# 1.2 Hypothesis Testing

- The most powerful way to test hypotheses: do **experiments**

# 1.2 Hypothesis Testing



## Controlled Experiments

- People who received echinacea tea felt that it was 33% more effective at reducing symptoms.

(a)

| Control group | Experimental group |
|---|---|
| Experiencing early cold symptoms | Experiencing early cold symptoms |
| Sought treatment from clinic | Sought treatment from clinic |
| Received **placebo** tea | Received **echinacea** tea |

(b)

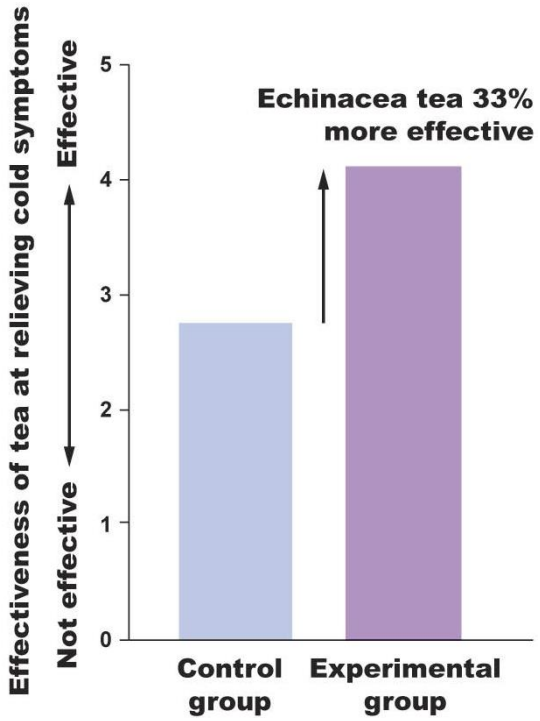




Figure 1.7

# 1.2 Hypothesis Testing



## Minimizing Bias in Experimental Design

- If human subjects know whether they have received the real treatment or a placebo, they may be biased.
- **Blind experiment:** subjects don't know what kind of treatment they have received
- **Double blinding:** the person administering the treatments also doesn't know until after the experiment is over
- Double blind, placebo-controlled, **randomized** experiment is the "gold standard"

# 1.2 Hypothesis Testing



- To summarize….
- Eliminating **bias** (a predetermined idea) is done by using blind or double blind experiment.
- **Randomize** to make sure the sample represents the population

# 1.3 Understanding Statistics



## Overview: What Statistical Tests Can Tell Us

- Statistics is a branch of mathematics used to compare and understand data
- Can we extend the results from small samples to an entire population?
  - This can be done if the small sample is a good representation of the population.
  - This is done by **random sampling**.

# 1.3 Understanding Statistics



**Factors that Influence Statistical Significance**

- Sample size
- The true difference between populations
- Bigger is better: more likely to detect differences