Planning Your Research Design

1. Selecting the Best Design to Improve Internal Validity
2. Selecting Outcomes to Measure
3. Preparing for a Survey and Designing the Questionnaire

SELECTING THE BEST DESIGN TO IMPROVE INTERNAL VALIDITY

Selecting the Best Design to Improve Internal Validity

• From Adam Wendling, MD:
  – I have 20 residents I can use to compare use of Virtual Patients (VP) to Standardized Patients (SP) for detecting Sleep Apnea.
    • Option 1: Assign 20 to VP and use data from last year for SP group?
      Or...
    • Option 2: Should I assign 10 to the VP and 10 to the SP?
Option 1:

• Static Group Comparison:
  – This is a pre-experimental design
  – See Campbell & Stanley Tables for sources of invalidity
  – Note how it is diagramed:

```
X   O
```

Option 2:

• Randomized Post-test Control Design:
  – This is an experimental design
  – See Campbell & Stanley Tables for sources of invalidity
  – Note how it is diagramed:

```
R X O
```

Note this design is stronger than using a randomized pre-test post-test design!

SELECTING OUTCOMES TO MEASURE
Types of Outcomes

• Donebedian’s Tripartite Model of Quality
  – Used in health care, teaching, and other areas

• This model characterizes 3 important considerations in evaluating quality
  – Structure
  – Process
  – Outcomes

Types of Outcomes

• Structure
  – The “input”
    • Examples are attributes of the faculty, attributes of the students, the qualities of the learning environment
      (size of learning groups, facilities for learning, etc.)

Types of Outcomes

• Process
  – What happened during the learning period
    • Examples:
      – Did learners complete all of the learning activities available in the module?
      – How well did the instructor follow procedures for leading the small group?
Types of Outcomes

- Outcomes (Educational Outcomes)
  - What was achieved or what resulted from the learning activity?
    - Examples:
      - Performance: Did the learners achieve the pre-established performance criteria?
      - Attitudes: Did the learners like the experience?
      - General: How many students completed the module? How many students who completed the module passed the Boards?

What All 3 Types of Outcomes are Important
Structure & Process can Explain the Outcomes!

Survey Research Methods
Diane E Beck, Pharm.D.
Terminology

• Survey:
  – The research method by which a questionnaire or survey instrument is administered as the data collection tool.

• Questionnaire:
  – The instrument or data collection tool that is used in a survey.

10 Guiding Questions for Survey Research

• Question 1:
  – Does the author state a clearly defined research question?
    • A clearly defined research question will have a conceptual framework as a foundation.
    • This conceptual framework is essential for defining the “constructs” that you want to measure.

10 Guiding Questions for Survey Research

• Question 2:
  – Did the author use samples that represent the population?
    • How to have a sample that represents the population:
      – Clearly identify the target population
      – Identify a sample frame that represents the target population
      – Delineate the sample selection process:
        » Sampling method
        • Probability sampling is preferred (simple random, stratified, etc.)
        • Other options: Convenience, quota, snow-ball sampling
        (e.g., study subjects recruit from their acquaintances)
        » Determine the sample size needed (Henry, 1990; Cohen 1988)
10 Guiding Questions for Survey Research

• Question 3:
  – Did the author balance design costs with errors?
    • A large sample size requires multiple follow ups to achieve a good response rate.
    • If costs for using a large sample size are significant, it may be better to select a smaller sample size that can be more appropriately managed.

10 Guiding Questions for Survey Research

• Question 4:
  – What survey instrument did the author use?
    • The instrument needs to have evidence of validity and reliability.
      – This is most efficiently achieved by using a questionnaire that is psychometrically sound.
        » Reliability – the instrument measures the constructs/variables in a reproducible manner.
        » Validity – the instrument measures what it is intended to measure.
    • Use an appropriate scale and in the manuscript, describe the scale so that it can be interpreted by the reader.

10 Guiding Questions for Survey Research

• Question 4 - Contd:
  • Use an appropriate scale and in the manuscript, describe the scale so that it can be interpreted by the reader.
    – If using a previously published questionnaire, cite evidence of validity and reliability. Make sure it generalizes to your population. Also provide proper attribution.
    – If using a scale/items from a previously published questionnaire, provide justification that the subset is valid/reliable.
    – If developing your own questionnaire, explain how items were generated, selection of scales, and initial testing of psychometric properties.
10 Guiding Questions for Survey Research

Question 5:
– Did the author pretest the questionnaire?
  • How pretesting is done:
    – Have a focus group review the questionnaire to identify ambiguous questions/wording, unclear instructions, other problems.
    – This can be accomplished by verbal probing and think aloud.
  • Also do pilot testing (not the same as pretesting)
    – Pilot testing involves actual administration to assess the administration process and time needed to complete the survey.

