest-posttest)
- Instrumentation (changes in the instrument)
- Statistical Regression
- Attrition
- Selection (bias in selecting participants)
 - Selection X history, etc.

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Experimental Reliability: Replication

- Experimental reliability
 - The degree to which consistent results are obtained, or replicated, upon repetition of a study
- Replication
 - A term that is used to describe *experimental reliability*
 - The term refers to obtaining the same findings upon repetition of a test or experiment, or a study that seeks to obtain such findings

Current real life example

- Impact of social distancing measures on coronavirus
 - Natural experiment – different dates of implementation of social distancing
 - Define IV and DV
 - Identify threats to internal validity

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Extraneous Variables

- **History** refers to specific events that are external to the experiment but occur at the same time as the experiment.
- **Maturation (MA)** refers to changes in the test units themselves that occur with the passage of time.
- **Testing effects** are caused by the process of experimentation. Typically, these are the effects on the experiment of taking a measure on the dependent variable before and after the presentation of the treatment.
- The **main testing effect (MT)** occurs when a prior observation affects a latter observation.
 - Priming
 - Practice effect (learning)
 - Fatigue

Extraneous Variables

- In the **interactive testing effect** (IT), a prior measurement affects the test unit's response to the independent variable.
 - Demand artifact: Interactive effect between the pre-test and the treatment (e.g., respondent can predict the purpose of the experiment after receiving the pre-test measurement and the treatment)
- **Instrumentation** (I) refers to changes in the measuring instrument, in the observers, or in the scores themselves.
- **Statistical regression** effects (SR) occur when test units with extreme scores move closer to the average score during the course of the experiment.
- **Selection bias** (SB) refers to the improper assignment of test units to treatment conditions.
- **Mortality** (MO) refers to the loss of test units while the experiment is in progress.

Controlling Extraneous Variables

- **Randomization** refers to the random assignment of test units to experimental groups by using random numbers. Treatment conditions are also randomly assigned to experimental groups.
- **Matching** involves comparing test units on a set of key background variables before assigning them to the treatment conditions.
- **Statistical control** involves measuring the extraneous variables and adjusting for their effects through statistical analysis.
- **Design control** involves the use of experiments designed to control specific extraneous variables (e.g., yoked design)

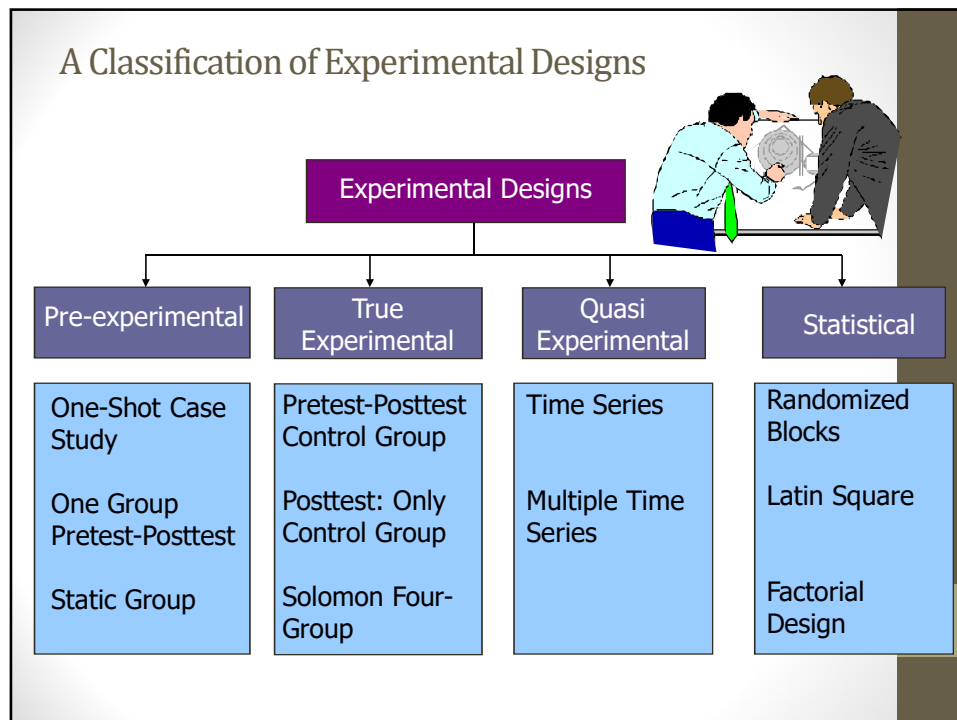
A Classification of Experimental Designs

- **Pre-experimental designs** do not employ randomization procedures to control for extraneous factors: the one-shot case study, the one-group pretest-posttest design, and the static-group.
- In **true experimental designs**, the researcher can randomly assign test units to experimental groups and treatments to experimental groups: the pretest-posttest control group design, the posttest-only control group design, and the Solomon four-group design.

A Classification of Experimental Designs

- **Quasi-experimental designs** result when the researcher is unable to achieve full manipulation of scheduling or allocation of treatments to test units but can still apply part of the apparatus of true experimentation: time series and multiple time series designs.
- A **statistical design** is a series of basic experiments that allows for statistical control and analysis of external variables: randomized block design, Latin square design, and factorial designs.

A Classification of Experimental Designs



Ex Post Facto Design

- After the fact
- Intact groups are used
- The IV is not manipulated, but has already been applied
- It eliminates the possibility that participants will be affected by an awareness of being tested
- E.g., what is the effect of maternal alcohol consumption on embryo development?

Quasi-experimental Design

- Intact groups are used
- The IV is manipulated
- E.g., Is cooperative learning better than standing lecture on academic outcomes?

Comparison

	Experimental Design	Quasi-experimental Design	Ex Post Facto Design
Control group	Yes	Yes	Yes
Random assignment	Yes	No	No
Manipulation	Yes	Yes	No
Strengths	High internal validity, causal relationships	Avoids ethical issues caused by random assignment	High feasibility, More attention to context
Limitations	Limited external validity, ethical concerns	No control over extraneous variables	No control over experimentations and extraneous variables

One-Shot Case Study

$X \quad O_1$

- A single group of test units is exposed to a treatment X .
- A single measurement on the dependent variable is taken (O_1).
- There is no random assignment of test units.
- The one-shot case study is more appropriate for exploratory than for conclusive research.

One-Group Pretest-Posttest Design

$O_1 \quad X \quad O_2$

- A group of test units is measured twice.
- There is no control group.
- The treatment effect is computed as $O_2 - O_1$.
- The validity of this conclusion is questionable since extraneous variables are largely uncontrolled.

Static Group Design

EG: X O_1

CG: O_2

- A two-group experimental design.
- The experimental group (EG) is exposed to the treatment, and the control group (CG) is not.
- Measurements on both groups are made only after the treatment.
- Test units are not assigned at random.
- The treatment effect would be measured as $O_1 - O_2$.

True Experimental Designs: Pretest-Posttest Control Group Design

EG: R O_1 X O_2

CG: R O_3 O_4

- Test units are randomly assigned to either the experimental or the control group.
- A pretreatment measure is taken on each group.
- The treatment effect (TE) is measured as: $(O_2 - O_1) - (O_4 - O_3)$.
- Selection bias is eliminated by randomization.
- The other extraneous effects are controlled as follows:
 $O_2 - O_1 = TE + H + MA + MT + IT + I + SR + MO$
 $O_4 - O_3 = H + MA + MT + I + SR + MO$
 $= EV$ (Extraneous Variables)
- The experimental result is obtained by:
 $(O_2 - O_1) - (O_4 - O_3) = TE + IT$
- Interactive testing effect is not controlled.

Posttest-Only Control Group Design

EG : $R \quad X \quad O_1$

CG : $R \quad O_2$

- The treatment effect is obtained by:

$$TE = O_1 - O_2$$

- Except for pre-measurement, the implementation of this design is very similar to that of the pretest-posttest control group design.

True Experimental Designs: Solomon four-group Design

EG1: $R \quad O_1 \quad X \quad O_2$

CG1: $R \quad O_3 \quad \quad O_4$

EG2: $R \quad \quad X \quad O_5$

CG2: $R \quad \quad \quad O_6$

Quasi-Experimental Designs: Time Series Design

$O_1 \ O_2 \ O_3 \ O_4 \ O_5 \ X \ O_6 \ O_7 \ O_8 \ O_9 \ O_{10}$

- There is no randomization of test units to treatments.
- The timing of treatment presentation, as well as which test units are exposed to the treatment, may not be within the researcher's control.

Multiple Time Series Design

EG : $O_1 \ O_2 \ O_3 \ O_4 \ O_5 \ X \ O_6 \ O_7 \ O_8 \ O_9 \ O_{10}$

CG : $O_1 \ O_2 \ O_3 \ O_4 \ O_5 \quad O_6 \ O_7 \ O_8 \ O_9 \ O_{10}$

- If the control group is carefully selected, this design can be an improvement over the simple time series experiment.
- Can test the treatment effect twice: against the pretreatment measurements in the experimental group and against the control group.

Statistical Designs

Statistical designs consist of a series of basic experiments that allow for statistical control and analysis of external variables and offer the following advantages:

- The effects of more than one independent variable can be measured.
- Specific extraneous variables can be statistically controlled.
- Economical designs can be formulated when each test unit is measured more than once.

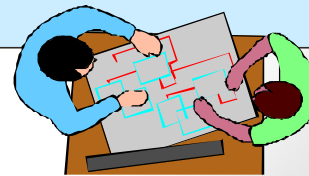
The most common statistical designs are the randomized block design, the Latin square design, and the factorial design.

Randomized Block Design

- Is useful when there is only one major external variable, such as store size, that might influence the dependent variable.
- The test units are blocked, or grouped, on the basis of the external variable.
- By blocking, the researcher ensures that the various experimental and control groups are matched closely on the external variable.

Randomized Block Design

Block Number	Store Patronage	Treatment Groups		
		Commercial A	Commercial B	Commercial C
1	Heavy	A	B	C
2	Medium	A	B	C
3	Low	A	B	C
4	None	A	B	C



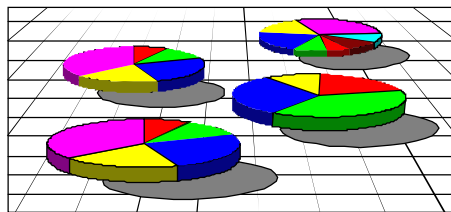
Latin Square Design

- Allows the researcher to statistically control two noninteracting external variables as well as to manipulate the independent variable.
- Each external or blocking variable is divided into an equal number of blocks, or levels.
- The independent variable is also divided into the same number of levels.
- A Latin square is conceptualized as a table (see Table 7.5), with the rows and columns representing the blocks in the two external variables.
- The levels of the independent variable are assigned to the cells in the table.
- The assignment rule is that each level of the independent variable should appear only once in each row and each column, as shown in Table 7.5.

