# Chapter 2: How Psychologists Do Research

## LEARNING OBJECTIVES

After studying this chapter, students should be able to answer the following questions:

1. What are five characteristics of an ideal scientist?
2. What are the defining elements of descriptive research? Can you give an example of a case study, observational research, a psychological test, and a survey?
3. What do positive and negative correlations look like, and what do they signify?
4. Why does a correlation not establish a causal relationship between two variables?
5. What is the difference between an independent variable and a dependent variable?
6. What is the difference between an experimental group and a control group?
7. Why is random assignment necessary when conducting an experiment?
8. What are two advantages and two disadvantages of conducting an experiment, compared to other research techniques?
9. How would a psychological scientist use descriptive statistics versus inferential statistics?
10. What are the major ethical guidelines researchers must follow when conducting research with human participants?
11. What are the major ethical guidelines researchers must follow when conducting research with animals?

## APPENDIX LEARNING OBJECTIVES

After studying this appendix, students should be able to answer the following questions:

1. What is a frequency distribution?
2. What are measures of central tendency and why are they important descriptive statistics?
3. What are measures of variability and why are they important descriptive statistics?
4. How do percentile scores and Z-scores work?
5. What are the basic properties of a normal distribution?
6. What is the distinction between a null hypothesis and an alternative hypothesis?
7. How do scientists undertake the process of hypothesis testing?
8. What does it mean to say an experimental result is "statistically significant?"

I. **Introduction to the Chapter**
   - **A.** Science or Pseudoscience?
     - **1.** "Facilitated communication" with autistic children

II. **What Makes Psychological Research Scientific?**
   - **A.** Characteristics of the Ideal Psychologist as Scientist
     - **1.** Precision
       - a. Begin with a theory (an organized set of assumptions and principles used to explain a particular phenomenon)
       - b. Develop a hypothesis (a specific statement that attempts to describe or explain a particular phenomenon)
       - c. Create operational definitions of a phenomenon so that one can objectively measure that phenomenon
     - **2.** Skepticism
       - a. Do not accept explanations of phenomena based on blind faith or authority
     - **3.** Reliance on empirical evidence
       - a. "Show me the data"

4. Willingness to make "risky predictions"
    a. Principle of falsifiability
        i. Theory must make predictions that are specific enough that they can be refuted—this allows for growth of the theory
        ii. Theory must predict both what *will* happen and what *will not* happen
    b. Confirmation bias
        i. Theory must make predictions that are specific enough that they can be refuted—this allows for growth of the theory
        ii. Scientists try to avoid confirmation bias via the scientific method
5. Openness
    a. Science relies on openness and full disclosure of methodological, statistical, and ethical procedures
    b. Need to replicate novel findings (e.g. need to "check" the Mozart effect to see if it is the phenomenon is is purported to be)
    c. Need do disseminate results via a peer review process

III. **Descriptive Studies: Establishing the Facts**

**A.** Case Studies

**1.** Case study provides a detailed description about an individual

**2.** Based on careful observation and/or psychological testing

**3.** "Genie"

**4.** *Advantages:* illustrate psychological principles different from generalizations from statistical evidence and provide very detailed picture of an individual

**5.** *Limitations:* cannot make broad generalizations to other individuals because individual may be under-representative of the group a researcher wishes to study

**B.** Observational Studies

**1.** Researcher tries to unobtrusively observe, measure, and record behaviour of many individuals/animals

**2.** Very useful first-step in research—observe behaviour before you attempt to explain it

**3.** *Naturalistic observation*

a. Observational research in the subject's natural setting

b. Jane Goodall's chimpanzees

c. Playgrounds, offices, bars

4. *Laboratory observation*
    a. Experimenter has more control over the environment in a laboratory and therefore may choose to observe behaviour in the lab
    b. Observation of children's play behaviour in a "play room" with a one-way mirror

**C.** Tests

1. *Indirectly* measure and evaluate personality characteristics, emotional states, aptitudes, interests, values, and abilities
2. Used in education, employment screening, industry, military, the helping professions, and psychological research
3. Psychological tests, intelligence tests, achievement tests (ACT, SAT, GRE, LSAT, MCAT, etc.), vocational-aptitude tests
4. A good test is one that is *standardized* or *normed*
5. A good test must be *valid* (or actually measuring what it says it measures)
6. A good test should be *reliable* (or demonstrate a consistency of scores from one time and place to another)

**D.** Surveys

1. *Directly* measure individuals' interests, values, attitudes, opinions, and preferences

2. Need a *representative sample*
    a. A group of individuals that actually reflects the population of interest
    b. Need to match individuals in sample on characteristics of interest (e.g., age, sex, religion, ethnicity, etc.)
3. *Volunteer bias*—volunteers (by virtue of volunteering) may not be a representative sample—volunteers may differ in many ways from non-volunteers
4. *Dishonesty in responding*—some may answer to make themselves "look" better either to oneself or to the experimenter, rather then responding honestly

IV. **Correlational Studies: Looking for Relationships**

**A.** Measuring Correlations

1. Measuring the *strength* of a relationship between two variables (or quantifiable outcomes—height, weight, IQ scores, GPA, etc.)
2. *Correlation coefficient*
    a. Statistic that expresses both the *strength* and the *direction* of the correlation (+/-)
    b. Ranges from -1.00 to +1.00