Draugalis et al. AJPE 2008

Question 6:
– What quality controls did the author use?
  • State in the methodology whether questions that involved “omit” or “skip patterns” were used.
  • State whether a code book was used for data entry and organization.
  • Cite how data was verified (eg, spot checking against original surveys).

Draugalis et al. AJPE 2008

Question 7:
– Did the author achieve a sufficient response rate?
  • Define your response rate – example, use the following:
    – Response rate = Number of Respondents
      Number of Eligible Subjects
  • Provide details:
    – Flow of study subjects
    – Drop outs and exclusions
    – Item-level response rates/reasons if they are different
  • Response rate needs to be >60% (some journals accept at least 50%)

Draugalis et al. AJPE 2008
10 Guiding Questions for Survey Research

• Question 8:
  – Did the author appropriately state statistical, analytic, and reporting techniques?
    • Use the proper statistical technique
    • Provide sufficient detail so the reader can link the analysis results to the study hypotheses.
    • If open ended questions were used...cite how they were summarized.

Draugalis et al. AJPE 2008

• Question 9:
  – Did the authors state IRB approval was obtained?
    • State that IRB approval was obtained and the results (exempt, expedited) and how consent was obtained.

Draugalis et al. AJPE 2008

• Question 10:
  – Was the author’s methodology transparent enough that the study can be replicated by another researcher?
    • State that IRB approval was obtained and the results (exempt, expedited) and how consent was obtained.
    • Provide details such as whether administered via paper-pencil or electronic.

Draugalis et al. AJPE 2008
6 Steps for Conducting a Quality Survey

1. Plan the survey, including instrument development.
2. Conduct a pretest and pilot test (if needed).
3. Research and analyze the data.
4. Implement the survey – data collection.
5. Code data and prepare raw data.
6. Finalize the survey design.

A Few Words About Writing Questionnaire Items

• **Types of Items**
  – **Open-ended items**
    • Are exploratory or inductive
    • Require qualitative analysis to interpret
  – **Close-ended items**
    • More deductive
    • Easier for respondents to answer
    • Easier to tabulate

  Hulley SB et al. Designing Clinical Research, 2007

• **Tips for Formatting**
  – Provide directions that are clear. Provide an explanation of scales.
  – Group similar items using headlines
  – Start with easy to answer/emotionally neutral items.
  – Make sure the questionnaire is visually pleasing

  Hulley SB et al. Designing Clinical Research, 2007
A Few Words About Writing Questionnaire Items

• Tips for Wording of Items
  – Clarity
    • Items need to be clearly written.
      – Example: How much exercise do you usually get? Vs. How many hours do you spend in rigorous walking?

  – Simplicity
    • Example:
      – What drugs can you buy without a doctor’s prescription? Vs What over-the-counter medications do you take?

Hulley SB et al. Designing Clinical Research, 2007

A Few Words About Writing Questionnaire Items

• Tips for Wording of Items
  – Neutrality
    • Example:
      – During the last month, how often did you drink too much alcohol? Vs During the last month, how often did you drink more than 5 drinks in 1 day?

Hulley SB et al. Designing Clinical Research, 2007

A Few Words About Writing Questionnaire Items

• Tips for Wording of Items
  – Set the time frame clearly
    • How many times during the last week...

  – Avoid double-barreled questions

  – Avoid hidden assumptions
    • Example: “I felt that I could not shake off the blues even with help from my family”

  – Make sure question and answer options match

Hulley SB et al. Designing Clinical Research, 2007
Let’s Apply

• Critique the Survey Items

Summary

• Survey research requires attention to 10 key areas.

• The instrument/questionnaire needs to have evidence of validity/reliability.

• Response rates of at least 60% are expected by AJPE.