Latin Square Design

Table 7.5

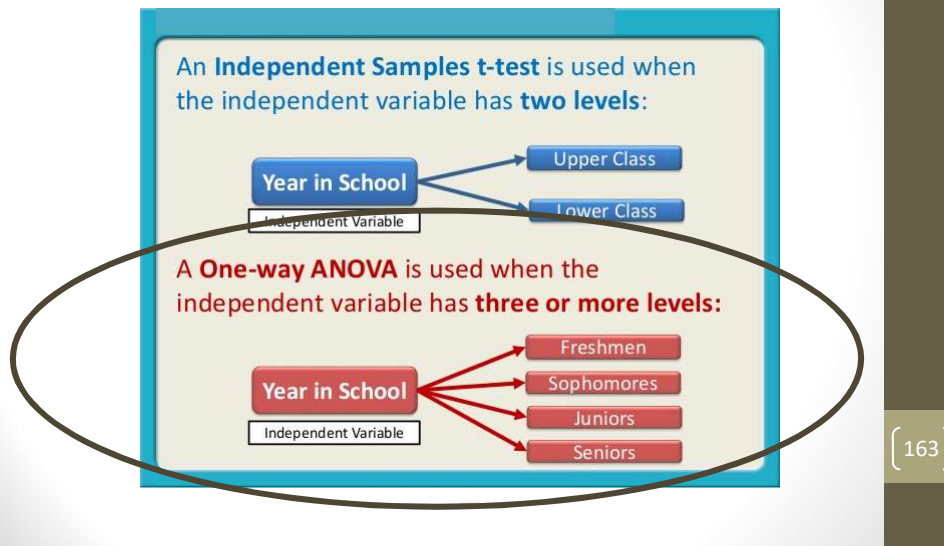
Store Patronage	Interest in the Store		
	High	Medium	Low
Heavy	B	A	C
Medium	C	B	A
Low and none	A	C	B



Single Factor Design: How many conditions?

- Your research question(s)
- Your resources
- Multitasking while driving...
 - No phone use
 - Texting
 - Texting via voice
 - Talking on phone holding phone
 - Talking on phone with headset
 - Etc.

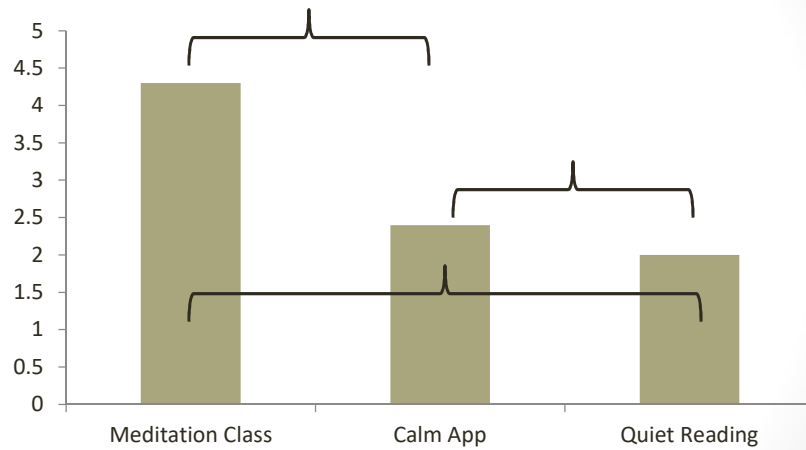
Single Factor Design: Analysis



Adding complexity: 3 levels of IV

- No App, Calm App, Meditation class
- Null Hyp
 - None = Calm = Meditation Class
- Multiple comparisons
 - None vs Calm, None vs MS, Calm vs MS
 - Too many t-tests (increase type 1 error)
- One-Way ANOVA
 - Are there any differences? (Global test)

Effect of Meditation on Test Scores

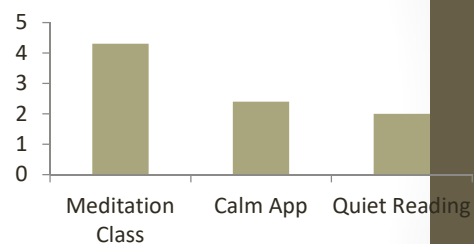


Three t-tests – three chances for a type 1 error

(165)

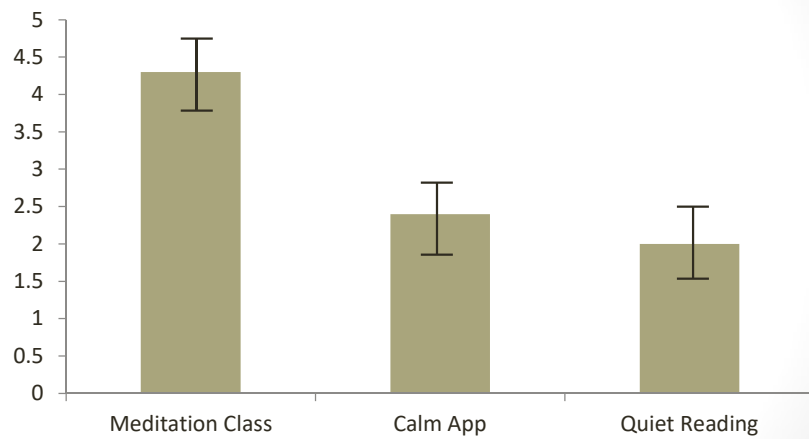
One way ANOVA

- One global test
- Can we reject null?
- $MC = CA = QR$
- If yes, additional tests ok



(166)

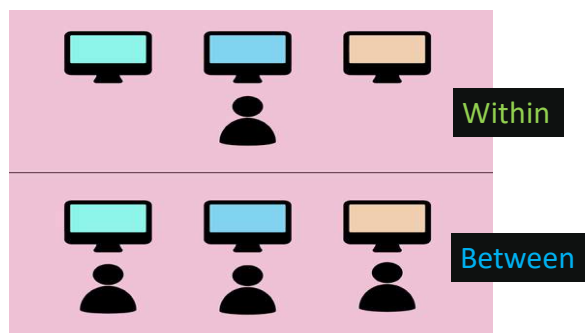
Adding Error Bars



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Single Factor Design: Within-subjects or Between-subjects

- Single Factor = ONE independent variable
- Between Subjects vs Within Subjects



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Within or Between?

- Sometimes only one option
- Between
 - No carryover effects
 - Less fatigue/boredom
 - Studying patient characteristics (e.g., schizophrenic vs normal control)
- Within
 - Same participants – no assignment issues
 - Faster/cheaper/easier to recruit participants

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Assessing experimental design Independent Variable

- Between Subjects Designs
 - Assignment to conditions (random assignment?)
- Within Subjects Designs
 - Fatigue?
 - Carryover effects?
 - Demand characteristics
- All designs
 - Confounding variables

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Factorial Design

- Is used to measure the effects of two or more independent variables at various levels.
- A factorial design may also be conceptualized as a table.
- In a two-factor design, each level of one variable represents a row and each level of another variable represents a column.

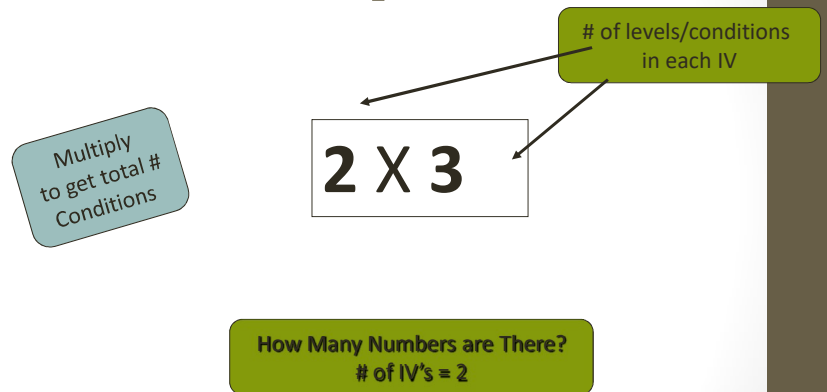
Factorial Designs: More than one IV

- Example:
 - IV1 = Temperature
 - IV2 = Amount of Water
 - 2 X 3 design

	60 Degrees	90 Degrees
Twice a week	Condition 1	Condition 2
Once a week	Condition 3	Condition 4
Twice A month	Condition 5	Condition 6

Factorial Designs

Numerical Description



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Example: 2 X 3 factorial design

- Possible t-tests here

C1 vs C2

C3 vs C4

C5 vs C6

C1 vs C3

C1 vs C5

C3 vs C5

C2 vs C4

C2 vs C6

C4 vs C6

	60 Degrees	90 Degrees
Twice a week	Condition 1	Condition 2
Once a week	Condition 3	Condition 4
Twice A month	Condition 5	Condition 6

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Factorial Design Statistical Concerns

- More tests = more chance of Type 1 Errors
- Statistics Options
 - Multiple t-tests with Bonferroni correction
 - ANOVA
- ANOVA
 - Global test – is there any effect?
 - Main effects
 - Overall effect of temperature
 - Overall effect of water
 - Interaction
 - Is effect of water the same at 60 vs 90?

[175]

Should experiment have more than one IV?

- One IV at a time – can see main effects
 - Experiment 1 – Effect of Temperature
 - Experiment 2 – Effect of Watering
 - Learn about effects separately
- Both IVs together
 - Can see main effects + interaction
 - Does the effect of one IV depend on the other?
 - Do the IVs behave differently when combined?

[176]

Does the impact of studying on grades depend on weather?



Condition 1
Grade??

Condition 2
Grade??



Condition 3
Grade??

Condition 4
Grade??

[177]

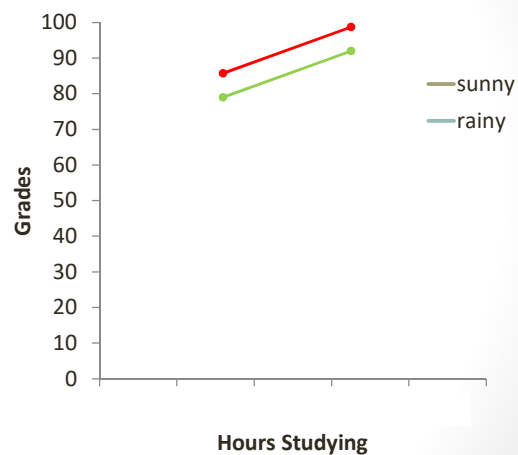
Graph it

- Weather at testing

- sunny
- rainy

- Hours studying

- 2
- 6



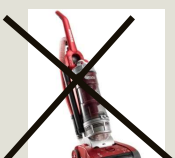
[178]

Are there significant effects?

