

## Experimental Methods: Establishing Cause & Effect



Image source: Classics of Western Literature, Bloom County 1986-1989, (1990), Berke Breathed

Opus believes that the reason why the woman rejects his “marriage proposal” was due to the hat he was wearing

However, there are other factors that could have led to his rejection such as

- Dropping her career
- Moving to Antarctica
- Raising ten kids
- Laving him with love and devotion between poker games throughout old age

Without systematically examining each factor, it is difficult which one(s) led to the rejection.

Experiments attempt to systematically examine each factor that may be responsible for a particular phenomenon (increases internal validity). However, doing so may create conditions that do not mimic the real world since multiple factors pull at us at once (decreases external validity).

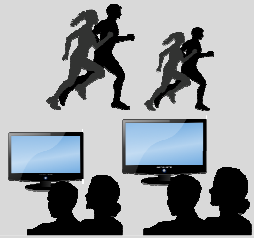
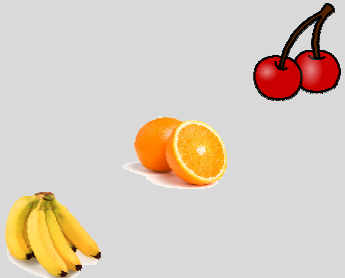
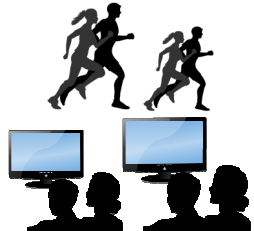

## **Experiments: Examining Cause and Effect**

An experiment is a research method of investigation used to demonstrate cause-and-effect relationships by purposely manipulating one factor (independent variable) thought to produce change in another factor (dependent variable) ([page 25](#)). There must be at least two groups (an experimental and control group to compare).

## Experiments


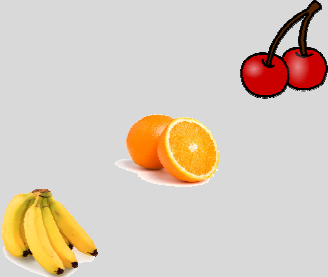
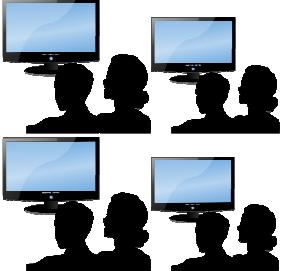

To determine if eating more fruit causes lower cholesterol levels, we would need to do an experiment where we manipulate (or change) one of the variables and randomly assign participants to an experimental condition. Random assignment reduces any pre-existing variables we can't account for.

We randomly assign participants to either eat a lot of fruit, or eat a little bit of fruit (this is the variable manipulation) and measure their cholesterol levels.

		have	Lower cholesterol
		have	Higher cholesterol

## Correlations

We cannot determine cause and effect relationships with only a correlational study that measures/observes variables. In this case, a third variable could cause changes in both variables—the amount of fruit eating and cholesterol levels—such as lifestyle.

We measure or observe how much fruit they eat, and measure and observe their cholesterol levels, and can find that those who eat more fruit have lower cholesterol levels than those who eat less fruit.			
Amount of exercise	Amount of fruit eaten		Cholesterol level
		have	Lower cholesterol
		have	Higher cholesterol

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- Dependent Variable: Aggressiveness