**B.** Cautions about Correlations

**1.** Correlation DOES NOT SHOW causation

**2.** E.g., correlation between number of hours watching television and number of aggressive acts during play DOES NOT MEAN that watching too much television CAUSES child to act aggressively

V. **Experiments: Hunting for Causes**

**A.** Allows researcher to *control* (or *manipulate*) the environment to see their effects on human behaviour

**B.** Experimental Variables

**1.** *Independent variable*—a variable the experimenter manipulates

**2.** *Dependent variable*—the [outcome] variable the experimenter measures that is predicted to be affected by the independent variable

**C.** Experimental and Control Conditions

**1.** *Experimental group*—receives the 'treatment'

**2.** *Control group*—is placed in same situation as experimental group, but does not receive the critical 'treatment'

**3.** *Placebo control group*—typically in drug studies, a group that receives an inactive substance or fake 'treatment' without being told it is inactive or fake

4. *Random assignment*—methodological procedure for placing participants to experimental and control groups, so that each individual has the same probability of being assigned to either group

**D.** Experimenter Effects

1. *Single-blind study*—an experiment in which the participant does not know whether s/he is in the experimental or control group
2. *Experimenter effects*—unintended changes in participants' behaviours due to inadvertent cues given by the experimenter (e.g., smiles, nods, tone of voice, etc.)
3. *Double-blind study*—neither the participant nor the experimenter knows to which group the participant was randomly assigned

**E.** Advantages and Limitations of Experiments

1. Allows researcher to control the situation
2. Permits researcher to identify cause and effect
3. BUT, situation is typically artificial, and results may not generalize outside of the laboratory environment
4. Consequently, many psychologists conduct *field research*; descriptive or experimental research in natural settings.

VI. **Evaluating the Findings**

**A.** Descriptive Statistics: Finding Out What's So

**1.** Group averages (arithmetic means)

**2.** Standard deviation (describes how much scores vary between each other and from the mean)

**3.** Descriptive statistics are usually presented in the form of tables or figures/graphs

**B.** Inferential Statistics: Asking "So What?"

**1.** Statistical procedures that allow researcher to draw inferences about how statistically meaningful the results are

**2.** Allow the researcher to better interpret the descriptive statistics—does the experimental group REALLY differ from the control group?

**3.** Significance tests show how likely a study's results are merely due to chance (versus due to the experimenter's manipulations)

**4.** Inferential statistics are usually presented in text

**C.** Interpreting the Findings

**1.** Choosing the best explanation

a. What do the results mean in terms of your hypothesis and in terms of your theory?

b. Sometimes the best explanations emerge from different methods that test one's theory and hypotheses
   **i.** *Cross-Sectional* studies involve participants of different ages tested at the same time.
   **ii.** *Longitudinal studies* involve testing the same people across extended periods of time.

**2.** Judging the result's importance
   a. Effect size
   b. Meta-analysis

VII. **Keeping the Enterprise Ethical**

**A.** The Ethics of Studying Human Beings

**1.** Informed consent

**B.** The Ethics of Studying Animals

**1.** Why study animals?
   a. To conduct basic research on a particular species
   b. To discover practical applications
   c. To study issues that cannot be studied experimentally using humans because of practical or ethical reasons
   d. To clarify theoretical questions
   e. To improve human welfare
   f. NOTE: all but (c) can be reasons for "Why study humans?"

VIII. **Taking Psychology with You**

**A.** Lying with Statistics

**1.** Misunderstanding, misuse, misrepresentation, or a flat-out lie?

**2.** Ask how the number was computed

**3.** Check to see how terms are defined (operationally)

**4.** Look for a control group comparison

**5.** Separate politics from statistics

**6.** Be cautious about correlations

## LECTURE SUGGESTIONS AND DISCUSSION TOPICS

### Lecture/Discussion 2.1: Pseudoscience and the Mozart Effect

Before discussing pseudoscience, ask students about their impressions of the so-called Mozart effect. Most students have heard of the general phenomenon, and have seen advertisements and CDs of music "designed to increase your children's IQ." Bring in a magazine advertisement and read from it, touting the merits of the product. Ask students if they believe it, and if they would buy the product. Probe them by asking what "proof" they would need that the product actually works. Usually, students will begin to question the merits of the product, at which point you can discuss the actual psychological findings of this moneymaking gimmick by summarizing the work of Steele, Bass, and Crook (1999).

Then I launch into the following lecture, based on information obtained from the following website, which is a good one to direct students to for critical thinking exercises:

http://plato.stanford.edu/entries/pseudo-science/

Pseudoscience quite literally means "false science." Its "claims [are] presented so that they appear scientific even though they lack the supporting evidence and plausibility" (Shermer, 1997, p. 33). Furthermore, pseudoscience appears to use scientific methods and tries to give that "science-y" impression. Some characteristics of pseudoscience include the following:

1. associates itself with true science
2. relies on and accepts anecdotal evidence
3. sidesteps disproof
   - any possible outcome is explained away
   - a theory is not a good theory if it can explain everything because it can never make specific predictions
4. dangerously reduces complexity to simplicity (to a consumer society)

At this point, I like to ask the class why the "Mozart effect" would be considered pseudoscience, based on the four aforementioned characteristics. I also ask students for other examples of products or otherwise that they would consider pseudoscience. Other psychologically oriented examples include: graphology, palmistry, aromatherapy, and quite arguably Eye-Movement Desensitization and Reprocessing (EMDR).

