Basic Methods II

Rival Hypotheses

I. Burden of Proof
   A. Burden of proof:
      For any statement in science (psychology) lies on the investigator. If I say that X causes Y, then it is up to me to convince you of this fact.
   B. Proof requires:
      That I not only show how X and Y are related, but that I show that that relation exist with all else equal.

II. Two Basic Research Designs

III. Threats to Internal Validity

IV. Summary
I. Burden of Proof

C. Alternative Explanations:
Demonstrating that other factors are not responsible for the observed relation between X and Y requires that I rule out any plausible alternative explanations of the findings.

Alternative Explanations = Rival Hypotheses

II. Two Basic Research Designs

A. Within Subjects Comparisons

Observation 1 - Treatment - Observation 2

Example:
Homework - Reward - Homework

B. Between Subjects Comparisons

Group 1 (control): - Observation
Group 2 (Exp.): Treatment Observation
II. Two Basic Research Designs

C. Each design has its own strengths and weaknesses.

Each design is susceptible to different threats to internal validity.

III. Threats to Validity

A. The seven mortal sins
   (Catholic Church)
   Avarice
   Gluttony
   Envy
   Pride
   Anger
   Lust
   Sloth

B. Eight deadly sins of a researcher
   - each represents an alternative explanation of your results

M I S S M I T H
Maturation

Any systematic changes that occur over time, and are thus confounded with the treatment.

Hypothesis:
Observe Treatment Observe

Alternative:
Observe time Observe

Instrumentation (Instrument Decay):
Changes that occur in the measuring device (instrument) during the course of the research that are confounded with treatment.

Hypothesis:
Observe Treatment Observe

Alternative:
Observe Instrument Change Observe
Selection
Systematic differences between the comparison groups as a result of how participants were placed in (selected for) the groups.

Hypothesis: Alternative:
Group 1: Control 1 sub-population
Group 2: Treatment 2nd sub-population

Statistical Regression
Between a first and a second assessment, extreme scores tend to shift toward the mean or the average.

Hypothesis: Alternative:
Observe Treatment Observe
Observe Statistical Regression Observe

Statistical Regression
Example: Give children a test of reading ability. Select those children who score particularly low on the test (below the mean). These children are then placed in a reading program. After the program is over, the reading test is administered again.
Statistical Regression

How it works
An individual's scores on a test varies from test to test.

Low    True Score    High

Frequency

Statistical Regression

If you specifically select participants who scored low on a first test ....

Low    True Score    High

Statistical Regression

... it is most probable that they will score higher on the next test.

Low    True Score    High

Frequency
**M I S S M I T H**

**Mortality (Attrition)**
Loss of research participants during the course of the study contaminate the results.

<table>
<thead>
<tr>
<th>Hypothesis:</th>
<th>Treatment</th>
<th>Observe</th>
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</thead>
<tbody>
<tr>
<td>Alternative:</td>
<td>Loss of Participants</td>
<td>Observe</td>
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</tbody>
</table>

Example: smoking cessation

**M I S S M I T H**

**Imitation of Treatments (carry-over)**
The results of a treatment effect are allowed to contaminate (carry-over) to other conditions.

<table>
<thead>
<tr>
<th>Hypothesis:</th>
<th>Alternative:</th>
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</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>Treatment 1</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>Knowledge of Treatment 1</td>
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</tbody>
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**M I S S M I T H**

**Testing**
Repeated measurement of the same individual may impact a person's score on the test.

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<th>Treatment</th>
<th>Observe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative:</td>
<td>Impact of first observation</td>
<td>Observe</td>
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</table>
**Hypothesis:**

Events that take place during the course of research that influence the outcome of the study.

**Observation**

**Treatment**

**Observation**

**Alternative:**

Observation (historical event) Observation

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**IV. Summary**

A. The burden of proof is on the researcher to rule out alternative explanation of results.

B. There are eight major threats to internal validity that represent alternative explanations.

C. These can be summarized by the acronym: MIS SMITH

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**M I S S M I T H**

Maturation
Instrumentation
Selection
Statistical Regression
Mortality
Imitation of Treatments
Testing
History