

## RESEARCH

### I. THINKING CRITICALLY ABOUT PSYCHOLOGY (OR ANYTHING ELSE)

Critical thinking is the process of assessing claims or assertions and making judgments about them on the basis of well-supported evidence. You can use the following set of questions to think critically about any topic:

- *What am I being asked to believe or accept? What is the hypothesis?*
- *What evidence is available to support the assertion?*
- *Are there alternative ways of interpreting the evidence?*
- *What additional evidence would help to evaluate the alternatives?*
- *What conclusions are most reasonable?*

#### F. Critical Thinking and Scientific Research

Psychologists investigate phenomena they are curious about by formulating hypotheses, which are testable propositions. As critical thinkers, scientists look for reliable, valid evidence, or data, that either supports or contradicts their hypothesis. Operational definitions are used to describe the methods used and the variables studied in the research.

#### G. The Role of Theories

A theory is an integrated set of tentative explanations of behavior and mental processes. The results of testing hypotheses are used to build or evaluate theories, which in turn create new hypotheses to be studied. As a result, theories are constantly being formulated, evaluated, revised, and evaluated again.

### II. RESEARCH METHODS IN PSYCHOLOGY

Psychologists strive to attain four goals when researching a psychological phenomenon:

*Describe* the phenomenon by gathering information about it.

Make *predictions* and formulate hypotheses about the phenomenon.

*Control* variables to eliminate alternative hypotheses and establish cause and effect.

*Explain* the phenomenon.

#### . Naturalistic Observation: Watching Behavior

Psychologists use naturalistic observation when they observe a phenomenon, without interfering, as it occurs in its natural environment.

#### A. Case Studies: Taking a Closer Look

A case study is an intensive examination of a phenomenon in a particular individual, group, or situation, often combining observations, interviews, tests, and analyses of written records. Case studies are used to describe a phenomenon.

#### B. Surveys: Looking at the Big Picture

Surveys involve asking people questions, in interviews or questionnaires, in order to obtain descriptions of behavior, attitudes, beliefs, opinions, and intentions.

- C. **Correlational Studies: Looking for Relationships**  
Correlational studies examine relationships between variables in order to describe research data, test predictions, evaluate theories, and suggest hypotheses. Correlational studies do not involve manipulating variables, but rather measure numerous variables in tandem, and test for co-relations between them.
- D. **Experiments: Exploring Cause and Effect**  
Psychologists use experiments to establish cause-effect relationships between variables and to help them choose among alternative hypotheses to explain a given phenomenon.

Experiments allow researchers to manipulate or control one variable to observe the effect of that manipulation on another variable, while holding all other variables constant. In an experiment, the variable manipulated or controlled by the researcher is called the independent variable. The measurement of the consequences is called the dependent variable.

Experiments have at least two groups of subjects: the experimental group and the control group. The control group receives no treatment, thus providing a baseline against which to compare the experimental group. The experimental group experiences the independent variable. Any difference in the dependent variable between the control and experimental groups is caused by the independent variable.

Flaws in experimental control can reduce the validity of an experiment. Confounding variables are uncontrolled factors that might have affected the dependent variable and confused interpretation of the experimental data.

1. *Random Variables.* Random variables are uncontrolled factors such as differences in subjects' backgrounds, personalities, health, and so on that might confound research results. Psychologists randomly assign research participants to experimental and control groups to reduce the impact of random variables on the results.
  2. *Participants' Expectations.* A placebo is a treatment that contains no active ingredient but produces a change in the dependent variable because the experimental subject believes it will.
  3. *Experimenter Bias.* This occurs when experimenters unintentionally affect the dependent variable based on their expectations of experimental results. To prevent experimenter bias, psychologists use a double-blind design in which neither the experimenter nor the participants know which group received the independent variable.
- E. **Selecting Human Participants for Research**  
Sampling is an important process used to select subjects for an experiment. Research results can be generalized (that is, said to be true of the entire population of interest) only if the sample of participants studied represents that population accurately. When choosing a sample, psychologists must consider the possible impact that variables such as age, gender, race,

ethnicity, cultural background, socioeconomic status, sexual orientation, disability, and so on can have on the behavior or mental process being studied.

If every population member has an *equal* chance of being chosen for study, the subjects selected make up a random sample; if all such chances are not equal, the sample is biased. When drawing a truly random sample is impossible, representative samples are used instead. Often, samples of convenience are used instead, which limits the conclusions psychologists can draw from that data.

- F. Linkages: Psychological Research Methods and Behavioral Genetics  
Many psychologists, despite their subfield or area of interest, attempt to understand how nature (genetic makeup) and nurture (environment/experiences) interact to produce behavior and mental processes.

Researchers interested in behavioral genetics study the effect of heredity and the environment on behavioral tendencies in groups. Their work employs quasi-experimental methods such as family, adoption, and twin studies.

### III. STATISTICAL ANALYSIS OF RESEARCH RESULTS

Statistical analyses are used to interpret research results. Descriptive statistics describe data. Inferential statistics are used to draw conclusions and make inferences about what the data mean.

#### . Descriptive Statistics

1. *Measures of Central Tendency.* Measures of central tendency are values that best describe a set of data. The mode is the most frequent score in a data set. The median score splits the data set in two; half the scores are above the median and half are below. The mean is the mathematical average. It is calculated by summing the values of all the scores and then dividing by the total number of scores.
2. *Measures of Variability.* Measures of variability indicate the dispersion or spread in a set of data. The range is calculated by subtracting the lowest score in a data set from the highest score. The standard deviation measures the average difference between each score and the mean of the data set.
3. *Correlation and Correlation Coefficients.* The correlation coefficient is a mathematical calculation that describes the direction and strength of the relationship between two variables. Correlations, even very strong ones, do not necessarily reflect cause-effect relationships between variables.

The sign (+ or -) of  $r$  describes a correlation's direction. A positive correlation (where the sign is +) describes a relationship in which two variables change in the same direction: as  $x$  increases, so does  $y$  (and vice versa). A negative correlation (where the sign is -) describes a

relationship in which two variables change in opposite directions: as  $x$  increases,  $y$  decreases (and vice versa).

A correlation's numerical value ( $r$ ) can vary from -1.00 to +1.00. The larger the absolute value of  $r$  (whether + or -), the stronger the relationship. In a perfect correlation,  $r = +1.00$  or  $-1.00$ ; knowing the value of one variable allows the exact prediction of the other variable.

A. Inferential Statistics

Inferential statistics are used to analyze research results. When inferential statistics demonstrate a high probability that research results are not due to chance, the results are said to be statistically significant.

B. Statistics and Research Methods as Tools in Critical Thinking

Scientific evaluation of research requires the use of critical thinking to carefully assess the statistical and methodological aspects of even the most dramatic or desirable results.

IV. ETHICAL GUIDELINES FOR PSYCHOLOGISTS

Ethical guidelines and regulations exist for psychologists' use in treating patients and conducting research. Scientists must accurately report their results, minimize participant discomfort, and prevent any long-term negative effects. Human participants must be fully informed about their participation before a given study and must be debriefed when the research is concluded. The obligation of psychologists to protect participants' welfare also extends to animals.