There is an excellent video clip entitled "Paper Personality" by *Scientific American Frontiers* that shows the downfalls of graphology, and a companion website for teaching activities related to graphology:

http://www.pbs.org/safarchive/4_class/45_pguides/pguide_802/4482_paper.html

"Paper Personality" *(Running time: 8:46).* Chedd-Angier Productions (1997). *Scientific American Frontiers*: Season VIII: Beyond Science?, Episode 2 of 5. [Television series episode].
Available to Purchase: http://www.shop.pbs.org
View Online: http://www.pbs.org/saf/archive.htm (Keyword: paper personality)

Steele, K. M., Bass, K. E., & Crook, M. D. (1999). The mystery of the Mozart effect: Failure to replicate. *Psychological Science, 10,* 366-369.

Shermer, M. (1997). *Why people believe weird things: Pseudoscience, superstition, and other confusions of our time.* New York: W. H. Freeman & Co.

### Lecture/Discussion 2.2: An Historical Perspective on Research Ethics

When discussing the ethical treatment of human research participants several "classic" studies, which would be ethically questionable by today's standards, serve as examples. For instance, many instructors discuss Stanley Milgram's studies of obedience, Philip Zimbardo's prison simulation, or Stanley Schachter's studies of autonomic arousal and attribution. Students often have mixed reactions to these examples. Some find them relatively innocuous, whereas others have strong reactions to the treatments participants were asked to endure. The fact that such studies took place within relatively recent times compounds the issue. Some students see these 1960s experiments as "long ago and of a different time," whereas others see them as examples of the "unethical treatment psychologists still foist on people to this day."

To provide a context for these types of issues, your students might be interested in hearing about older examples of ethically questionable research. For example, Carney Landis, a noted psychologist of the 1920s and 1930s, conducted a series of studies dealing with the experience and expression of emotion. In one set of studies he was particularly interested in capturing facial expressions of emotion, and used strong elicitors of emotion to produce them. For example, one situation involved dropping a lit firecracker underneath an unsuspecting subject's chair, whereas another involved showing participants pornographic (for their day) photographs and photos of horribly disfiguring skin diseases.

Although these manipulations may seem harsh, Landis used stronger ones as well. For example, participants were instructed in one situation to plunge their hand into a pail of shallow water that, unbeknownst to them, contained three live frogs. (This manipulation was presumably used to evoke disgust.) To quote Landis, however. . ."After the subject had reacted to the frogs the experimenter said, 'Yes, but you have not felt everything yet, feel around again.' While the subject was doing so he received a strong. . .shock from an induction coil, attached to the pail by concealed wiring."

And for the *coup de grâce*:

> "The table in front of the subject was covered with a cloth. A flat tray and a butcher's knife were placed on the cloth. A live white rat was given to the subject. He (sic) was instructed, 'Hold this rat with your left hand and then cut off its head with the knife.'. . .In five cases where the subjects could not be persuaded to follow directions the experimenter cut off the head while the subject looked on."

Mention is also made of a final experiment involving shock which ". . .varied from a just noticeable intensity to a strength which caused the subject to jump from the chair," as well as other studies. Landis's participants, in passing, included graduate students, a stenographer, a schoolteacher, and a thirteen-year-old boy with high blood pressure.

Although Landis has been singled out for examination here, there certainly are no lack of experiments from the 1920s through the 1960s work mentioned above that can provide examples of ethically dubious research. Discussing such studies, especially in light of current APA standards, should produce spirited discussion among your students.

Landis, C. (1924). Studies of emotional reactions II: General behaviour and facial expression. *Comparative Psychology*, *4*, 447–509.

## Lecture/Discussion 2.3: Ethical Issues in Psychological Research

First of all, as objective scientists of human and animal behaviour, WE MUST: (1) treat human research participants with respect; (2) care for the welfare of animals as research subjects; and (3) be honest in the dissemination of our work. The Medical Research Council of Canada [now Canadian Institutes of Health Research], Natural Sciences and Engineering Research Council of Canada and Social Sciences and Humanities Research Council of Canada developed a code of ethics for research involving humans in 1998 called the Tri-Council Policy Statement: Ethical Concuct for Research Involving Humans (TCPS), which has been revised most recently in 2005. More revisions are underway and can be found on the Interagency Advisory Panel on Research Ethics website:

http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/Default/

The Canadian Psychological Association also has developed a Code of Ethics based upon principle of ethical action. It can be downloaded from this site:

http://www.cpa.ca/cpasite/userfiles/Documents/Canadian%20Code%20of%20Ethics%20for%20Psycho.pdf

Research involving humans in Canada must first be reviewed by a Research Ethics Board (REB)) which is typically a group of university scholars from various disciplines who review recent proposals for ethical concerns. Psychological research requires that participation is voluntary, and the potential participant knows this. This should be accomplished through informed consent, which is a documented description of the research project in which they may choose to participate. Information contained in an informed consent form

includes a statement that participants may withdraw at any time without penalty. In addition, any potential risks, discomforts, adverse effects, etc., are described before participation. If participants agree to participate, they typically sign the informed consent form and proceed with the experiment.

