

Introducing Psychology

The primary difference between personal and scientific explanations of behavior rests in the nature of acceptable evidence. Psychologists have learned to question observations based only on personal experience because they know how biased or subjective human judgment is. This knowledge comes from their own research in perception, cognition, information processing, and social psychology. Psychology as a science promotes the belief that the sturdiest kind of evidence comes from *systematic* and *controlled* observation. This reliance on well-designed research leads to the most credible conclusions about behavior. Scientific critical thinkers try to support their ideas with evidence from controlled comparisons whenever possible, whether they design their own experiments or rely on the controlled observations of others.

Designing meaningful research that will increase our understanding of human behavior is a challenging but exhilarating enterprise. This enterprise relies on some key ideas and procedures. When researchers link concepts or variables to speculate about causes of behavior, they create *hypotheses*. Hypotheses are inferences that predict cause-effect relationships between behavioral variables. There are two kinds of variables in psychological research. *Independent variables* are factors that promote changes in behavior; researchers typically manipulate independent variables (causes) to produce a desired effect in experiments. The desired effect is called the *dependent variable* because the effect *depends* on the various causes.

Suppose that we wanted to find out whether drinking coffee promotes anxiety. In our experiment we could establish three different groups: one group would get no coffee, another group would get two cups, and the final group would get four. In this example, the amount of coffee (none, 2

cups, or 4 cups) constitutes the levels of the independent variable that we think will lead to different intensities of anxiety. Our hypothesis could be that drinking coffee increases anxiety: The independent variable (coffee drinking) causes the dependent variable (anxiety). Or stated conversely, the level of anxiety (dependent variable) depends on coffee intake (independent variable).

Another important aspect of scientific critical thinking in psychology is defining and measuring behavior. Psychologists like to be as precise and as unbiased or objective as possible when exploring the meaning of a behavior. We often define the behaviors we wish to understand by describing the "operations" we go through to produce the behavior. These *operational definitions* promote objectivity in observation.

For example, how will we measure anxiety in our coffee-drinking subjects? We might measure each subject's anxiety response by counting nervous gestures, measuring blood pressure elevations, or requesting a self-rating of anxiety on a scale of 1 to 10. Each approach would give us a different way to quantify anxiety. Operational definitions provide the opportunity to measure behavior as precisely as possible. Researchers evaluate the precise measurements statistically to determine whether the experiment (or other research method) produces meaningful comparisons or patterns.

Competently designed experiments must have clear definitions of the variables in the research and acceptable methods of measuring behavioral responses. But effective *control procedures* are also essential to rule out alternative explanations. We want to make sure that we control all aspects of the experiment so that we can be certain a cause-effect statement is valid or truthful. Control procedures allow us to rule out all cause-effect explanations

other than the one we intend to explore in the experiment.

In our coffee-drinking study, we would try to control other factors that might contribute to anxiety. For example, we might want to limit our subject population to people of a certain age. We would avoid conducting our experiment during a period in which those people might be expected to be anxious for some other reason (for example, during final exam time). We would need to make sure that our subjects drank only the amount of coffee specified in their research assignment. And

we would have to decide what to do with subjects who hate coffee. All these conditions represent threats to the valid construction of an experiment on the anxiety-producing effects of coffee. As psychologists, we would strive to produce an experiment in which any findings we obtain would be as free as possible from alternative explanations.

The exercises in Chapter 1 emphasize the importance of understanding and applying the principles of experimental design in scientific research and in consumer contexts.

Exercise 1.1

DESIGNING CAREFULLY CONTROLLED RESEARCH

Scientific Problem Solving

Scientific problem solving has four components:

- *Forming hypotheses*—We develop tentative predictions about the causes of behavior; hypotheses represent an attempt to resolve a discrepancy in our formal knowledge about the causes of behavior.
- *Defining variables operationally*—We define research components in terms of operations in order to promote objectivity in observation and precision in measurement.
- *Conducting systematic or controlled investigations*—We strive to reduce cause-effect explanations to their simplest possible forms. We often emphasize experimental comparisons as a preferred method for developing the sturdiest and most truthful cause-effect explanations. We carefully use control procedures to eliminate alternative explanations for any obtained results.
- *Interpreting results statistically*—We use statistical analysis to help determine whether we have isolated the most important variables.

