

## CORRELATION

### General Concept:

You measure variables in pairs

For example

### First Question:

Do two variables...

**Example:** IQ and Big Toe Length

You measure each person two ways

(You don't have to copy the data in your notes, just get the idea)

**Conclusion:**

**Second Question:**

If the two variables are related...

**Do they vary positively (directly)?**

Example: Height and Weight

**Or do they vary negatively (inversely)?**

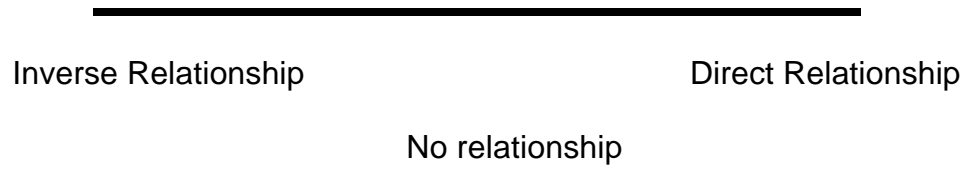
Example: Golf scores and Years of play

**CORRELATIONAL ANALYSIS**

**CORRELATION COEFFICIENTS**

Pearson Product Moment Correlation Coefficient ( $r$ )

Range:



**Examples**

direct or positive

inverse or negative

zero

Perfect positive

Perfect negative

## **Scatterplots**

Constructing a scatterplot

Health & Exercise example

**PEARSON PRODUCT MOMENT CORRELATION COEFFICIENT**

Formula

Example

**FACTORS AFFECTING THE SIZE OF THE CORRELATION COEFFICIENT**

Nonlinear relations

Truncated (restricted) range

Outliers

**True Experiments versus Quasi-experiments versus Correlational studies**

Generally, for statistical procedures we group True and quasi-experiments together. These take generally require the same kinds of procedures

Correlational studies generally use different kinds of statistical procedures than do True or Quasi-experiments

True Experiment

Quasi-Experiment

Correlational Study

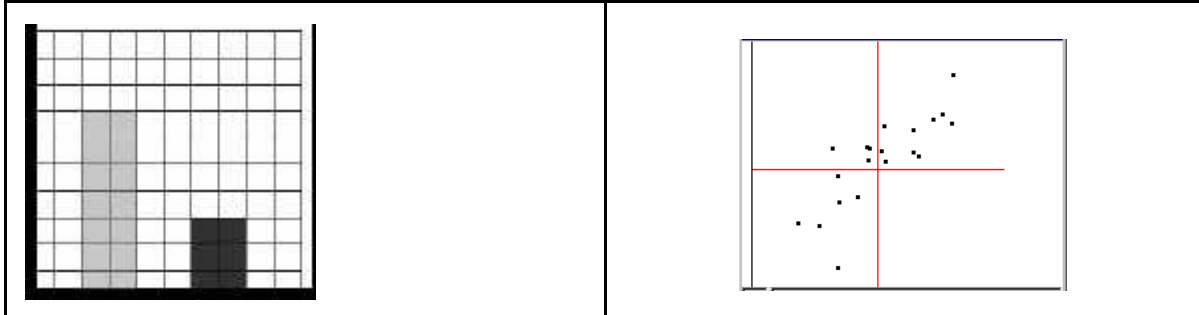
In the Interface to Science lecture we talked about Independent Variables (IV's) and Dependent Variables (DV's). Review IV's and DV's if you need to. Remember that terms, Dependent Variable and Criterion Variable, are often used interchangeably.

**Stress and Sleep Example**

What does stress have to do with sleep disruption? The question includes two variables, stress and sleep disruption. To examine how this question can be pursued in both a true experiment and a correlational study, we will develop two parallel examples. In both cases sleep disruption will be a DV. But stress will be an IV in the true experiment and a DV in the correlational study.

So the same variable, stress, might be an IV or a DV, depending on how the study is run.