Sometimes it is necessary not to disclose the true nature of the experiment to the participants before they participate, because such knowledge may contaminate the results. The TCPS suggests that researchers should avoid deception unless it is justified by the study's prospective scientific value. It should be noted, however, that participants are never deceived about significant risks, discomforts, etc. Finally, all information about the deception must be explained to the participant after the experimental session.

Confidentiality is a factor that plays a crucial role in the data collection and analysis phases of the experiment. Data should be collected in such a way that no identifiable aspects can be traced to any one individual. Typically, researchers assign participant numbers to data. . .not names or social security numbers. At the end of the study, all participants should undergo a debriefing, which is full disclosure of the nature of the study to the participants. Along with a formal debriefing, sometimes some "desensitizing" will occur, which involves reducing any negative feelings from participation.

All research, testing and teaching involving the use of animals must conform rot the guidelines set forth by the Canadian Council on Animal Care (CCAC). The CCAC is made up of representative from the Tri-Council, CPA, researchers, as well as community members. When conducting research with animals (such as mice, rats, or chimpanzees) researchers must follow strict federal regulations about animal care. In order to conduct such research, the scientific purpose of experiment must fully warrant the use of animals to be considered, and benefits of research must outweigh any costs. Some argue that it is much easier to experiment on humans than on animals because of all of the federal regulations for animal care that exist, for which there are no comparable guidelines for humans!

Ethical issues also arise in Dissemination of Scientific Works. Once research is complete, and researchers write up their results to share with the world, there are several ethical considerations that researchers must adhere to. First, in reporting of results, researchers must not fabricate data, nor can they not report data. Plagiarism raises other ethical concerns, and plagiarism is not only found in naive (or cunning) undergraduate students! When describing other studies, theoretical claims, or even data, one cannot take the ideas of others and claim them as one's own. Furthermore, whether such instances are deliberate or not, it's ALL plagiarism.

## Lecture/Discussion 2.4: Improving Informed Consent

Informed consent is one of the hallmarks of the ethical treatment of research participants. But for some participants, reviewing information about a study and agreeing to participate may not be the seamless act we assume it to be. In particular, considerable concern has been raised over the ability of individuals with severe psychological disturbances to fully appreciate the risks and benefits of their research participation. A recent study, however, suggests that some techniques may boost patients' understanding of their role in the research process.

A team of investigators led by psychiatrist Donna A. Wirsching of the West Los Angeles Veterans Affairs Medical Center recruited 49 patients diagnosed with schizophrenia and who were already participating in clinical trials of several antipsychotic medications. The patients were read an informed-consent document that presented information about an upcoming clinical trial, then were given a survey designed to gauge how well they had understood what they heard. The survey asked about the study's goals and procedures, as well as the patient's options as potential participant, the responsibilities of the physicians, and any potential side effects of the antipsychotic medication being tested. Five patients answered all of the survey questions correctly. The researcher immediately explained any items that were answered incorrectly to the remainder of the patients and readministered the survey. Twenty-six patients correctly answered all items on the second pass, and eighteen patients did so after three or more attempts. Importantly, all patients answered the majority of questions correctly when tested one week later, including those patients with the most severe thought disturbances and hallucinations.

These results suggest that relatively simple procedures can be enacted to assure that informed research participation really is informed. They also suggest that with a collaborative effort between the researcher and potential participant, even those individuals plagued by severe psychological disturbances can more fully appreciate their contributions to research.

Bower, B. (1998, December 5). Schizophrenia: Consenting adults. *Science News, 154,* 367.

## Lecture/Discussion 2.5: Deception in Research—The Case Against It

The penultimate draft of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS) disallowed the use of deception in research. Last minute changes to the document allowed researchers to use deception through a "waiver of informed consent" provision. The ethical principles of the Canadian Psychological Association and the TCPS allow for the use of deception in research as long as it is justified by the study's prospective value, no alternatives are available, and the participants are given a full explanation of the study as soon as possible. John Adair addresses the issue of deception and other issues in the Canadian research ethics community:

> Adair, John G. (2001) Ethics of psychological research: New policies; continuing issues; new concerns. *Canadian Psychology, 42*, 25-37.

Diana Baumrind argued strongly against any use of intentional deception in psychological research (such as withholding information to ensure that subjects will participate, using deceptive instructions, or using staged manipulations in naturalistic settings). She attributed its justification to the adoption of an act-utilitarianism meta-ethic. That is, a particular action, in this case deception, is perceived as being acceptable if no other action would have better consequences. She criticized act-utilitarianism on the basis that it fails to account for long-range costs, the rights of the minority, and its subjectivity. She argued that deception is morally wrong on the basis of three generally accepted ethical rules in Western society: the right of informed consent, the obligation of researchers to protect the welfare of the subject, and the responsibility of researchers to be trustworthy. Furthermore, she argued that the costs of deception to the research participant (for example, undermining their trust in their own judgment), profession of psychology (loss of community support for their research or suspicion of always trying to "trick" the research participant), and society (the potential that trust in authority will be undermined) outweigh its use in research. Alternatives to using deception proposed by Baumrind included conducting naturalistic rather than experimental research, introspection about the phenomenon by researchers and their confederates rather than experimental manipulations, and detailed debriefing by a skilled and concerned professional.