- Is there an effect of studying?
- Is there an effect of weather?
- Does the effect of studying depend on weather?
- Probably no interaction!
 - additive

[179]

An additive effect: No interaction

	
	
Dirty	Clean surfaces
Clean floors	Clean surfaces and clean floors

This is just adding up
the effects of dusting
and vacuuming

[180]

Analyzing factorial designs: Interactions

- When the effect of one independent variable **depends on** the level of another independent variable
- When the effect of two, or more, variables is not simply additive
- Example: Alcohol and Percocet/Vicodin

[181]

An interaction

	Placebo	
		
	Normal	A little Buzzed
	A little Buzzed	Totally messed up

This is different from adding up the effects of alcohol and percocet

[182]

Interactions: Why Do I Care?

- When “It Depends”
- And/or when one size doesn’t fit all
 - Gender
 - Personality type
 - Age
- Interesting/non-obvious
- Gets published

[183]

Interactions: What Aren’t They? or: Main Effects

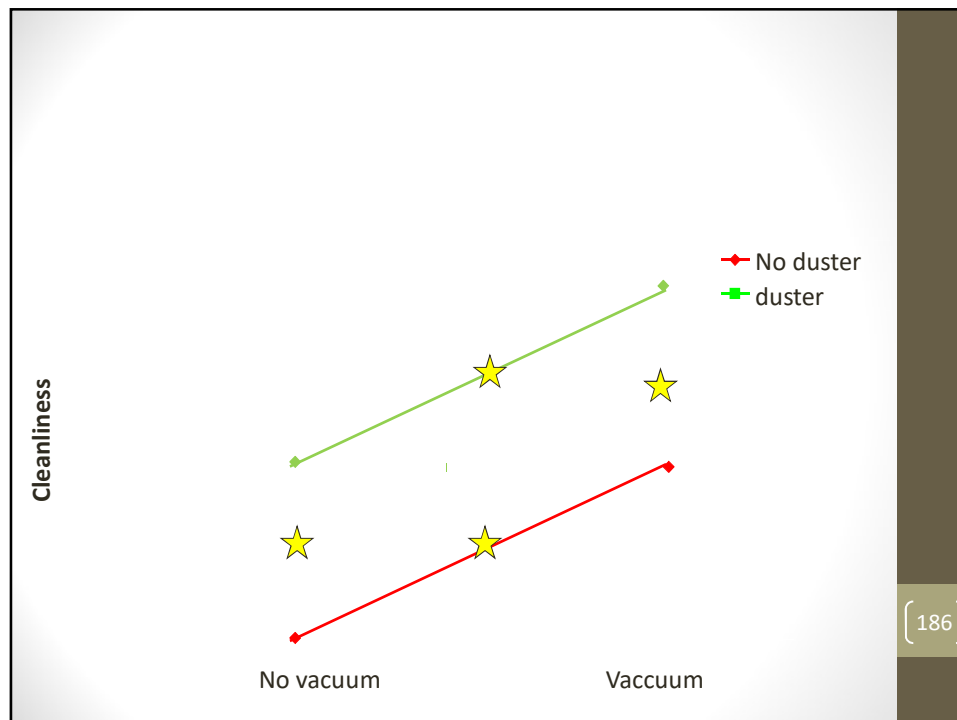
- Main (or simple) effect: the effect of the change in level of one factor in a factorial experiment measured independently of other variables

[184]

Two Main Effects

		
	Dirty	Clean surfaces
	Clean floors	Clean surfaces and clean floors

[185]

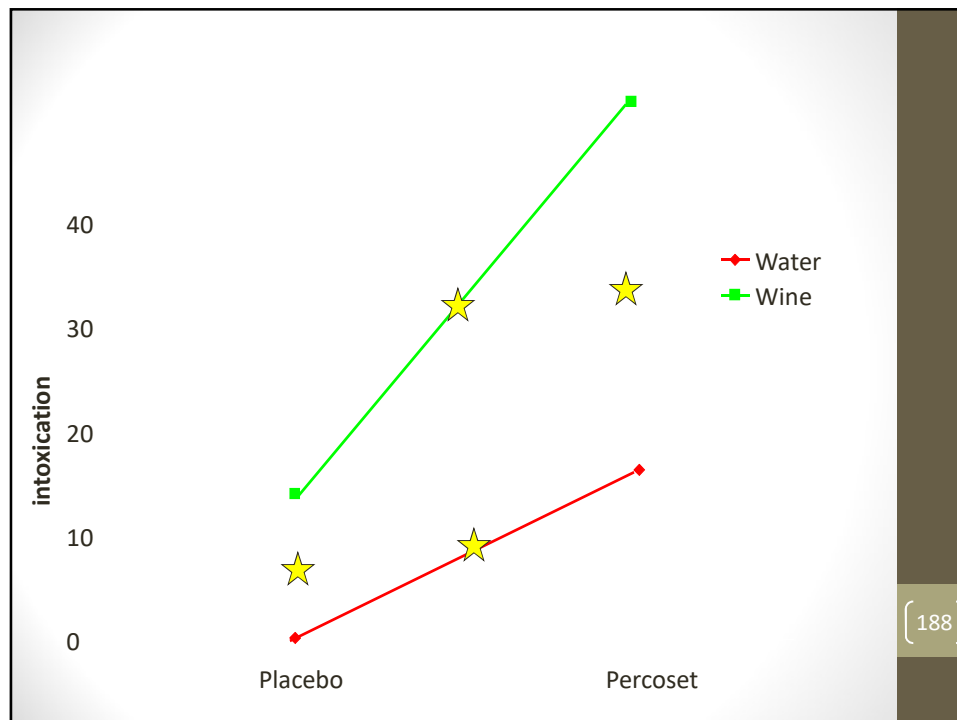


[186]

Two Main Effects + Interaction

	Placebo	
	Normal	A little Buzzed
	A little Buzzed	Totally messed up

[187]

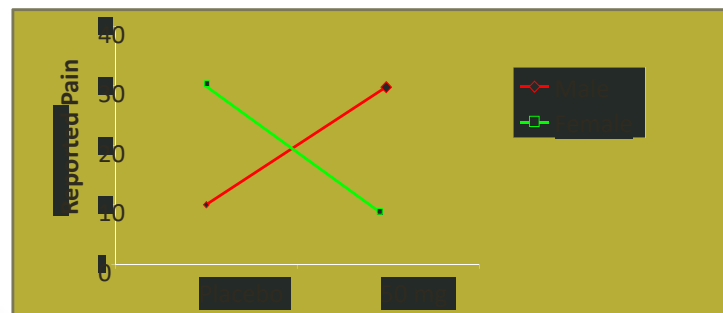


[188]

Fill in the missing values and graph it

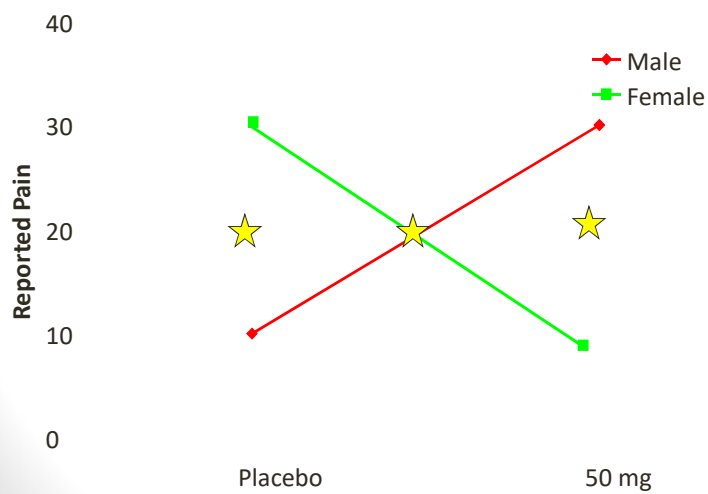
	Placebo	50mg pain reliever	Mean
Male	10	30	
Female	30	10	
Mean			

IV1 – drug
IV2 – gender
DV = reported pain



[189]

Impact of pain reliever



[190]

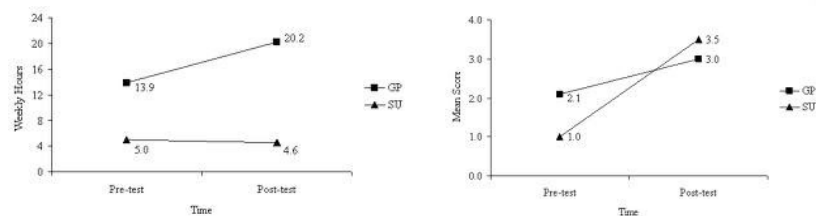
How to Identify Effects Graphically

- Main Effects for each IV
 - Difference in DV for each level of an IV
 - Compare mean values on Y-axis
- Interaction
 - Lines are not parallel

[191]

How to Identify Interactions

- Line graphs
 - Lines are not parallel



[192]

How to Identify Interactions

- Bar graphs
 - Difference between bars is unequal
 - Look, you can draw lines....

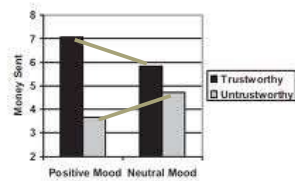
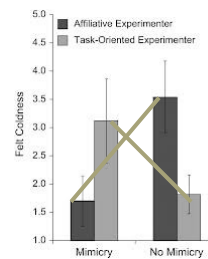


Figure 3. Mean amounts of money sent (\$) in the trust game in Experiment 3.



(193)

Let's Get Methodical About These... Methods...

Any time you have a 2 x 2, you need to test 3 things:

- Main Effect 1
- Main Effect 2
- Interaction

(194)

8 Possible Patterns of Results

No interaction, with:

- No main effects
- Main effect 1 but no main effect 2
- Main effect 2 but no main effect 1
- Both main effects

An interaction, with:

- No main effects
- Main effect 1 but no main effect 2
- Main effect 2 but no main effect 1
- Both main effects

