

## ***Research Design***

Spring 2006

### ***The research paper reflects the research process***

- **Title page**
- **Abstract**
- **Introduction**
- **Method**
- **Results**
- **Discussion**
- **References**
- **Tables**
- **Figures**
- **Appendixes**

### ***Developing an outline***

#### **An outline is:**

- a logical, general description
- a schematic summary
- an organizational pattern
- a conceptual design for your writing
  
- **It is not necessarily a linear pattern!**
  - Networking & brainstorming, followed by refining

### ***The purpose of an outline***

- helps to organize your ideas
- presents your material in a logical form
- shows the relationship among ideas in your writing
- constructs an ordered overview of your writing
- defines boundaries

### **Questions to address**

- **What is the research question or the hypothesis?**
- **What is the relevant literature about?**
- **What do we know about the issue?**
- **What do we *not know* about the issue?**
- **What are the implications of this study?**

### **Abstracts**

**brief, comprehensive summary of the study (APA says 120 words!)**

- **States the problem being studied**
- **States who the participants were**
- **Summarizes the experimental method**
- **Summarizes the findings**
- **Summarizes the conclusions**

### **Introduction**

- **scholarly review of relevant literature**
  - Not a laundry list of the papers you've read
  - "Relevant" is a key word here!
- **Clearly states the purpose of the study**
- **Outlines the implications of any findings**
- **Clear statement of the hypotheses & the rationale for each**
- **Definition of the variables**

### **Introduction**

- **provides a rationale for the study**
- **reviews current knowledge on a topic**
  - compares & contrasts
  - comments on strengths & limitations
  - identifies knowledge gaps
- **culminates by stating the purpose of this research project**
  - present the research aims, and questions or hypotheses, clearly

### Said another way ...

#### **The introduction should:**

- **Be informative**
- **Evaluate alternatives & other viewpoints**
- **Integrate relevant knowledge**
  - That means including related information from outside the OT literature

### Points to include in an Introduction

- **Why is this problem important?**
- **What is the scope of the problem?**
- **What knowledge gaps exist?**
- **What are the implications of this study?**
  - for practice
  - for theory
  - for other populations or problems
  - for other fields?

### Methods

- **makes it possible to replicate your study**
- **Allows readers to judge reliability & validity**

#### Generic Organization

*participants/sample*

*selection, assignment, demographics*

*procedure (what & how)*

*materials, apparatus, measures, variables*

*(independent & dependent), stimuli used,*

*control groups*

### Results

- **summary of findings (results, statistical analyses of results)**
- **figures & graphs to show results**
- **present these in the order of hypotheses**

#### **How to describe statistical results in text?**

*See the APA reference manual for what relevant features should be included.*

## ***Discussion***

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- **indicate which analyses led to which answers**
  - *were hypotheses supported or not supported*
  - *Remember, hypotheses never are “proven” right/wrong*
- **include what is interesting about your findings**
- **include description of limitations**
- **include implications of the results**
  - *so what might all this mean?*

## ***Research Design***

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- **A clear hypothesis is the first step...**
  - ‘testability’
  - ‘significance’

## ***Research Design***

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- **A clear hypothesis is the first step...**
  - ‘testability’
  - ‘significance’
- **Expected difference among groups?**
  - ‘null’ hypothesis is tested = “NO difference present”
- **Directional hypothesis**
  - Prediction made about nature of change
  - Fewer subjects required
  - Smaller effects may be detected
  - Change in an unexpected direction won’t be detected

## ***Design approaches***

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- **Experimental**
  - Hypothesis testing
- **Naturalistic Inquiry**
  - Theory development
- **Case Studies**
  - Typically use a mixture of experimental & naturalistic approaches
  - *NOT* necessarily single-subject studies!