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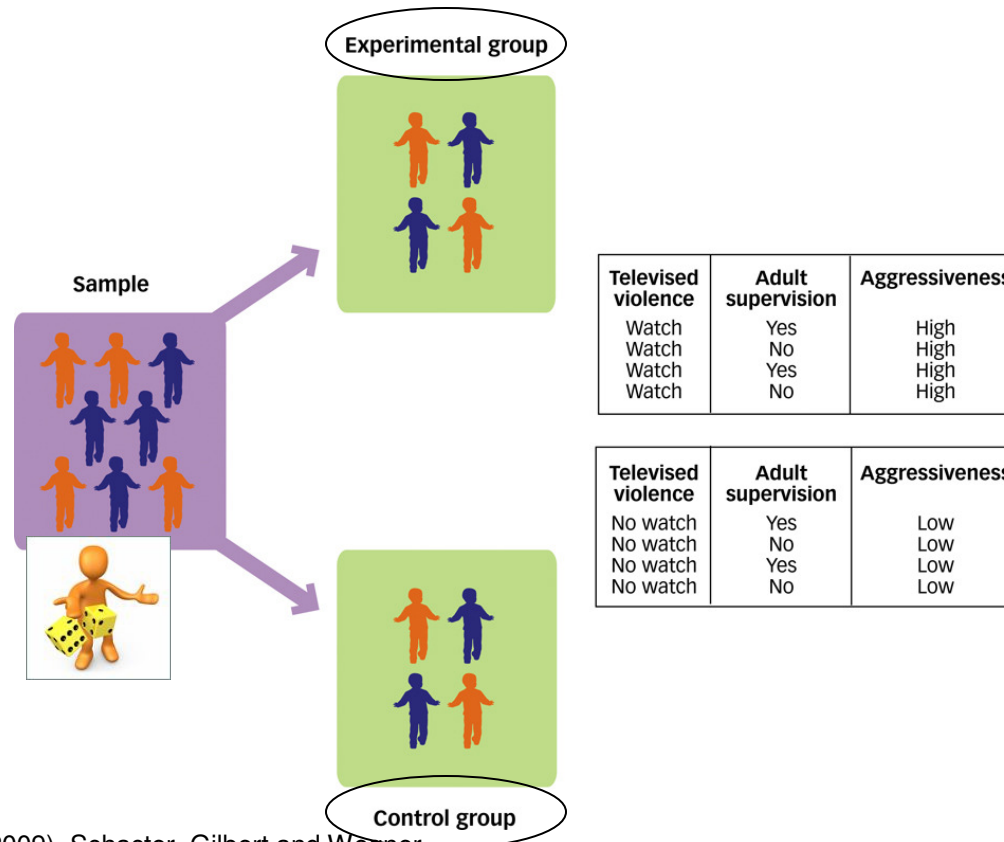


Image Source: Psychology (2009), Schacter, Gilbert and Wegner

## Examples of Experiments:

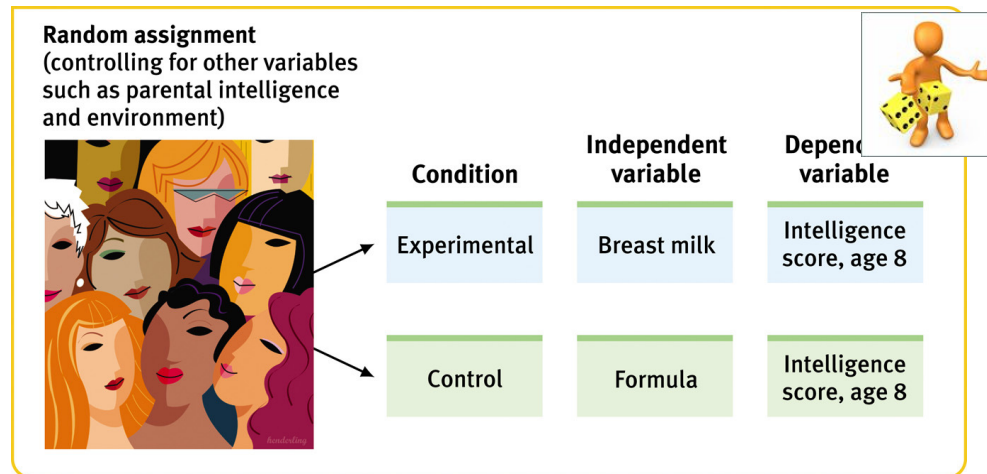


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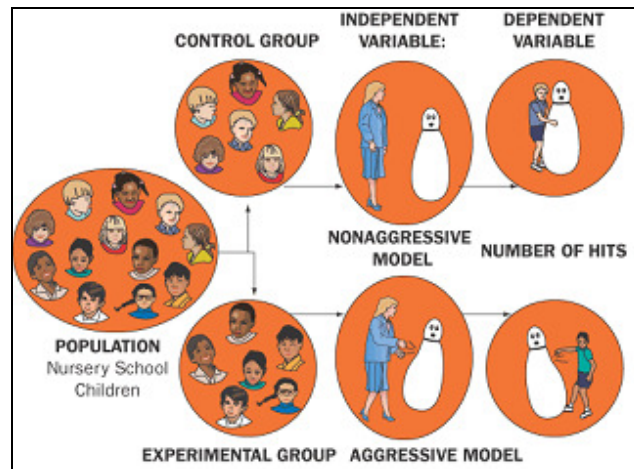