> Baumrind, D. (1985). Research using intentional deception: Ethical issues revisited. *American Psychologist*, *40*, 165–174.

## Lecture/Discussion 2.6: Is Animal Research Cruel and Unjustified?

You may wish to use this as a springboard for a classroom debate. (See: **Debate 2.1: Is it ethical to use animals in psychological research?**).

"The tools of the experimental psychologist are mutilation, castration, agony, starvation, and insanity" (Mobilization for Animals, 1984). Animal rights groups are making such claims as this with greater and greater frequency, and the morality of behavioural research using laboratory animals is being fiercely questioned. What are psychologists doing to their animals, and should they be allowed to continue doing it? Is animal research justified?

Behavioural research labs are being portrayed as chambers of horrors, and John McArdle of the Humane Society of the United States has suggested that torture is the central principle of psychology. Mobilization for Animals, a coalition of over 400 protectionist groups, has accused psychologists of giving intense, inescapable shocks to animals, mutilating and amputating their limbs, of killing them through food or water deprivation, of driving animals insane from the terror and despair of total isolation, and of smashing animals' bones and internal organs. Possibly most important is the claim that the research is done merely out of curiosity, with no purpose, justification, or likelihood of useful results. A 1984 Humane Society Close-up Report urged Humane Society members to demand the elimination of federal funding for behavioural research involving animals. It said, "Remember, experimental psychology is one area of research in which it is clear that no human good results from the unspeakable suffering of animals."

Aversive techniques are used in some behavioural research, but they are relatively uncommon and certainly not performed out of idle curiosity. A survey of the 608 articles published from 1979 to 1983 in journals of the American Psychological Association that report animal research indicated that none of the most extreme accusations are justified (Coile & Miller, 1984). For example, only 10 percent of the studies used any electric shock, and only 3.9 percent used inescapable shock of greater than .001 ampere (which can easily be tolerated on the fingertips). Also, 80 percent of the studies using shock or deprivation were funded by respected organizations that require thorough justification of all procedures and a statement of purpose. Experiments performed out of mere curiosity are not funded.

Coile and Miller (1984) admit that their survey might not represent a perfect evaluation of animal research, because they did not examine non-APA journals and because instances of cruelty might have occurred without being reported. Still, it is clear that since no cases of abuse appeared in the major psychology journals, abusive treatment of animals cannot be considered a central characteristic of psychology. Also, there are mechanisms that attempt to prevent the inhumane, irresponsible treatment of animals. Most research institutions and universities have ethics committees that evaluate research proposals. Rules and guidelines for the care and treatment of animals have been established by the Federal Animal Welfare Act and by the National Academy of Sciences, and these rules are enforced through inspections by federal and funding agencies.

The accusation that behavioural research on animals has not resulted in any benefit to humans is also unjustified. Such research has been responsible for major advances in human well-being (Miller, 1985). For example, the principles of learning established originally with animals have been used to improve classroom instruction and to provide more advanced treatments of enuresis (bed-wetting), anorexia nervosa (self-starvation), and scoliosis (curvature of the spine). Animal research has given rise to techniques to recover lost function in partially paralyzed limbs and to treat hypertension and headaches. Research on early visual deprivation in animals has shown that permanent neurological changes occur, leading the medical community to emphasize earlier detection and treatment of visual defects in human infants. Deprivation of normal and emotional contact in infancy has been associated with a growth hormone deficiency that can cause dwarfism. As a result, physical contact with premature infants is encouraged both for the emotional "bonding" of the parent and child and the physical development of the child.

Both sides have been guilty of distortion in their arguments on this issue. Abuse probably does occur, but it is not common. Some research may be of questionable validity, but animal research has resulted in many benefits, and besides, in many cases, no reasonable alternative exists (Gallup & Suarez, 1985). As Herzog (1988) has pointed out, the decisions being made concerning humanity's moral obligations to other species are often inconsistent and illogical. The moral status and rights of a mouse are greatly influenced by whether it is labeled lab animal, pest, or food source for other animals. To kill the lab animal might be criticized, whereas to kill "bad mice" (pests) or to use live mice as food for snakes or other animals is likely to produce little protest. We need neither complete prohibition nor complete licence, but rather a calm, informed, and objective (as far as possible) evaluation along with reasonable standards and the means to enforce those standards. (*Note*: Suggestions for a student debate on this topic are given in the following *Demonstrations and Activities* section of this manual.)


Coile, D. C. & Miller, N. E. (1984). How radical animal activists try to mislead humane people. *American Psychologist*, *39*, 700–701.

Gallup, G. G., Jr. & Suarez, S. D. (1985). Alternatives to the use of animals in psychological research. *American Psychologist*, *40*, 1104–1111.

Herzog, H. A., Jr. (1988). The moral status of mice. *American Psychologist*, *43*, 473–474.

King, F. A. (1984, September). Animals in research: The case for experimentation. *Psychology Today, 18*, 56–58.