### Experimental Designs

- **Randomization**
- **Control group(s)**
- **Manipulation of independent variable**

### Experimental Designs

- **Randomization**
  - Subject selection      subjects represent the larger population
  - 'population'            all possible 'subjects' meeting inclusion criteria
  - Group assignment      subjects have equal chance of being assigned to each group
- **Control group(s)**
- **Manipulation of independent variable**

### Experimental Designs

- **Randomization**
- **Control group(s)**
  - Changes not due to the manipulation
  - 'Halo' or 'placebo' effects possible
  - Negative, positive, sham, & silent control groups
- **Manipulation of independent variable**

### Experimental Designs

- **Randomization**
- **Control group(s)**
- **Manipulation of independent variable**
  - Presence or absence of independent variable
  - Not often possible in health care settings!
  - Requires careful examination of potential threats to *internal validity* - the ability of a research design to answer the research question accurately

### **Threats to internal validity**

- 1) History
- 2) Testing
- 3) Instrumentation
- 4) Maturation
- 5) Regression
- 6) Mortality
- 7) Interactive effects

### **Threats to internal validity**

- 1) **History:** effect of external events on study outcomes
- 2) Testing
- 3) Instrumentation
- 4) Maturation
- 5) Regression
- 6) Mortality
- 7) Interactive effects

### **Threats to internal validity**

- 1) History
- 2) **Testing:** effect of being observed or tested on outcomes
- 3) Instrumentation
- 4) Maturation
- 5) Regression
- 6) Mortality
- 7) Interactive effects

### **Threats to internal validity**

- 1) History
- 2) Testing
- 3) **Instrumentation:** accuracy of the instrument & extent to which the instrument itself may be responsible for the outcomes
- 4) Maturation
- 5) Regression
- 6) Mortality
- 7) Interactive effects

### Threats to internal validity

- 1) History
- 2) Testing
- 3) Instrumentation
- 4) **Maturation:** effect of the passage of time
- 5) Regression
- 6) Mortality
- 7) Interactive effects

### Threats to internal validity

- 1) History
- 2) Testing
- 3) Instrumentation
- 4) Maturation
- 5) **Regression:** a statistical phenomenon, where extreme scores tend to cluster ('regress') closer to the mean upon repeated testing
- 6) Mortality
- 7) Interactive effects

### Threats to internal validity

- 1) History
- 2) Testing
- 3) Instrumentation
- 4) Maturation
- 5) Regression
- 6) **Mortality:** effect of subject attrition ('drop-out') before the study is completed
- 7) Interactive effects

### Threats to internal validity

- 1) History
- 2) Testing
- 3) Instrumentation
- 4) Maturation
- 5) Regression
- 6) Mortality
- 7) **Interactive effects:** extent to which any of these factors interacts with sample selection to influence outcomes

## Experimental Designs

### • Simple comparison

- 1 independent variable
  - What is being manipulated (exercise)
- 1 dependent variable
  - What is being measured (heart rate)

exercise	
0 minutes	15 minutes
<b>Heart rate</b>	
(pretest)	(posttest)

## Experimental Designs

### • Simple comparison

- 1 independent variable
  - What is being manipulated (exercise)
- 1 dependent variable
  - What is being measured (heart rate)

exercise	
0 minutes	15 minutes
<b>Heart rate</b>	
(pretest)	(posttest)

- Add control group for an 'experimental' design
  - Test at 0 minutes
  - Test again 15 minutes later, but without exercise

No exercise	
0 minutes	15 minutes
<b>Heart rate</b>	

## Experimental Designs

### • 2 x 2 design

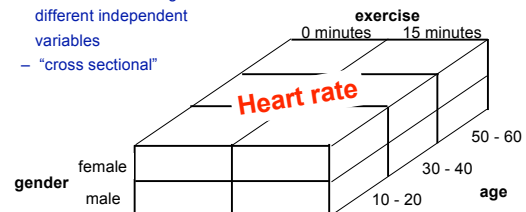
- 2 independent variables (exercise & gender)
- 2 levels of each independent variable
- 1 dependent variable (heart rate)

		exercise	
		0 minutes	15 minutes
gender	female		
	male	<b>Heart rate</b>	

## Experimental Design Variations

### • Factorial

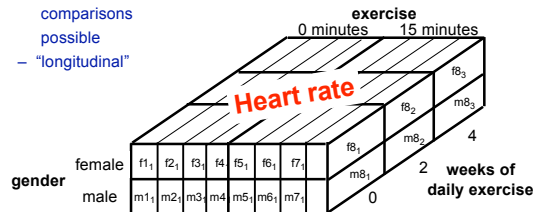
- Multiple comparisons possible
- Direct effects of each independent variable
- Interactions among different independent variables
- "cross sectional"



