

PSYCHOLOGY AS A SCIENCE

“Psychology is a science.” What does this mean? Psychologists function as scientists in an attempt to:

- (1) gather data from events they have observed, and
- (2) search for and confirm explanations of the event that they observed.

Psychology is the “scientific study of behavior and mental processes.” Psychologists seek lawful relationships about observable and cognitive behavior. They do this by relying on the **scientific method**. This method consists of a set of procedures in which researchers identify problems, gather data, draw conclusions about (causal) relationships, and then test the accuracy of those conclusions.

The first step in this endeavor involves the formulation of testable **hypotheses**. A hypothesis is a statement about the relationship between two (or more) factors, such as “X causes Y.” The two factors are called **variables**. Variables can be characteristics that differ among people, objects, or events over time or in quantity. We can distinguish four different kinds of variables. These are:

- **Independent variable:** a factor that can be manipulated, changed, or varied by the experimenter to see if it causes change in some other factor. For example, amount of practice with a particular video game program (no practice, one hour of practice) might be manipulated to examine its effect on math performance. The independent variable is hypothesized to be the “cause” of the change.
- **Dependent variable:** the factor that is being observed by the experimenter to see whether or not it changes as a function of the changes in the independent variable. For example, performance on a math test as a function of amount of practice on a video game would be a dependent variable. The dependent variable is where the “effect” is seen.
- **Control variables:** factors that are not allowed to vary but are held constant throughout the course of the experiment. If not held constant, these factors might affect the dependent variable. For example, we need to make sure that the group given the video game practice does not differ from the group given no practice. Random assignment of participants to the two groups is a control.
- **Confounding variables:** factors that represent a potential alternative explanation to the findings. For example, if members of one group had more math experience than members of the other group, previous experience might be what affects math performance rather than amount of video game practice. We need to *control* potential confounding variables.

A good experiment is one in which the *independent* variable is manipulated, all other possible variables are held constant (*controlled*), and the *dependent* variable is observed to see whether or not it changes as a result of changes in the *independent* variable.

Psychologists use a variety of methods to gather data and test hypotheses. The methods can be grouped into three main kinds of research: **descriptive, correlational, and experimental**. In lab, we will discuss correlational and experimental approaches.

Correlational Approaches

Correlations measure the **degree of relationship** between two variables. Specifically, correlations summarize the strength and direction of the relationship.

- **Positive correlation:** when increases in one variable (X) are associated with increases in another variable (Y). For example, as amount of time studying (X) increases, test scores (Y) increase.
- **Negative correlation:** when increases in one variable (X) are associated with decreases in another variable (Y). For example, as amount of time studying (X) increases, number of errors on a test (Y) decreases.

A correlation describes a relationship between two variables but it does **not** show that one variable **caused** the change in the other variable. **Correlation does not mean causation.**

Experimental Methods

The experimental method involves manipulating, controlling, and measuring variables. Scientists want their observations to be reliable (replicable) and their hypotheses to be valid (accurate). Scientists systematically vary the independent variable(s) and then observe whether or not the systematic changes bring about a change in the dependent variable. At the same time, every other factor which may possibly affect the dependent variable is held constant. If systematic changes in the dependent variable are found (and there are no simultaneous changes in any other factors), we can conclude that the independent variable **caused** the change in the dependent variable.

This is the only method by which **causal inference**, or an inference about a causal relationship between two variables, can be made.

(adapted from Gorman-Rose, J., Warren, E., & Ulsh Lee, H. (2004). *Laboratory manual for introductory psychology*. Connecticut College, New London, CT: Unpublished.)