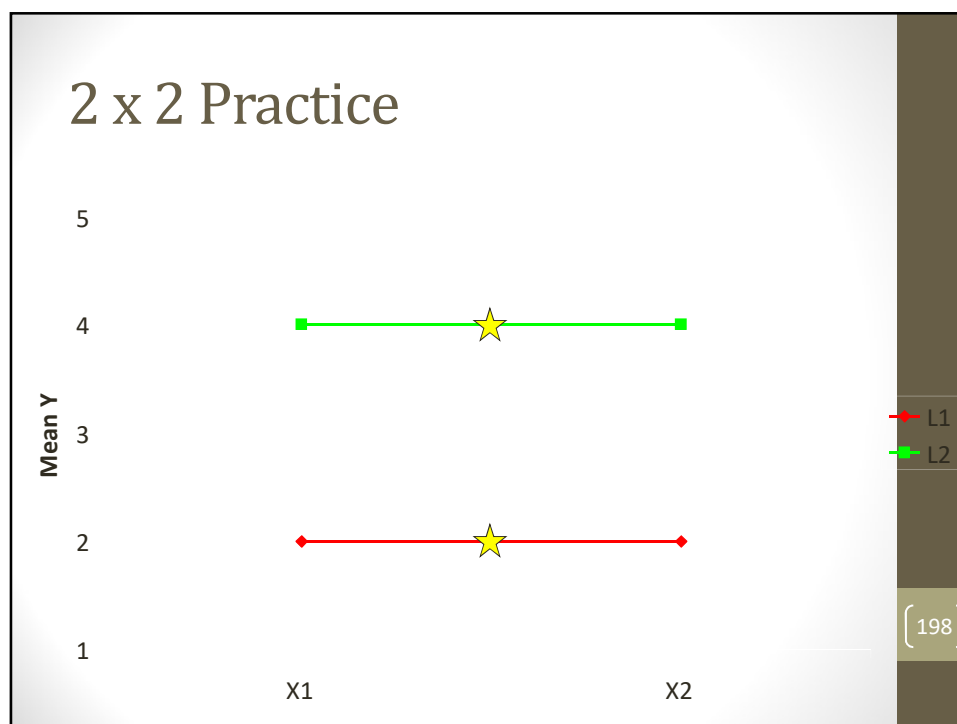
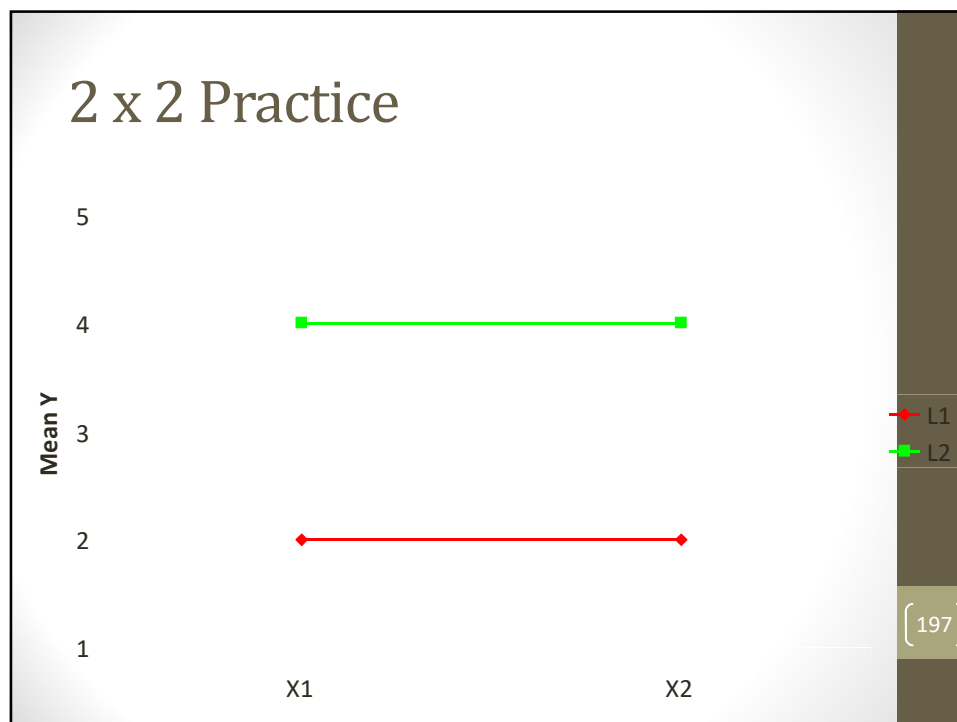
[195]

Time for Some (Abstract) Practice

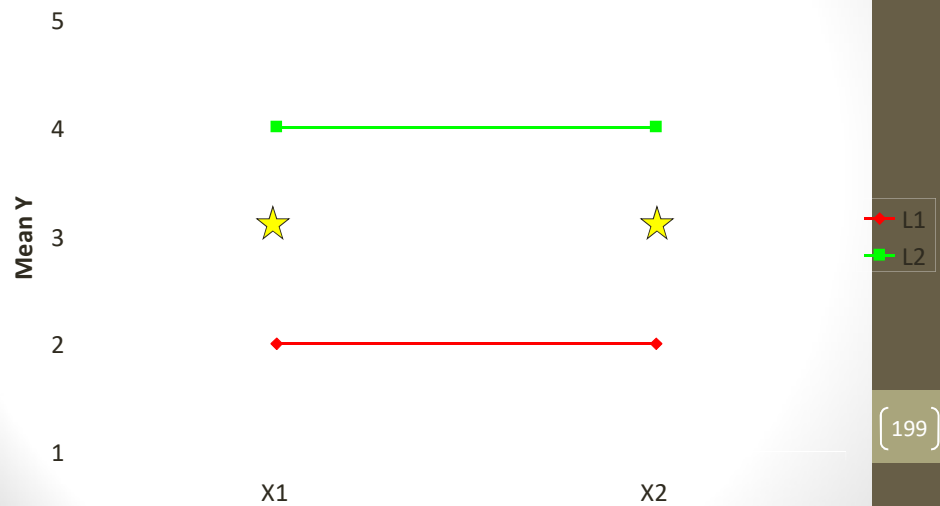
Effects of X and L on Y

We start with line graphs because they are easier to see...

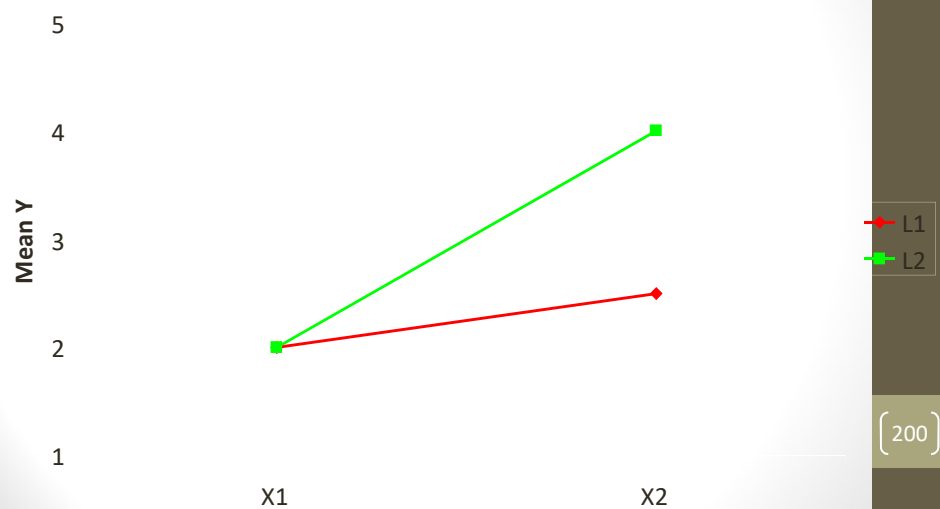
[196]