## Experimental Design Variations

- **Repeated measures**

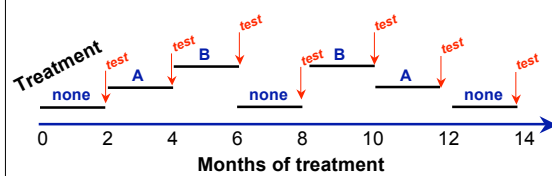
- Variation of factorial design
- Same subject measured at repeated intervals
- Within-subjects comparisons possible
- "longitudinal"



## Experimental Design Variations

- **Counterbalanced design**

- More than one manipulation tested (none, A, & B)
- Order of participation varied



## 'Non-Experimental' Approaches

- **Rely on statistical manipulation of data**
  - Useful when testing a concept or relations among constructs that naturally occur
- **Types:**
  - Surveys
  - Correlational designs
  - *Ex post facto* designs (conducted 'after-the-fact')
- **Can not determine 'causality'**
- **Can not generalize outside that sample**

## Naturalistic Inquiry

- Sometimes called 'Qualitative' research
- **Phenomena occur in natural settings**
- **Purpose is to observe without interacting**
- **Used to generate or describe theories**
  - *Not* used to test theories
  - *Not* used to establish causal relations ('associations' only)
- **Sequence of thinking and taking action can not be scripted, and is unique to each setting & question**

## Naturalistic Inquiry

- **Endogenous:** subject as researcher yields insider perspective
- **Participatory action:** generate knowledge to inform action
- **Critical theory:** understand experiences for social change
- **Phenomenology:** discover meaning of lived experience
- **Heuristic:** reveal personal & lived experience
- **Life history:** yield biographical experience
- **Ethnography:** understand culture
- **Grounded theory:** generate theories

## Participatory Action designs

- **Working within groups or communities to experience & describe issues, and promote problem resolution**
  - All individuals who are stakeholders in the problem or resolution are included in the research process
  - All participants are valued equally regardless of prior research experience
  - Historically, a research process aimed at decreasing societal oppression
  - Now, more often a systematic strategy that promotes expression of full human potential

## Participatory Action designs

- **Typically a cyclic process**
  - Identify a problem that calls for action
  - Identify stakeholders
  - Develop systematic inquiry process with stakeholders
  - Analyze outcomes with stakeholders
  - Plan a response
  - Implement the response
  - Repeat as needed...

## Case Studies

- **Useful when:**
  - Randomization is not possible or desirable
  - Insight into the phenomenon can't be studied by grouping across subjects
  - Determining an outcome or change over time in one or more individuals
  - It is necessary to obtain in-depth information
  - Generating theories

## Case Study designs

- **The nature of the phenomenon determines the type of case study**
  - The focus of the question determines who is observed

<b>Embedded</b>	<b>Holistic</b>
Ralphie	The family (including Ralphie)

## Case Study designs

- **Embedded**
  - Unit of analysis has naturally occurring parts (subunits) that will reveal relevant information
  - Members of a family  
*“Dynamics among individuals that may provoke family violence”*
- **Holistic**
  - More information if subunits are considered together
  - The family is observed & tested as a whole  
*“Family violence is a cultural phenomenon”*

## Case Study designs

- **The nature of the phenomenon determines the type of case study**
  - Number of cases observed as part of the study

	<b>Embedded</b>	<b>Holistic</b>
<b>Single-case</b>	Ralphie	The family (including Ralphie)
<b>Multiple-case</b>	Other kids like Ralphie	Other families like Ralphie's

## Case Study designs

- **Single-case design**
  - Generate theory
  - Describe an atypical phenomenon
  - Describe progress of an individual over time
  - Single-subject designs
- **Multiple-case design**
  - Examine same phenomenon across different cases
  - Test theory emerging from a single-case design
- **AB, ABA, ABAB designs**
  - **A:** baseline; multiple measures for stable baseline
  - **B:** a similar number of observations after intervention

## ***Problems***

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- **Experimental**
  - Limited ability to control variables
  - Findings may not generalize to complex settings
  - Outcome influenced by the process of being observed
  - Temptation to interpret artificial constructs as 'real'
- **Naturalistic**
  - Standardization of procedures is not possible
  - Data management & data reduction are difficult
  - This approach is time consuming & labor intensive
  - This approach is difficult in studying large populations

## ***Questions guiding design selection***

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- Does design allow the research question(s) to be answered?
- Does design adequately control all independent variables? Are extraneous variables present to confound interpretation?
- Does design maximize control and minimize bias
- Does design allow generalization to other subjects, settings or conditions?
- Is design limited by ethical & setting issues?