Image source: Psychology (), David and Pallidino



- Does watching violent television lead to more aggressive behavior? Two groups randomly assigned: one group watches 24 (violent TV) and the other watches Sesame Street (nonviolent TV); compare the probability of violent behavior by members of the two groups
  - IV = type of television program
  - DV = violent behavior
- Does oat bran reduce cholesterol levels?
  - IV = presence or amount of oat bran
  - DV = cholesterol levels
- Does taking vitamin C reduce the number of colds?
  - IV =
  - DV =
- Which of two new anti-depressants is more effective in treating major depression?
- Developmental psychologists want to know if exposing children to public television improves their reading skills.
- A pizza parlor wants to know if changing the number of toppings increases sales.
- A Social psychologist wants to know whether being polite or rude to people tends to make them more cooperative.

### Strengths:

- Cause-and-effect relationships can be established.
- Precise control can be exerted over other, potentially confounding variables.

### Weaknesses:

- Results can be subject to several sources of bias (eg. experimenter effects or demand characteristics).
- Generalizability can be doubtful if behavior is observed under highly artificial conditions that may inhibit the natural behavior of subjects and may not generalize to the “real-world”.
- In some cases, experimentation may be unethical, such as with patients with brain damage.

## **Experiment vs. Correlations**


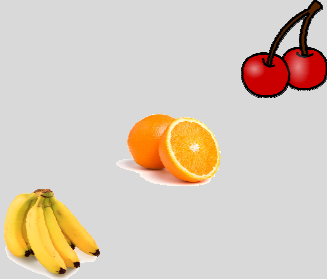
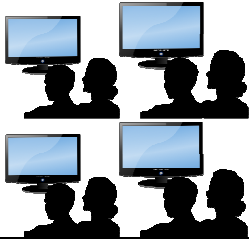


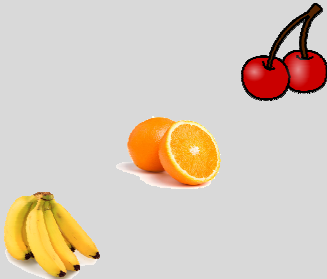
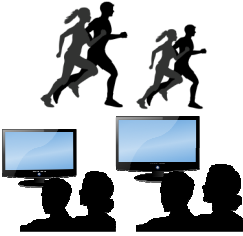

The main difference between experiments and correlations is how the data was collected in the study.

- Experiments: At least one variable was manipulated.
- Correlations: None of the variables were manipulated. All variables that we measured/assessed were naturally occurring.

## Experiment vs. Correlations

	<u>Correlations</u>	<u>Experiments</u>
• Measures two or more variables	X	X
• Determines relations between variables	X	X
• Has a hypothesis	X	X
• Manipulates a variable to establish cause and effect		X
• Observes naturally occurring variables	X	
	• Do people who take vitamin C have fewer colds?	• Does taking vitamin C reduce the number of colds?
	• Do those who eat oat bran have lower cholesterol?	• Does eating oat bran reduce cholesterol levels?

## Correlations versus Experiments

<p><b>Correlations</b> measure pre-existing variables. If there is a relationship, it could be due to another variable.</p>			have	Lower cholesterol
			have	Higher cholesterol
<p><b>Experiments</b> manipulate one variable to establish cause and effect relationships.</p> <p>Think <b>cause</b>, think <b>experiments</b></p>			have	Lower cholesterol
			have	Higher cholesterol

## **Is this an Experiment or Correlation?**

A study was done with some safety equipment. Would the safety equipment interfere with how enjoyable participants engaged in the activity?

Does using a condom interfere with people experiencing pleasure during sex? A study was done that found that whether or not you use a condom, there is no reported difference in pleasure

- Is it more likely that this study was an experiment or a correlation?

Before answering the question and just responding, think about the following:

- (1) What is an experiment?
- (2) What is a correlation?
- (3) What is the difference between an experiment and correlation?

How would you conduct an experiment to see if gender effects how many cats are adopted?