McArdle, J. (1984, Spring). Psychological experimentation on animals: Not necessary, not valid. *Humane Society News*, 20–22.

Miller, N. E. (1985). The value of behavioural research on animals. *American Psychologist*, *40*, 423–440.

Mobilization for Animals (1984, February). *Direct Action Program 1984.* Columbus, OH: Mobilization for Animals.

Rollin, B. E. (1985). The moral status of research animals in psychology. *American Psychologist*, *40*, 920–926.


## Lecture/Discussion 2.7: How Do We Know What We Know?

***How do you know that. . .***
***Sir John A. Macdonald was the first prime minister of Canada?***
***you really have a stomach?***

Dependence on observation is one of the hallmarks of science, but it is not the only way humans acquire knowledge. There are, in fact, many questions that cannot be answered by scientific methods and for which other means of acquiring knowledge are more appropriate. Begin by asking the following questions.

- How do you know that Sir John A. Macdonald was the first prime minister of Canada?
- How do you know that you really have a stomach?
- What makes you so sure the sun will rise tomorrow?
- How do you know the colour of the shirt I'm wearing?
- How can you be sure that there aren't little creatures inside computers that are responsible for the things computers do?
- Are you sure you don't have a big hole in the back of your pants or skirt?

*Authority* is one source of knowledge. We know, or believe, that Macdonald was the first prime minister because we trust the authority of historians and history books. During the centuries that Western Civilization was dominated by the Church, the authority of holy writings was believed to be the only dependable way of knowing.

*Reason* was considered by Renaissance scholars to be the most reliable source of knowledge. If you say, "All humans have stomachs; I am human; therefore, I have a stomach," you have used deductive reasoning. If you say, "The sun rose today, yesterday, the day before yesterday, and for as long as I or anyone can remember," you are using inductive reasoning.

*Observation* is still another way of acquiring knowledge. You know the colour of my shirt because you can see the shirt. You assume that you do not have a hole in the posterior of your clothing because you have not observed stares and giggles.

One might use any of these ways of knowing to deny the existence of little creatures in computers. People you perceive to be authorities about computer innards may have told you how they work. You may have reasoned that creatures need nourishment and there is no food supply inside microprocessors. Or you may have looked inside a computer and failed to see little creatures waiting to solve your problems. But there is no way one can absolutely refute the computer-creature hypothesis; so if you want to keep your computer running, maybe you should find out what the little creatures eat.

All these ways of knowing, authority, reason, and observation, are used by scientists, but observation must be the basis for knowledge that is scientific. Science puts greater emphasis on evidence provided by the senses than on authority of others or reasoning.

Science relies on empirical evidence.

## CLASSROOM ACTIVITIES, DEMONSTRATIONS, AND EXERCISES

### Activity 2.1: The Scientific Method and Zodiac Signs

Ward and Grasha (1986) provide a great classroom demonstration for introducing the scientific method by examining students' horoscopes. This exercise works well after a discussion / lecture of the scientific method.

1. Ask students what they know about their astrological/zodiac sign. Provide a list of the zodiac signs with dates for those students who do not know their sign. (**Handout 2.1a**)
2. Ask students to generate testable hypotheses based on assumptions they think astrologers make about human behaviour; write each assumption on the chalkboard.
3. Be sure that one hypothesis that is generated is the following: personality types are associated with particular zodiac signs. Use this hypothesis for the remaining demonstration.
4. Give participants **Handout 2.2** that describes various personality profiles that are associated with the different zodiac signs.
5. Ask students to select which personality profile best matches their personality.
6. If zodiac signs are related to personality profiles, then the number of correct profile-to-sign matches should be greater than the number of incorrect matches.
7. Provide the class with the "answer key" for the personality profiles, derived from popular astrology books. (**Handout 2.1b**)
8. By a show of hands, count how many students correctly matched their personality profile with their zodiac sign.
9. Note that by chance, 8 percent of the students should be correct. Hopefully, your class results will be close to or below chance.

10. Describe how the class data is used to help refine the original theory about personality and horoscopes, which leads to new testable hypotheses, and hence, the cycle of science.

Ward, R. A., & Grasha, A. F. (1986). Using astrology to teach research methods to introductory psychology students. *Teaching of Psychology, 13,* 143–145.

## Activity 2.2: Dangers in Survey Research—Chocolate-Covered Ants

Scoville (1987) provides a compelling demonstration of the dangers of self-reported responses to hypothetical questions . . . a difference between "saying" one would act and actually performing the action. You will need some sort of exotic food, especially one that would produce a nice disgust response (Scoville suggests chocolate-covered ants); keep this food hidden from students until the end of the demonstration. You should get a sense of your audience, so that you can choose students later who are likely to *say* they would eat the food, but refuse to do so when confronted with the opportunity to eat the food. Scoville suggests that you ask how many students have eaten exotic foods, such as grubs, chocolate-covered grasshoppers or ants, etc. For those individuals who did not raise their hands, ask a few of them, "Now, would you consider eating a chocolate-covered ant?" Many will probably refuse, but you may attempt to "bribe" them with hypothetical money. Nevertheless, you can probably negotiate students down to eat the ants for no money. After you have some students who said they would eat the ants, take out the chocolate-covered ants that you had hidden. Approach the students and see if they will follow through on what they said. Inevitably, some students will reject the offer, but others will try the ants. Discuss with students how asking hypothetical questions on surveys may lead to responses that would not necessarily match with actual behaviour. Ask students what other kinds of questions on psychology surveys may lead one to respond in a particular fashion on the survey they may not correspond to reality.