• If you develop your own questionnaire – make sure the items are well written.
TABLE 1

<table>
<thead>
<tr>
<th>Sources of Invalidity</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>History</td>
<td>Maturation</td>
</tr>
<tr>
<td>Pre-Experimental Designs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. One-Shot Case Study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. One-Group Pretest-Posttest Design</td>
<td>-</td>
<td>-</td>
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<tr>
<td>3. Static-Group Comparison</td>
<td>+</td>
<td>?</td>
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<tr>
<td>True Experimental Designs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pretest-Posttest Control Group Design</td>
<td>+</td>
<td>+</td>
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<tr>
<td>5. Solomon Four-Group Design</td>
<td>+</td>
<td>+</td>
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<tr>
<td>6. Posttest-Only Control Group Design</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- = This is a source of invalidity
+ = The design overcomes the source of invalidity

### Table 2

**Sources of Invalidity for Quasi-Experimental Designs 7 through 12**

<table>
<thead>
<tr>
<th>Quasi-Experimental Designs</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7. Time Series</strong></td>
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<tr>
<td>0 O O O O X O O O O</td>
<td>− + + + ? + + + + +</td>
<td>− ? ?</td>
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<tr>
<td><strong>8. Equivalent Time</strong></td>
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<tr>
<td>Samples Design</td>
<td></td>
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<tr>
<td>X O X O X O X O, etc.</td>
<td></td>
<td></td>
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<tr>
<td><strong>9. Equivalent Materials</strong></td>
<td></td>
<td></td>
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<tr>
<td>Samples Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M O M O M O M O M O, etc.</td>
<td></td>
<td></td>
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<tr>
<td><strong>10. Nonequivalent Control</strong></td>
<td></td>
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<tr>
<td>Group Design</td>
<td>+ + + + ? + + + +</td>
<td>− ? ?</td>
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<tr>
<td>O X O</td>
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<tr>
<td><strong>11. Counterbalanced</strong></td>
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<tr>
<td>Designs</td>
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<tr>
<td>X O X O X O X O X O</td>
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<td>− ? ? ? −</td>
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<tr>
<td>X O X O X O X O X O</td>
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<tr>
<td><strong>12. Separate-Sample</strong></td>
<td></td>
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<tr>
<td>Pretest-Posttest Design</td>
<td></td>
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<tr>
<td>R O (X)</td>
<td></td>
<td></td>
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<tr>
<td>R R</td>
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<tr>
<td><strong>12a. R O (X)</strong></td>
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<tr>
<td>R X</td>
<td>+ − + ? + + − +</td>
<td>+ + +</td>
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<tr>
<td>R R</td>
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<td></td>
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<tr>
<td><strong>12b. R O (X)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R X</td>
<td>+ − + ? + + − +</td>
<td>+ + +</td>
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<tr>
<td>R R</td>
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<td></td>
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<tr>
<td><strong>12c. R O (X)</strong></td>
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</tr>
<tr>
<td>R X</td>
<td>+ − + ? + + − +</td>
<td>+ + +</td>
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<tr>
<td>R R</td>
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</tbody>
</table>

Student Professionalism Survey

1. Which campus do you attend?

2. What makes a pharmacist unprofessional?

3. Which of the following activities have you participated in? (check all that apply)
   i. SAMA
   ii. IFH
   iii. Volunteered at a hospital
   iv. Attended AMA Meeting
   v. Other: ______________________________

4. How often do you get with classmates to work on a group assignment?
   a. 1 or more times a day
   b. 1-4 times per week
   c. 1 – 3 times a month
   d. Less than once a month

5. Indicate the extent that you agree with the following where:
   SA = Strongly Agree   A = Agree   N = Neutral   D = Disagree   SA = Strongly Agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians are expected to disclose all medical errors to patients.</td>
<td></td>
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</tr>
<tr>
<td>Physicians should help a patient acquire care although the patient cannot pay for them.</td>
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<tr>
<td>Physicians should be licensed and undergo recertification several times during their career.</td>
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<tr>
<td>Physicians should maintain patient trust by managing conflicts of interest.</td>
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<tr>
<td>Physicians should report all instances of significantly impaired colleagues and also self-report themselves.</td>
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<tr>
<td>Physicians should self-report all medical errors they observe even though there is no evidence the patient was harmed.</td>
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<td></td>
</tr>
</tbody>
</table>

6. What is your age?
   a. <20 years
b. 20 – 25 years  
c. 25 – 30 years  
d. 30 – 35 years  
e. >35 years

7. Answer the following where:
   1 = Most of the time   2 = Often   3 = sometimes   4 = Rarely   5 = Almost Never

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I panic when I have to face someone who is angry.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I have a personal problem, I cannot think of anything else.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel like I worry about things that other people don’t even think about.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am ashamed of how I look or behave.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>