## **Difficulties can occur in interpreting the meaning of empirical evidence and conducting experiments**

Like with many research methods, there are other factors affecting people's behavior other than the ones you take into account. Some common problems that social scientists have to take into account are

- Pre-existing differences
- Expectations or beliefs of the participants
- Expectations or beliefs of the researcher

### Pre-existing differences:

- Participants may differ on many different factors such as gender, age, political affiliation, educational level, income levels...
  - To reduce the effect of pre-existing differences between groups, researchers randomly assign participants to the control or experimental group so that individual differences are not likely to be a factor in any differences in the outcome (the dependent variable).

## Difficulties can occur in interpreting the meaning of empirical evidence and conducting experiments

Expectancy effects—beliefs by the participants: The expectations of the participant influence the participant's behavior. Participants can make an educated guess about the hypothesis of a study or about how they are to behave and unconsciously change their behavior to match that of the hypothesis.

- For example, if participants are told to drink alcoholic drinks that smell or taste like alcoholic drinks (even if it isn't alcoholic) might act as if they are intoxicated.
- Placebo treatments are used to identify whether or not expectations influences the outcome.

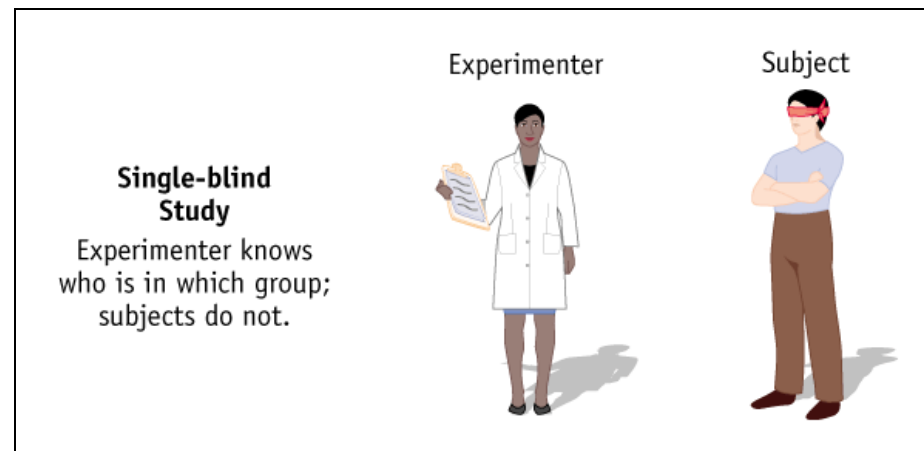


Image source: Wade and Tavris



## The Hawthorne Effect

When observing people and you are visibly observing people, the person being observed might alter their behavior. This is called reactivity ([page 45](#)).

**Hypothesis:** Being observed can lead participants to change their behavior.

**Research Method:**

- 1** During studies of the effects of workplace conditions, the researchers manipulated several independent variables, such as the levels of lighting, pay incentives, and break schedules.
- 2** The researchers then measured the dependent variable, the speed at which workers did their jobs.



**Results:** The workers' productivity increased when they were being observed, regardless of the change to the independent variable.

**Conclusion:** Being observed can lead participants to change their behavior because people often act in particular ways to make positive impressions.

**Source:** Roethlisberger, F. J., & Dickson, W. J. (1939). *Management and the worker: An account of a research program conducted by the Western Electric Company, Hawthorne Works, Chicago*. Cambridge, MA: Harvard University Press.

Psychological Science, 4/e Figure 2.13  
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Hawthorn effect\*: Changes in behavior are produced when people know they are being observed.

## Reactivity and Behavior

A person who is nice to you, but rude to the waiter,  
is not a nice person.

– Dave Barry



More funny pictures at [Dudelol.com](http://Dudelol.com)

When you are out on a date, you know you should be nice to the other person. That is expected. We act consistently with that expectation.

However, are we expected to treat a waiter (or waitress) nice?

## Difficulties can occur in interpreting the meaning of empirical evidence and conducting experiments

Expectations or Beliefs: Beliefs we have influence what we see and don't see, how we interpret evidence and the standards we use when evaluating the evidence.

- Demand characteristics—beliefs by the experimenter: The behavior of the researcher influences the behavior of the participants in a way that is consistent with their hypothesis. These behaviors are often subtle and unintentional.
  - For example, researchers might be more empathic to participants who receive a drug that is supposed to help them.
  - Double-blind studies are used to reduce the expectancy effects.