Scoville, W. E. (1987). What would you do if? In V. P. Makosky, L. G. Whittemore, & A. M. Rogers (Eds.) *Activities handbook for the teaching of psychology (Vol. 2)* (pp. 18–19). Washington DC: American Psychological Association.

## Activity 2.3: Using Memory to Demonstrate Methodology

This demonstration introduces the concept of the experimental method; however, it is equally applicable to the material on memory. Students are given the question "Can we improve memory by using a mnemonic technique?" and are asked to design an experiment to test the hypothesis. The experiment is then conducted using procedures summarized below. Through this procedure, students are guided through a typical psychological experiment and are introduced to the concepts of independent variable, dependent variable, experimental and control groups, and control procedures.

Prepare a mnemonic technique and write it on small slips of paper to hand to some of the students (half of the class). Construct a list of common words to use in conjunction with the mnemonic. Here is one of many mnemonic techniques:

PRESIDENTIAL

Word List: Pet, Road, Eagle, Screen, Ink, Dog, Envelope, Number, Target, Income, Alley, Library

Begin a discussion of the experimental method by asking for definitions of a hypothesis. After discussing the students' definitions tell them that they are going to conduct an experiment in class and provide them with the question above as the hypothesis. After defining mnemonic techniques, inform the class that you have a mnemonic technique but need to know how to proceed from this point. Students are asked for input as to how to test the hypothesis. Usually someone proposes that the class be divided into two groups: one that receives the mnemonic and one that does not. Ask how the students should be assigned to each group. This leads us to a discussion of random assignment.

The experiment begins by passing out the slips of paper with the mnemonic to the "experimental" group. All students are then given the following instructions: "I am going to read a list of words; when I'm finished I want you to recall as many words as you can IN THE SAME ORDER AS THEY WERE READ." Tell the experimental group how to use the mnemonic: "The letters of the word correspond to the first letter of each word in the list, so you can use the word to help you remember the order of the words in the list."

Read the list of words, pausing about 4 seconds between words. Then tell the students to write down as many words as they can remember in the same sequence as they were read. Allow about three minutes of

recall time, then ask the students to correct their own paper and tabulate the results on the board. This demonstration typically yields a large difference between the two groups. If desired, you can initiate a discussion of statistical inference and perhaps conduct some preliminary analyses. Discuss how the results pertain to the original hypothesis.

> Adapted from Davis, S. F., & Palladino, J. J. (1994) *Interactions: A newsletter to accompany Psychology, 1(Win)*, 1.

## Activity 2.4: Identifying IVs and DVs

Using the research teams' operational definitions from **Activity 2.2: Operational Definitions** demonstration above, ask each team to take their definitions one step further and generate a hypothesis about the research idea: *aggression in children who watch a lot of TV*. Using their hypothesis as a base, ask them to then identify their independent variables (IVs) and dependent variables (DVs). This will serve as a precursor for **Assignment 2.3: Designing an Experiment** below.

You may opt to ask students to identify IVs and DVs from a variety of empirical questions from psychology. Below are some examples:

Which is the best method of treatment for depression: cognitive-behavioural therapy, drug treatment, or no-treatment control?

Is it better to "cram" for a test (massed practice) or better to "space-out" our studying (distributed practice) when trying to remember information for an exam?

Does the number of people present affect the likelihood that someone will help another person in need?

Compared to females, do males find females more attractive when they encounter each other on a shaky bridge versus a stable bridge?

Is overall health influenced by one's deepest thoughts, feelings, and attitudes about coming to college?

## Activity 2.5: Understanding Random Assignment—The In-Class Basketball Team

Expand on the text's treatment of research methods by discussing the procedure by which participants are assigned to conditions in an experiment. Explain that *random assignment* involves placing participants in experimental conditions in such a way that every participant has an equal chance of being placed in any condition. Participants can be assigned to conditions by any number of random methods, including flipping coins, drawing slips of paper out of a hat, or by using a random number table. Random assignment is a key feature of experiments because it ensures that the experimental groups are roughly equivalent (e.g., in age, intelligence, personality, attitudes, appearance, and so on) before the independent variable is manipulated. As a result, experimenters can be more confident that differences in behaviour at the end of the experiment are due to the effects of the independent variable rather than to any preexisting differences between participants.