True Experiment	Correlational Study
<p><b>The effects of Stress on Sleep</b></p> <p><b>Purpose:</b> To determine if changes in stress level (IV) cause changes in sleep disruption (DV).</p>	<p><b>The association between Stress and Sleep</b></p> <p><b>Purpose:</b> To discover if there is a link between stress levels (DV) and sleep disruption (DV).</p>
<p>A group of scientist hypothesize that high levels of stress will disrupt sleep. They take lab rats and randomly divide them into two groups. The High Stress group is given occasional, harmless but annoying electrical shocks through their metal cages. The occurrence of the shock is unpredictable.</p> <p>The No Stress control group just live in their cages as they normally do. No shock is given during the sleep cycle in either group. The rats are observed during their sleep cycle, and the number of sleep disruptions is counted.</p> <p>When the study is over, the scientists have one measure (sleep disruption) on each rat. They also know which group each rat was in.</p>	<p>A group of scientists hypothesize that there is a relationship between stress level and sleep disruption.</p> <p>They ask a group of 20 human volunteers to rate the stress level of their lives during the last month. They also ask the volunteers to count the number of nights in the last month that their sleep is seriously disrupted.</p> <p>When the study is over, the scientists have two measurements on each person (self-rated stress level, and number of disrupted nights of sleep).</p>

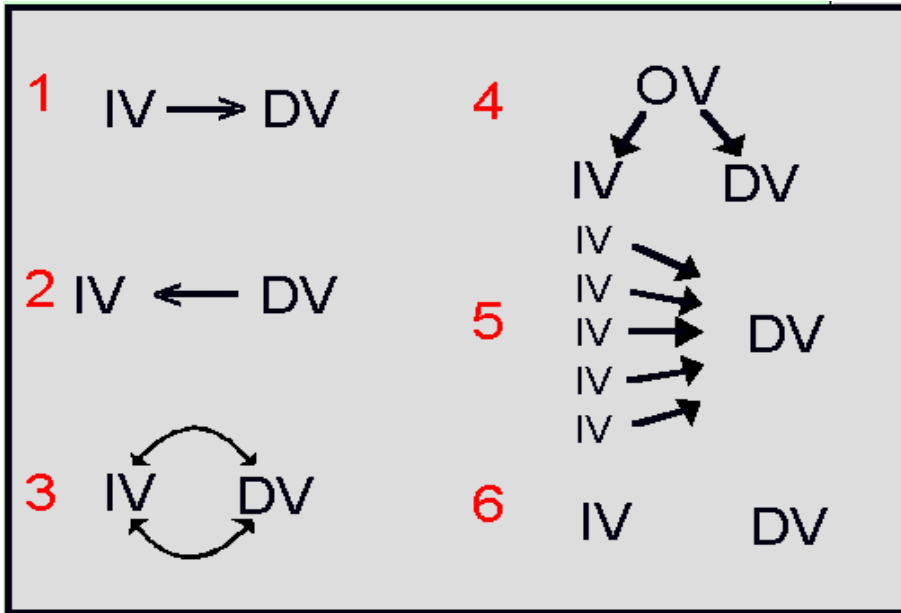


Results

**Summary of differences between a true experiment and a correlational study**

1	1
2	2
3	3

**Why is the Distinction between true experiments and correlational studies matter?**



**Correlational studies and inferences about causation**

Suppose the Scientific hypothesis is that the IV causes changes in the DV

(IV) Person A' rude behavior causes an increase in (DV) Person B's anger

Six Possibilities

- 1 Scientific Hypothesis is true: IV causes DV
  
2. PCH: Reverse causality
  
3. PCH: Dynamic system (mutual causality)
  
4. PCH: 3<sup>rd</sup> variable causes both IV and DV to vary
  
5. PCH: Multiple causality
  
- 6: PCH: Chance (observed relationship occurred randomly)

### **Classical Causation Logic**

TIME RELATIONS

CORRELATION

NO PLAUSIBLE COMPETING HYPOTHESES