The following three badly designed experiments and the questions accompanying them will help you to recognize research concepts and sharpen your ability to detect flaws in experimental design. After you complete all the questions, compare your answers with those in the Answer Key at the end of the book.

The Colorful Boss

Arlene wanted to increase the productivity of the clerical staff in her plant. She thought painting their cubicles blue (her favorite color) would increase their rate of work completion but that painting the cubicles yellow (a color she thought was harsh) would have no effect or might even slow down the clerical staff's rate of completion. To test this idea she had the work cubicles in the Sales Department painted blue and those in the Public Relations Department painted yellow. Then she kept track of how many projects each department completed in the next three months. For the two-month period following the painting, the sales clerical staff dramatically outperformed the public relations clerical staff in the number of projects completed.

Research Design Elements (See Answer Key.)

What is the *focal behavior* of the study and how is it *defined operationally*? _____

Exercise 1.1 Designing Carefully Controlled Research

What is the *hypothesis*? _____

What is the *independent variable*? _____

How is the *dependent variable* measured? _____

What variables are controlled? _____

What variables are not controlled? _____

Did the research measure what Arlene thought she measured? Justify your answer:

The Bad Driver

John is intrigued by the relationship between frustration and aggression. He proposes to study whether socioeconomic status is a factor in how drivers express aggression when they are frustrated. John decides to employ a high-status car (a shiny new Mercedes) and a low-status car (a dented, rusty 1983 Volkswagen) as the stimuli in a "field" experiment on the roads near his home during a sunny April afternoon. He plans to drive the high-status car from 1 to 3 P.M. and the low-status car from 3 to 5 P.M. During these periods, he will linger when he has to stop for red lights and will move forward only when the driver behind him honks. His research assistant, riding on the passenger side, will time how long it takes the driver of the car behind the experimental car to honk. John believes drivers will take longer to honk when they are behind the Mercedes than when they are behind the Volkswagen. He thinks frustrated people will suppress their frustration and aggression when the person causing the frustration is of high socioeconomic status.

Research Design Elements (See Answer Key.)

What is the *focal behavior* of the study and how is it *defined operationally*? _____

What is the *hypothesis*? _____

What is the *independent variable*? _____

How is the *dependent variable* measured? _____

What variables are controlled? _____

What variables are not controlled? _____

How can the experiment be improved? _____

Going for the Gold

Rita, a sports psychologist, has applied for a huge grant sponsored by the American Olympiad Organization. She wants to identify variables that will produce more winners in the next international competition. She plans to build a special camp where the athletes can train for two weeks each summer with other athletes. She will fly all the volunteer athletes to the camp and will randomly assign each of them to one of three conditions. Rita will host only one type of group at a time. In Condition 1, which meets during the first two weeks of the experiment, the athletes get no special treatment beyond the opportunity to train in the specially designed camp. Athletes assigned to Condition 1 are control group members. In Condition 2, during the second two weeks, the athletes will receive a well-regulated diet and low-dose steroids. In Condition 3, during the last two-week period, the athletes will sleep with a self-esteem training tape under their pillows. Rita believes that unconscious sleep preparation will be superior to other forms of training in producing winning athletes. She plans to measure her success by contrasting the number of medals the three groups of athletes win in their next outing.

Research Design Elements (See Answer Key.)

What is the *focal behavior* of the study? _____

What is the *hypothesis*? _____

What is the *independent variable*? _____

How is the *dependent variable* measured? _____

What variables are controlled? _____

What variables are not controlled? _____

Would you fund this proposal? If so, give your reason. If not, describe some ways in which the study could be improved:

All three experiments have flaws of sufficient magnitude that their findings would be invalid or at least questionable. However, even in well-designed and published research, you may encounter subtle problems in design, control procedures, and variable definitions that will challenge the interpretation of the results described by the researcher. As you continue to read about scientific experimentation, look for flaws. All those who publish their results expect criticism. Effective criticism helps the literature of psychology—and our knowledge about human behavior—to grow.