

## Basic Methods II

### Rival Hypotheses

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## Basic Methods II Rival Hypotheses

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- I. Burden of Proof
- II. Two Basic Research Designs
- III. Threats to Internal Validity
- IV. Summary

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## I. Burden of Proof

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- 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.

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## I. Burden of Proof

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### 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

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## II. Two Basic Research Designs

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### A. Within Subjects Comparisons

Observation 1 - Treatment - Observation 2

Example:

Homework - Reward - Homework

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## II. Two Basic Research Designs

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### B. Between Subjects Comparisons

Group 1 (control): - Observation

Group 2 ( Exp.): Treatment Observation

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## II. Two Basic Research Designs

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C. Each design has its own strengths and weaknesses.

Each design is susceptible to different threats to internal validity.

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## III. Threats to Validity

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A. The seven mortal sins  
(Catholic Church)

- Avarice
- Gluttony
- Envy
- Pride
- Anger
- Lust
- Sloth

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## III. Threats to Validity

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

M I S S M I T H

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

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Maturation  
Instrumentation  
Selection  
Statistical Regression  
Mortality  
Imitation of Treatments  
Testing  
History

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

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

Hypothesis:  
Observe Treatment Observe

Alternative:  
Observe time Observe

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

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**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

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# MIS SMITH

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## Selection

Systematic differences between the comparison groups as a result of how participants were placed in (selected for) the groups.

Hypothesis:

Group 1 : Control

Group 2 : Treatment

Alternative:

1 sub-population

2nd sub-population

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# MIS SMITH

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## Statistical Regression

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

Hypothesis:

Observe

Treatment

Observe

Alternative:

Observe

Statistical Regression

Observe

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## Statistical Regression

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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.

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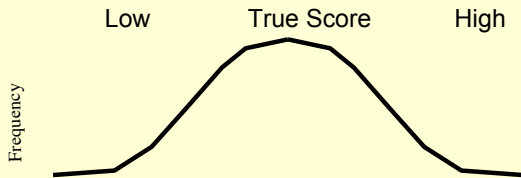
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## Statistical Regression

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How it works

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



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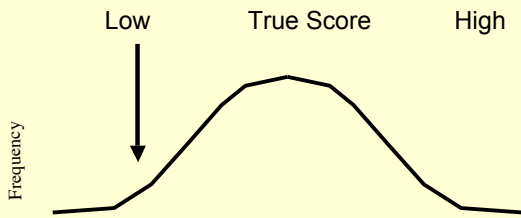
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## Statistical Regression

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



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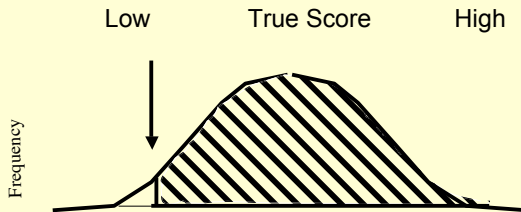
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## Statistical Regression

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



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M I S S M I T H 19

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

Hypothesis:  
 Observe            Treatment            Observe

Alternative:  
 Observe    Loss of Participants    Observe

Example: smoking cessation

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M I S S M I T H 20

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

Hypothesis:                      Alternative:  
 Treatment 1                      Treatment 1  
 Treatment 2                      Knowledge of Treatment 1

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M I S S M I T H 21

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

Hypothesis:  
 Observe            Treatment            Observe

Alternative:  
 Observe    Impact of first observation    Observe

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## M I S S M I T H

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

Hypothesis:  
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

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