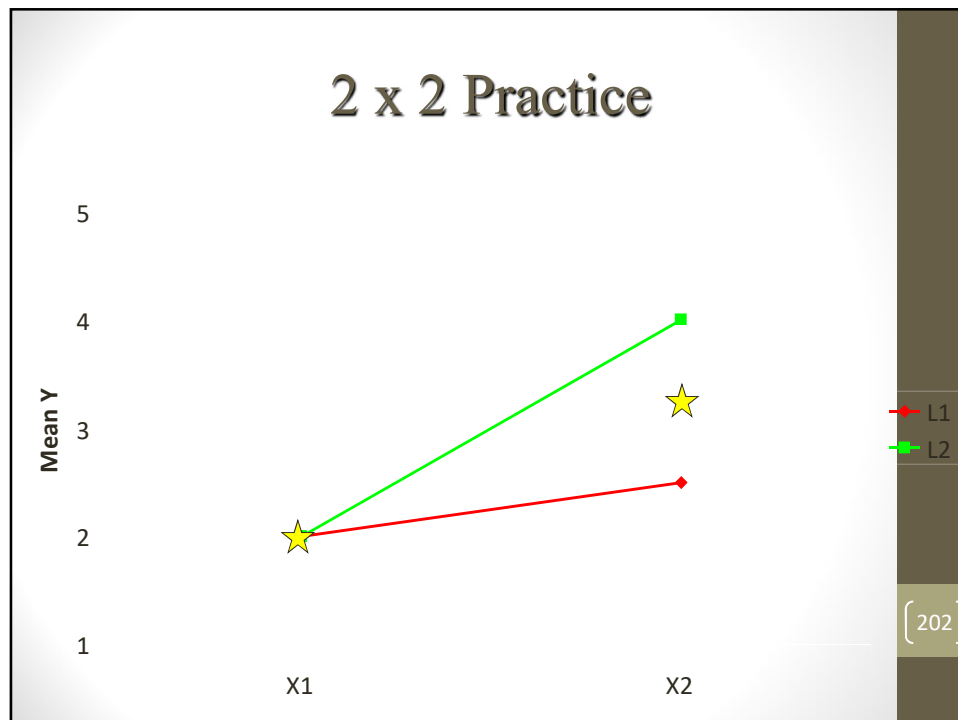


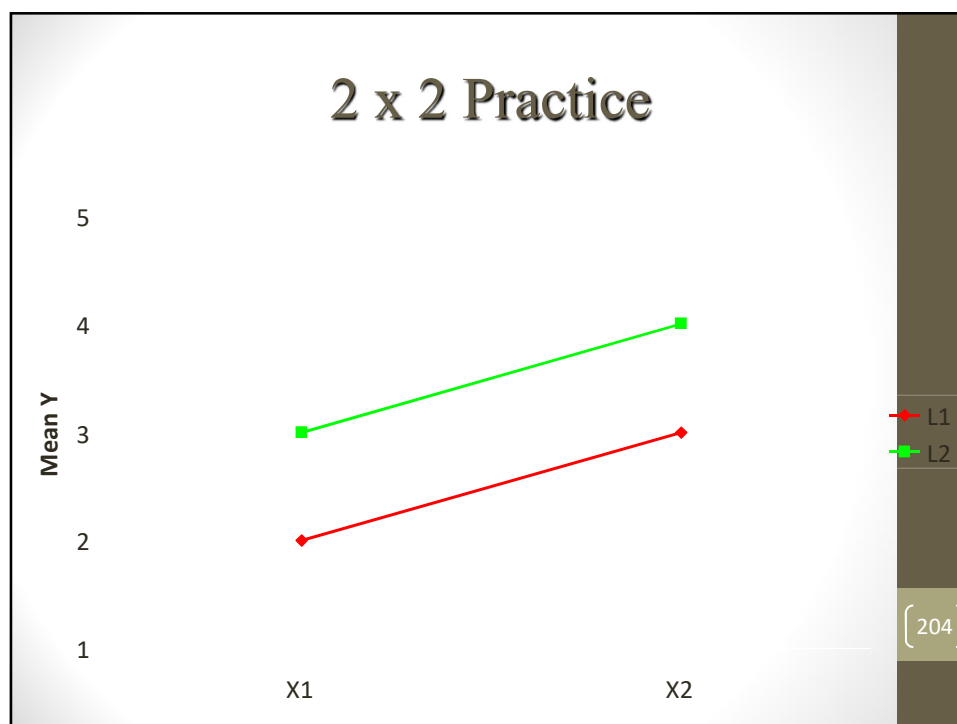
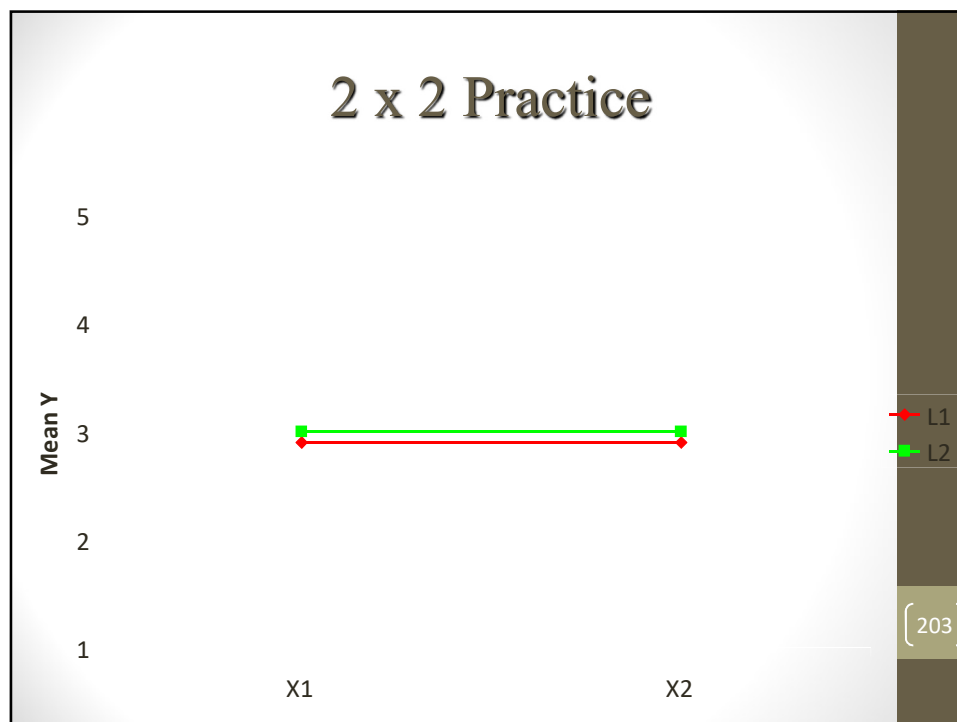
2 x 2 Practice

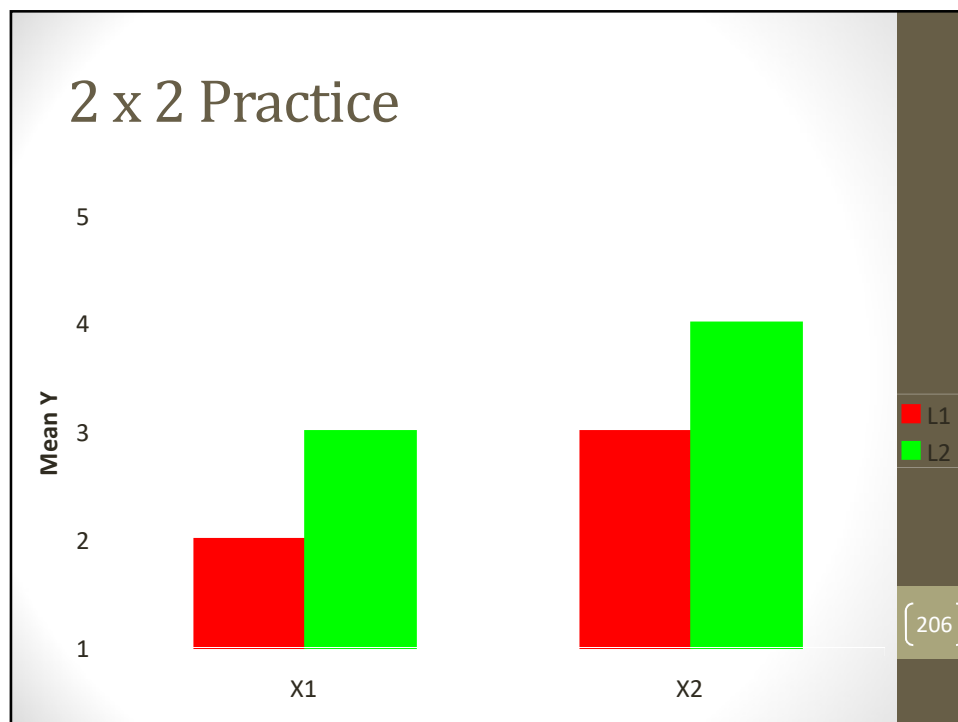
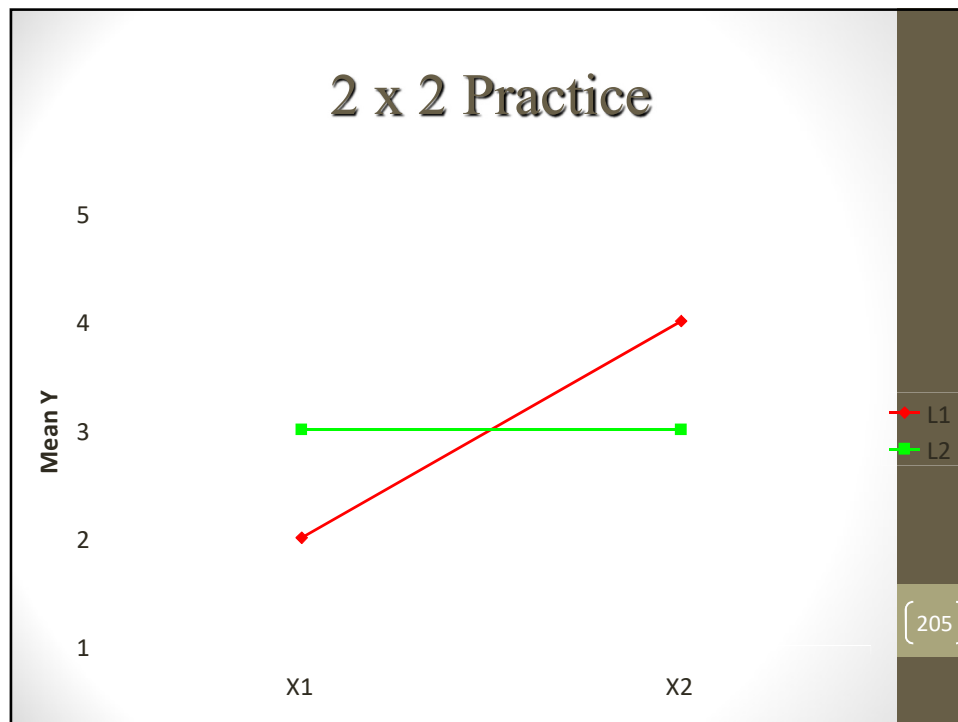


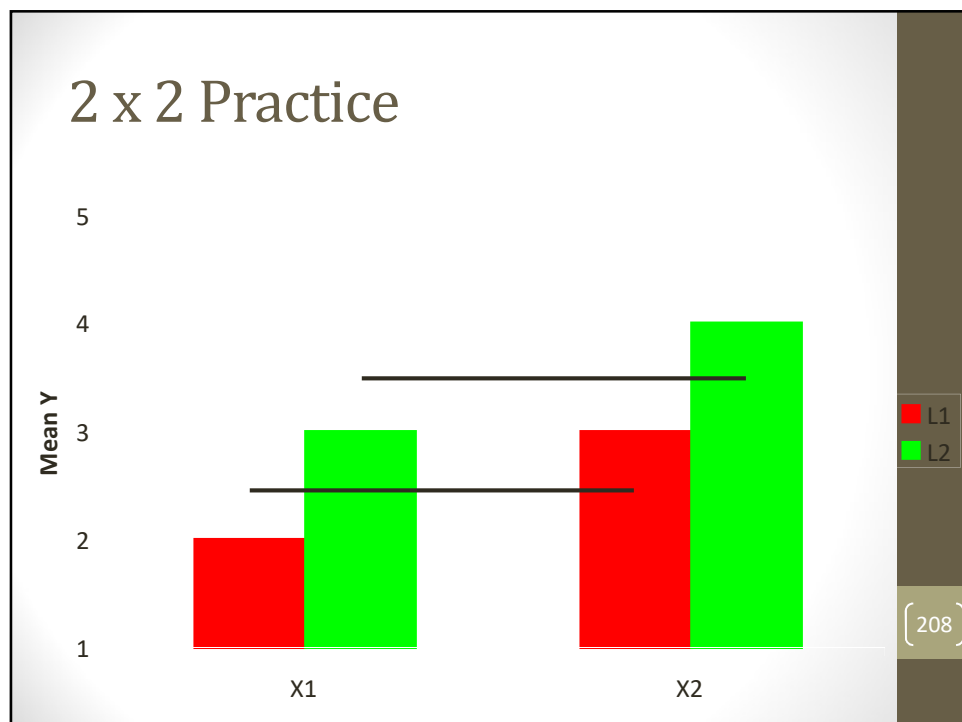
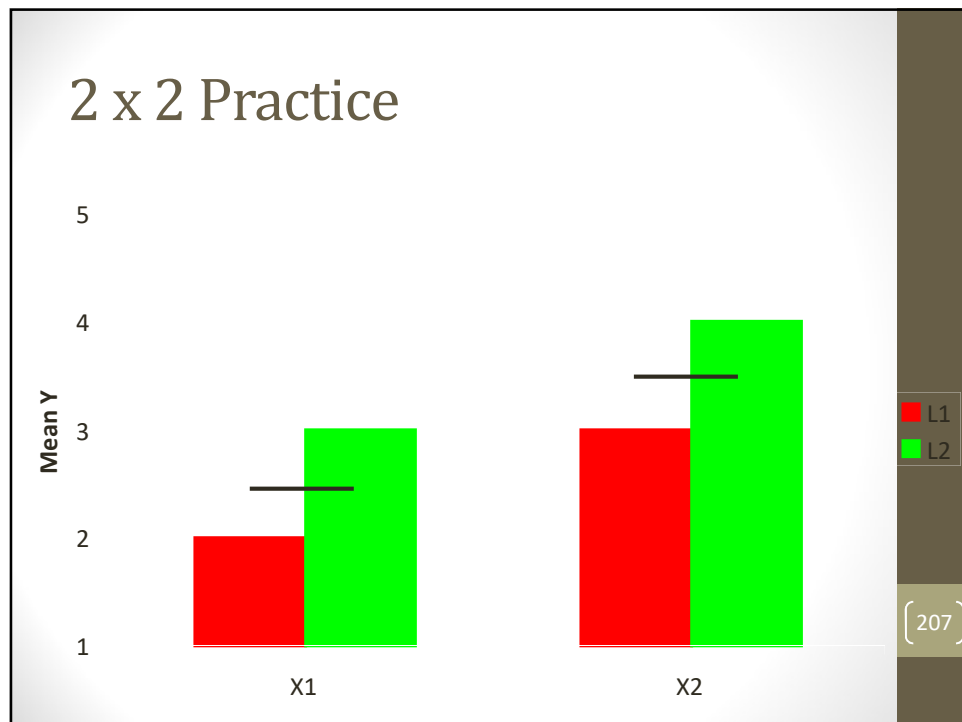
2 x 2 Practice

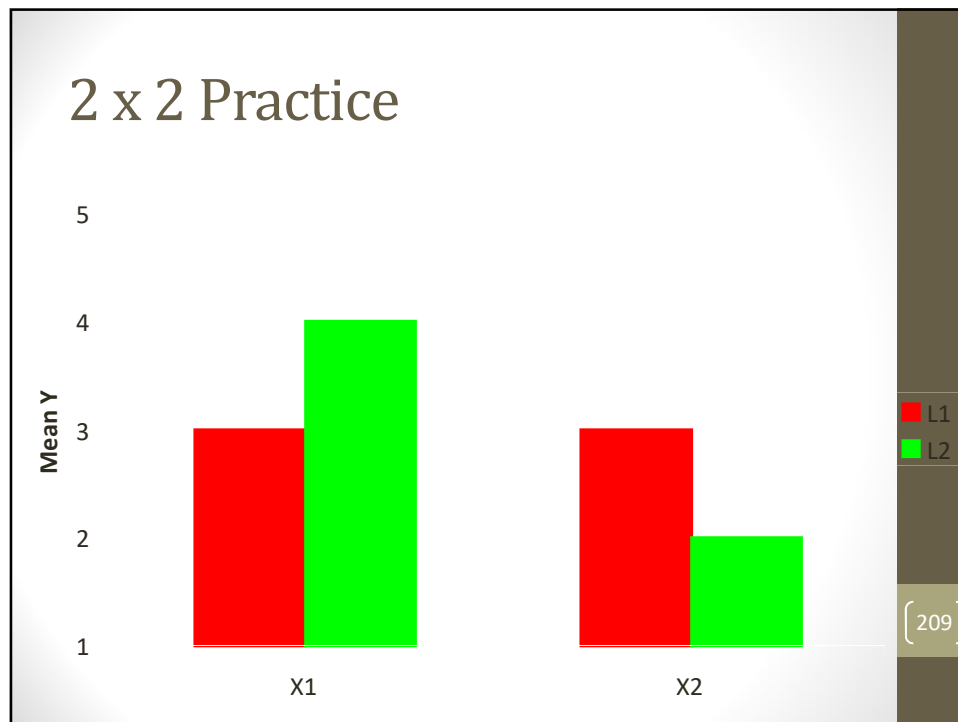












Now Try Drawing It Yourself

- Line graph
- Main effect for L
- No Main Effect for X
- An Interaction

210

Does the impact of studying on grades depend on weather?



Condition 1
Grade??

Condition 2
Grade??



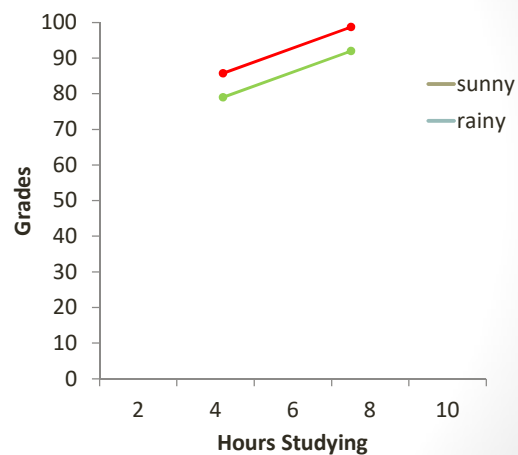
Condition 3
Grade??

Condition 4
Grade??

(211)

Graph it

- Weather at testing
 - sunny
 - rainy
- Hours studying



(212)

Interactions can involve continuous variables: For example



Notorious B.I.G.
"Mo money mo problems"



ABBA
"Money, money, money
Always sunny
In the rich mans world "

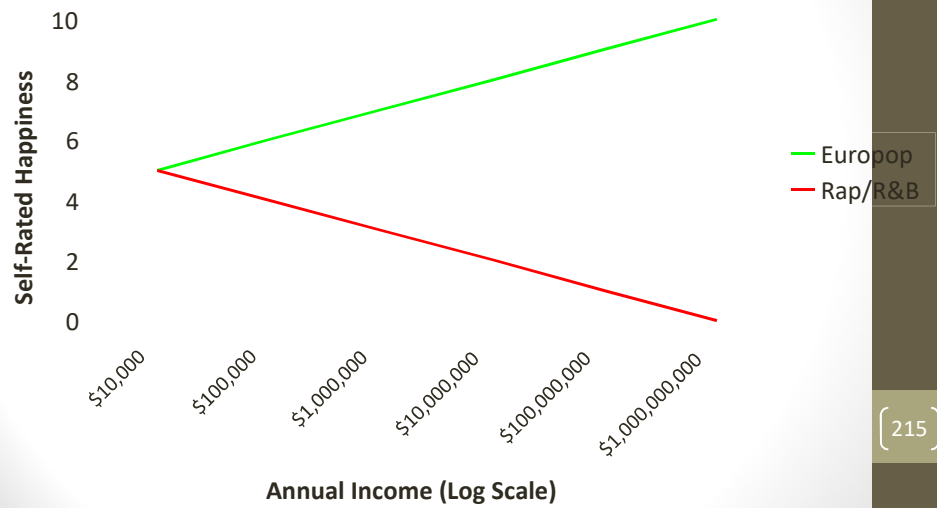
[213]

Does money lead to happiness?

- Hypothesis 1 – Main effect of money
 - Money is related to happiness
- Hypothesis 2 – Main effect of type of music
 - Pop stars are happier than rappers
- Hypothesis 3 - Interaction
 - Money's relationship to happiness depends on whether you perform Rap/R&B or Europop.
- Design (Quasi Ivs):
 - IV 1: Performance Genre (Rap/R&B, Europop)
 - IV 2: Annual Income (continuous scale)
 - DV: Self-Rated Happiness (0-10 scale)

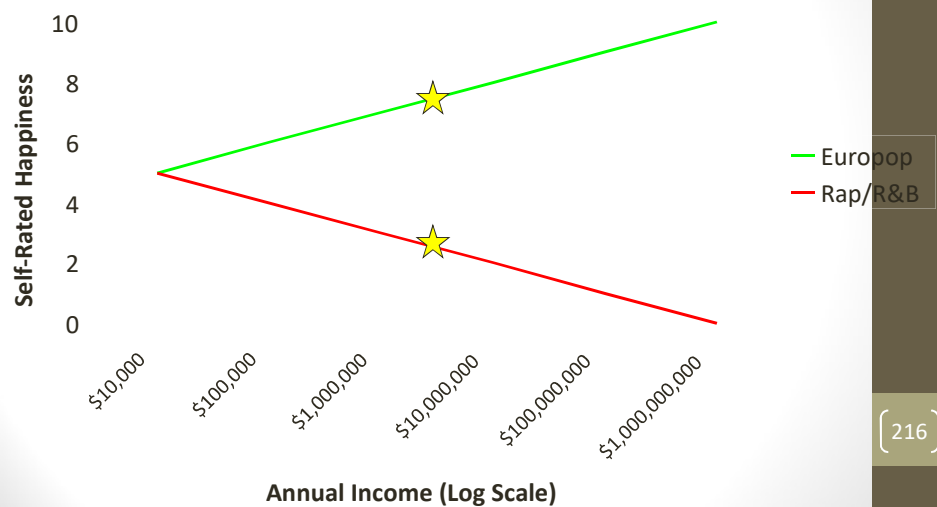
[214]

2 x Continuous



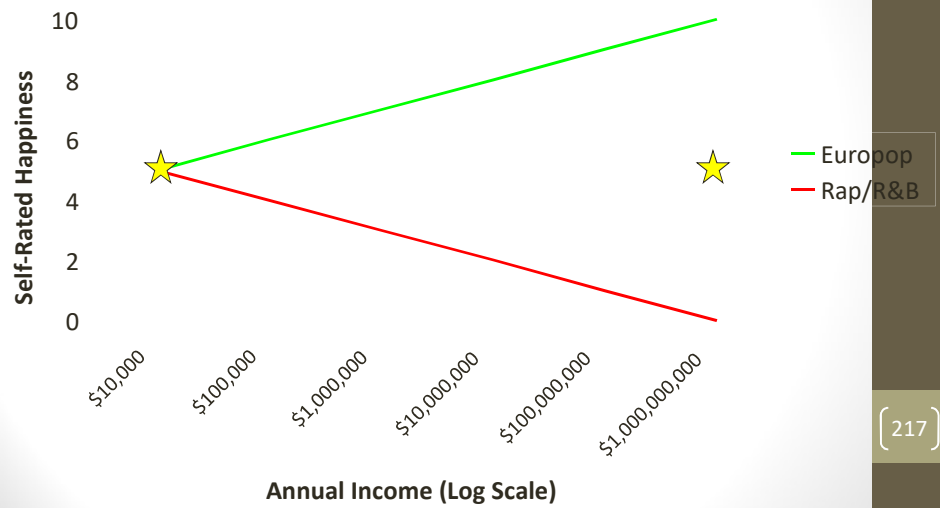
(215)

Main Effect of Music Genre



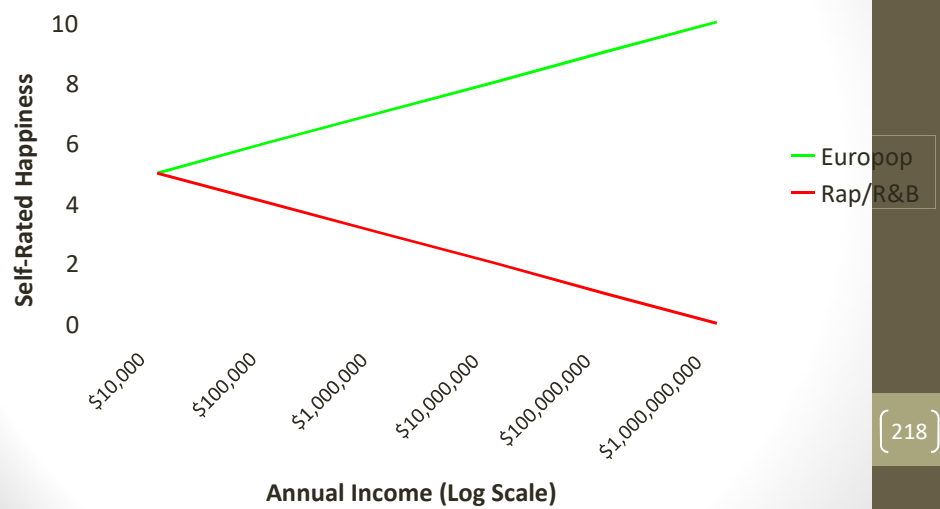
(216)

No Main Effect of Income



[217]

Interaction



[218]

Your own example

- IV 1 – Gender, age, personality type, etc.?
- IV 2 – income, drug use, etc.?
- DV – happiness, drug response, etc.?

	IV 2 Level 1	IV 2 Level 2	Mean
IV 1 – level 1			
IV 1 – level 2			
Mean			

[219]

REMEMBER

You need to be able to **identify**,
interpret, and **diagram** main
effects and interactions, using both
bar charts and **line graphs.....**
(but not until Exam 2)

[220]

Laboratory Versus Field Experiments

Factor	Laboratory	Field
Environment	Artificial	Realistic
Control	High	Low
Reactive Error	High	Low
Demand Artifacts	High	Low
Internal Validity	High	Low
External Validity	Low	High
Time	Short	Long
Number of Units	Small	Large
Ease of Implementation	High	Low
Cost	Low	High

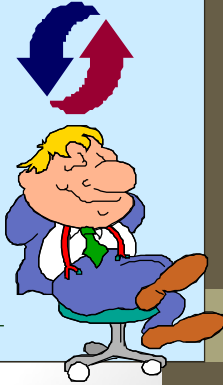
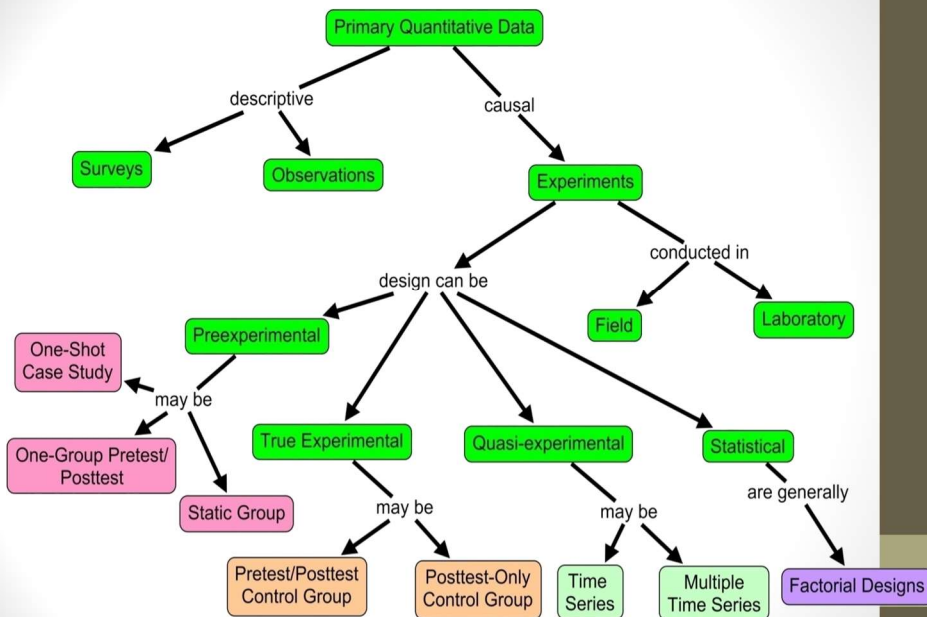


Figure 7.2 A Concept Map for Experiments



Limitations of Experimentation

- Experiments can be time consuming, particularly if the researcher is interested in measuring the long-term effects.
- Experiments are often expensive. The requirements of experimental group, control group, and multiple measurements significantly add to the cost of research.
- Experiments can be difficult to administer. It may be impossible to control for the effects of the extraneous variables, particularly in a field environment.
- Competitors may deliberately contaminate the results of a field experiment.

CROSS-SECTIONAL VS. LONGITUDINAL
DESIGNS

[224]

Cross-Sectional Designs

- Involve the collection of information from any given sample of population elements only once
- In **single cross-sectional designs**, there is only one sample of respondents and information is obtained from this sample only once.
- In **multiple cross-sectional designs**, there are two or more samples of respondents, and information from each sample is obtained only once. Often, information from different samples is obtained at different times.
- **Cohort analysis** consists of a series of surveys conducted at appropriate time intervals, where the cohort serves as the basic unit of analysis. A cohort is a group of respondents who experience the same event within the same time interval.

Consumption of Various Soft Drinks by Various Age Cohorts

Age	Percentage consuming on a typical day				
	1950	1960	1969	1979	
8-19	52.9	62.6	73.2	81.0	
20-29	45.2	60.7	76.0	75.8	C8
30-39	33.9	46.6	67.7	71.4	C7
40-49	23.2	40.8	58.6	67.8	C6
50+	18.1	28.8	50.0	51.9	C5
		C1	C2	C3	C4
C1: cohort born prior to 1900					
C2: cohort born 1901-10					
C3: cohort born 1911-20					
C4: cohort born 1921-30					
C5: cohort born 1931-40					
C6: cohort born 1940-49					
C7: cohort born 1950-59					
C8: cohort born 1960-69					

Longitudinal Designs

- A fixed sample (or samples) of population elements is measured repeatedly on the same variables
- A longitudinal design differs from a cross-sectional design in that the sample or samples remain the same over time

Cross-Sectional vs. Longitudinal

Cross-Sectional Design

Sample
Surveyed
at T_1

Longitudinal Design

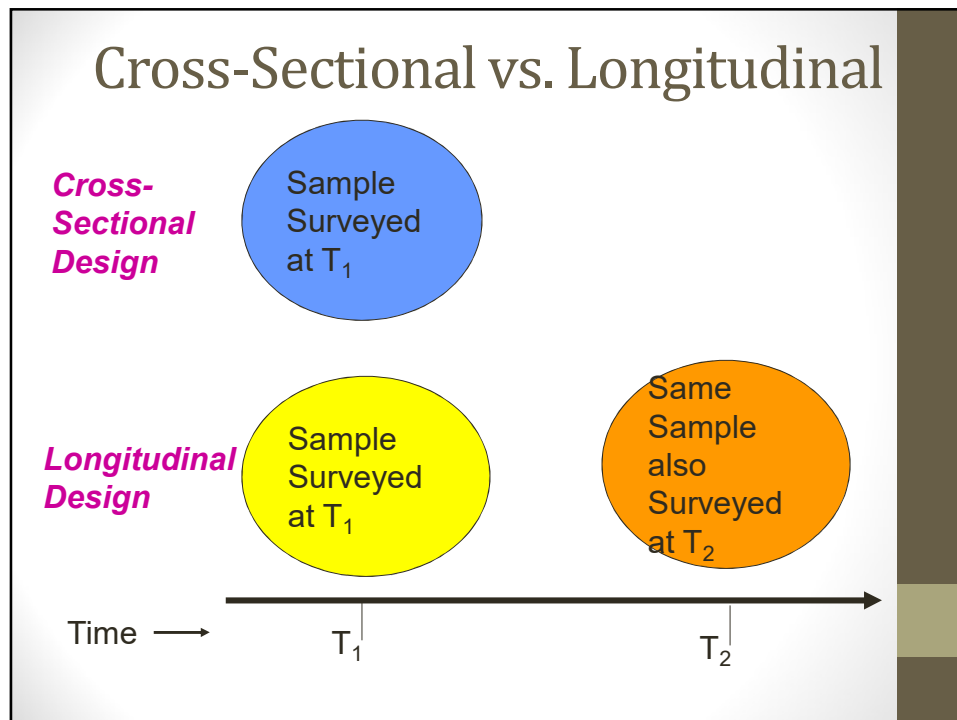
Sample
Surveyed
at T_1

Same
Sample
also
Surveyed
at T_2

Time →

T_1

T_2



Relative Advantages and Disadvantages of Longitudinal and Cross-Sectional Designs

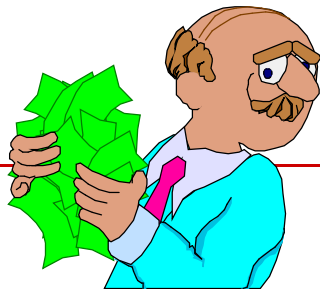
Evaluation Criteria	Cross-Sectional Design	Longitudinal Design
Detecting Change	-	+
Large amount of data collection	-	+
Accuracy	-	+
Representative Sampling	+	-
Response bias	+	-

Note: A "+" indicates a relative advantage over the other design, whereas a "-" indicates a relative disadvantage.

Cross-Sectional Data May Not Show Change

Table 3.5

Brand Purchased	Time Period	
	Period 1 Survey	Period 2 Survey
Brand A	200	200
Brand B	300	300
Brand C	500	500
Total	1000	1000



Longitudinal Data May Show Substantial Change

Table 3.6

Brand Purchased in Period 1	Brand Purchased in Period 2			Total
	Brand A	Brand B	Brand C	
Brand A	100	50	50	200
Brand B	25	100	175	300
Brand C	75	150	275	500
Total	200	300	500	1000

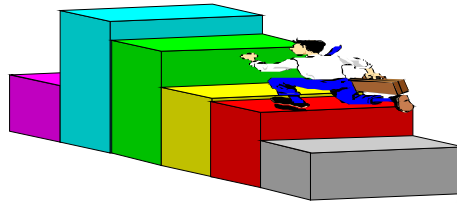
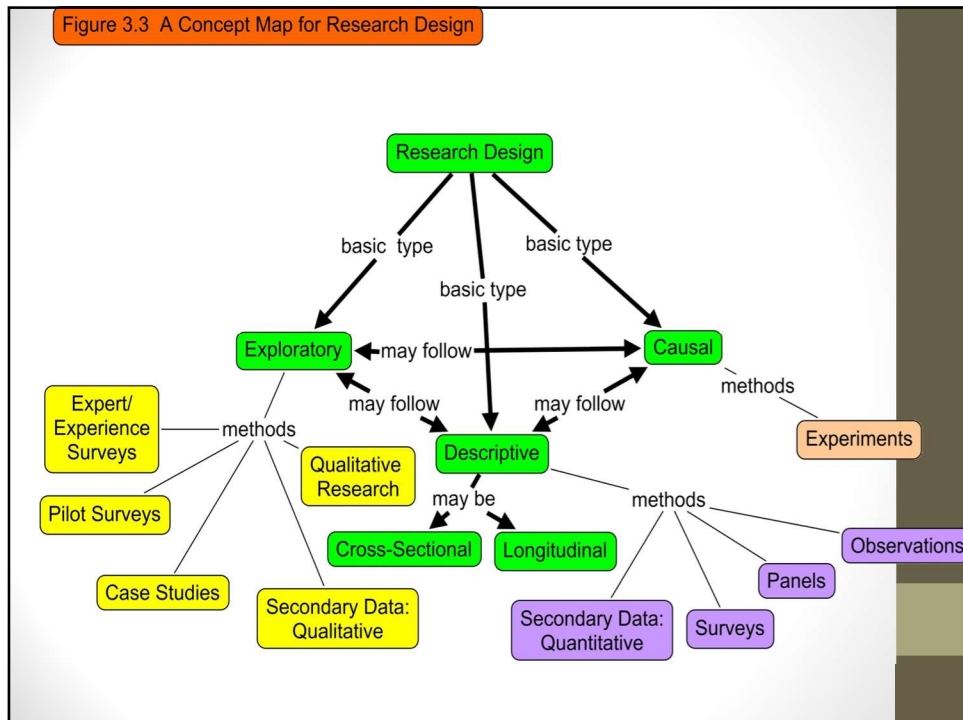
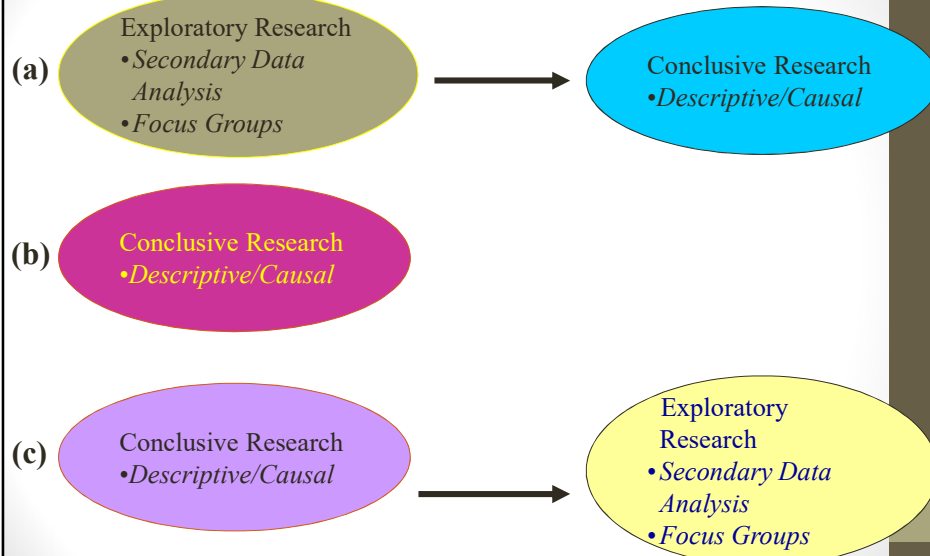


Figure 3.3 A Concept Map for Research Design



Alternative Research Designs

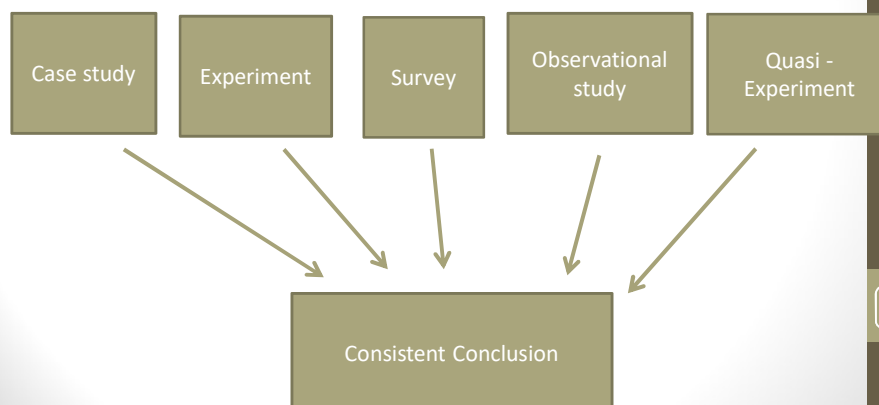


What is the right method?

- There is no right or wrong, but more or less appropriate
- Mixed method designs
 - Quantitative study + Qualitative study
 - e.g., quantitatively test whether two groups are different, and then use interview or focus groups to find out why
 - Participant observation + semi-structured interview
 - *Triangulation*

Thoughts on Design Choice

- Nothing is perfect
- Ideally seek converging evidence



Citicorp Banks on Exploratory, Descriptive, and Causal Research

Marketing Research at Citicorp is typical in that it is used to measure consumer awareness of products, monitor their satisfaction and attitudes associated with the product, track product usage and diagnose problems as they occur. To accomplish these tasks Citicorp makes extensive use of exploratory, descriptive, and causal research. Often it is advantageous to offer special financial packages to specific groups of customers. In this case, a financial package is being designed for senior citizens.

The following seven-step process was taken by marketing research to help in the design.

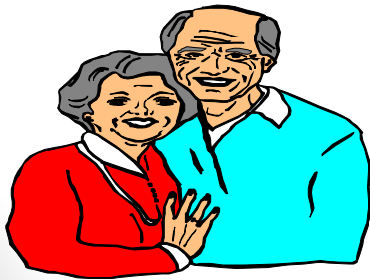
Citicorp Banks on Exploratory, Descriptive, and Causal Research



1) A taskforce was created to better define the market parameters to include all the needs of the many Citicorp branches. A final decision was made to include Americans 55 years of age or older, retired, and in the upper half of the financial strata of that market.

Citicorp Banks on Exploratory, Descriptive, and Causal Research

2) Exploratory research in the form of secondary data analysis of the mature or older market was then performed and a study of competitive products was conducted. Exploratory qualitative research involving focus groups was also carried out in order to determine the needs and desires of the market and the level of satisfaction with the current products.



In the case of senior citizens, a great deal of diversity was found in the market. This was determined to be due to such factors as affluence, relative age, and the absence or presence of a spouse.

Citicorp Banks on Exploratory, Descriptive, and Causal Research

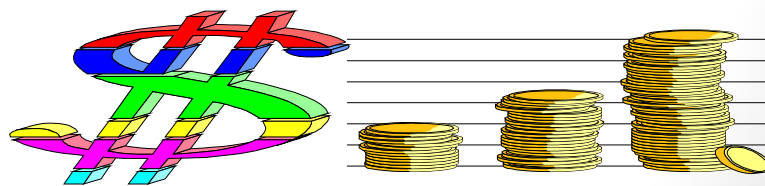


3) The next stage of research was brainstorming. This involved the formation of many different financial packages aimed at the target market. In this case, a total of 10 ideas were generated.

Citicorp Banks on Exploratory, Descriptive, and Causal Research

4) The feasibility of the 10 ideas generated in step 3 was then tested. The ideas were tested on the basis of whether they were possible in relation to the business. The following list of questions was used as a series of hurdles that the ideas had to pass to continue on to the next step.

- Can the idea be explained in a manner that the target market will easily understand?
- Does the idea fit into the overall strategy of Citicorp?



Citicorp Banks on Exploratory, Descriptive, and Causal Research

- Is there an available description of a specific target market for the proposed product?
- Does the research conducted so far indicate a potential match for target market needs, and is the idea perceived to have appeal to this market?
- Is there a feasible outline of the tactics and strategies for implementing the program?
- Have the financial impact and cost of the program been thoroughly evaluated and determined to be in line with company practices?

In this study, only one idea generated from the brainstorming session made it past all the listed hurdles and on to step 5.

Citicorp Banks on Exploratory, Descriptive, and Causal Research

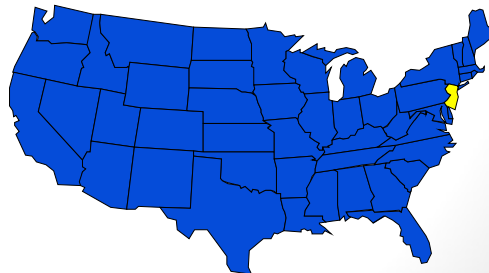
5) A creative work-plan was then generated. This plan was to emphasize the competitive advantage of the proposed product as well as better delineate the specific features of the product.

6) The previous exploratory research was now followed up with descriptive research in the form of mall intercept surveys of people in the target market range. The survey showed that the list of special features was too long and it was decided to drop the features more commonly offered by competitors.



Citicorp Banks on Exploratory, Descriptive, and Causal Research

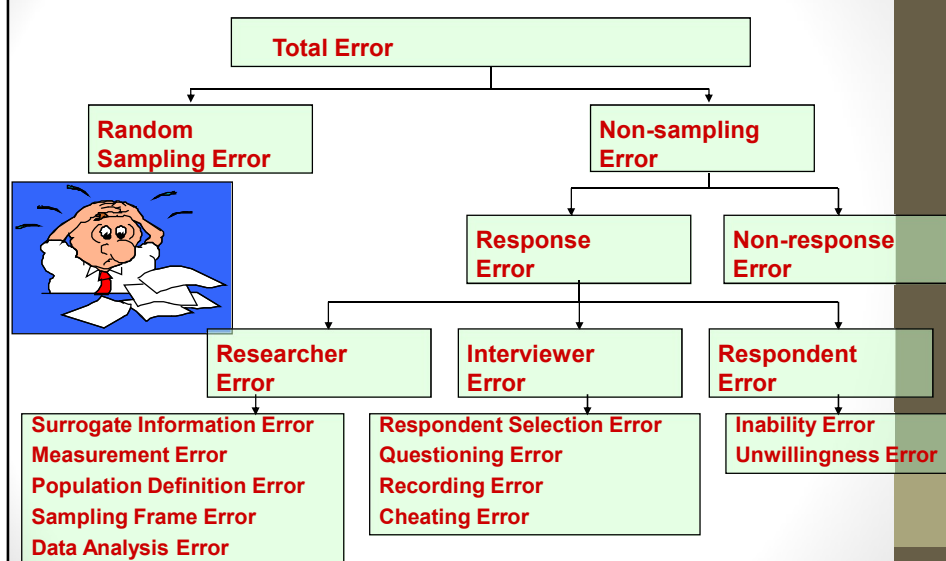
7) Finally, the product was test marketed in six of the Citicorp branches within the target market. Test marketing is a form of causal research. Given successful test marketing results, the product is introduced nationally.



ERRORS IN RESEARCH DESIGNS

[245]

Potential Sources of Error in Research Designs



Errors in Research

- The **total error** is the variation between the true mean value in the population of the variable of interest and the observed mean value obtained in the marketing research project.
- **Random sampling error** is the variation between the true mean value for the population and the true mean value for the original sample.
- **Non-sampling errors** can be attributed to sources other than sampling, and they may be random or nonrandom: including errors in problem definition, approach, scales, questionnaire design, interviewing methods, and data preparation and analysis. Non-sampling errors consist of non-response errors and response errors.

Errors in Research

- **Non-response error** arises when some of the respondents included in the sample do not respond.
- **Response error** arises when respondents give inaccurate answers or their answers are misrecorded or misanalyzed.

RESEARCH PROPOSAL

[249]

Research Proposal

- Executive Summary
- Background
- Problem Definition/Objectives of the Research
- Approach to the Problem
- Research Design
- Fieldwork/Data Collection
- Data Analysis
- Reporting
- Cost and Time
- Appendices