David Watson (1990) suggests a simple but clever exercise to demonstrate this principle (which can be difficult to understand in the abstract). Tell your class that you have invented a superior new way of coaching basketball and you would like to test the effectiveness of your method in an experimental context. One team (the experimental group) will be trained by your new method and the other team (the control group) will be trained by traditional methods. If your training method is indeed superior, then the team trained by your method should do better than the traditional team in a tournament. Explain to your class that you are worried about controlling for height, a variable that is obviously important in basketball (i.e., if all the tall players ended up, say, on the control team, the experimental team may lose the tournament and the loss might be attributed to failure of the new training method rather than to height, the true cause). Tell the class that you will randomly assign students to two teams by flipping a coin. Watson suggests using only one sex to avoid too much variation in height (he uses females because they are more plentiful in psychology classes). Randomly approach students in the class and flip a coin for each so that "heads" go to Team A and "tails" go to Team B. Ask students to stand on different sides of the room as they are assigned to one of the two teams. After 10 students are assigned to each team, Watson suggests lining up the members of each team (so that Team A is standing directly behind Team B) from tallest to shortest. Randomization should have ensured that the teams are clearly equal in height, and everyone will be satisfied that the height variable is eliminated from your experiment.

Watson, D. L. (1990). A neat little demonstration of the benefits of random assignment of subjects in an experiment. In V. P. Makosky, C. C. Sileo, L. G. Whittemore, C. P. Landry, & M. L. Skutley (Eds.), *Activities handbook for the teaching of psychology: Vol. 3* (pp. 3–4). Washington, DC: American Psychological Association.

## Activity 2.6: Using Sherlock Holmes to Teach Observation and Inference—Elementary, My Dear Watson

Jane Halonen (1986) suggests an excellent exercise that incorporates naturalistic observation as a research method as well as the importance of critical thinking in psychology. In this assignment, students are asked to test their critical thinking and observation skills by assuming the identity of detective Sherlock Holmes. The basic premise is that Sherlock Holmes has carefully examined one of the student's personal environments (e.g., home, work, car, health club) and is attempting to find and meet the student based on clues derived from his investigation. Students are asked to write a short paper that consists of the letter that Sherlock Holmes might write to Dr. Watson describing his pursuit in detail, including the reason for it and the specific elements from the environment that justify his leads. This exercise should be assigned after you have talked about naturalistic observation and inference, and Halonen suggests that students read Webb et al.'s (1981) excellent chapter on physical evidence in their *Nonreactive Measures in the Social Sciences*. According to Halonen, students react very enthusiastically to this assignment, as they enjoy the opportunity to disclose about themselves as well as to role-play the clever Holmes. Importantly, students' papers are typically very thoughtful and reveal many instances of critical thinking, such as extensive observations, use of concepts from the Webb chapter (e.g., erosion, garbology), logical but purposefully inaccurate inferences to add humor, and attention to the ethical dilemma of exploring private environments.

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

Webb, E. J., Campbell, D. T., Schwartz, R. D., Sechrest, L., & Grove, J. B. (1981). *Nonreactive measures in the social sciences* (2nd. ed.). Boston: Houghton-Mifflin.

## Activity 2.7: Wonder Horse Dials 911 to Save Boy's Life

Jane Halonen suggests a fun class exercise that tests students' understanding of experimental methodology principles. Once you have covered the basics of correlation, experimentation, and causal inference, challenge your students to apply these principles by examining the outrageous claims made in tabloid headlines, many of which imply a causal relationship (e.g., dreaming in black-and-white improves your sex life; garlic diet improves memory. . .but not breath; large gopher presence precedes volcano eruptions). For this exercise, bring in a variety of headlines from the *Star*, *National Enquirer*, *Weekly World News*, *Globe*, etc., that are psychology-related and causal-sounding (or ask students to bring in examples). Challenge students to design simple studies that will accurately test whether or not the relationship claimed in the headline is a valid one. Halonen reports that students enjoy the opportunity to "think like scientists" in response to humorous and outrageous claims and that this exercise helps stimulate them to scrutinize causal claims from all sources and to design experiments more carefully and creatively (and, if that isn't enough, they can practise their newfound skills in line at the grocery store!).

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

## Activity 2.8: Soften Hands While You Do Dishes

A variation of the tabloid exercise suggested above encourages students to apply experimental principles to claims they are bombarded with on a daily basis—television and magazine advertising. For this exercise, bring in (or have your students bring in) samples of advertising and have students critique the product claims of success according to principles of experimental methodology. Ads can be critiques on several grounds, including the problem of personal testimony as unreliable, the absence of a control or comparison group, the presence of extraneous variables, the presence of plausible alternative explanations, unclear or undefined variables, and a lack of supporting statistics. Jane Halonen reports that students become enthusiastic about the usually

dreaded topic of experimental methodology when they realize it has the potential to make them smarter consumers.

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

## OUT-OF-CLASS ASSIGNMENTS AND PROJECTS

### Assignment 2.1: Observational Research in the Dining Hall

Koschmann and Wesp (2001) provide several research activities for observational research, correlational research, and experimental research. One way to introduce students to research methods is to allow them to become more cognizant of their everyday surroundings and fellow classmates' behaviours. Koschmann and Wesp suggest that the college or university dining hall is an excellent "laboratory" to observe human behaviour. Merely ask students to observe others during dinner in the cafeteria, such as seat selection or food choices. You might encourage student research teams to decide which behaviours they wish to observe. Ask students to record their observations, maintain confidentiality, and "debrief" anyone who asked them what they were doing. During the next scheduled class, ask students to share their findings and to generate discussion about potential hypotheses that may provide a better understanding of the behaviours they observed.

Koschmann, N., & Wesp, R. (2001). Using a dining facility as an introductory psychology research laboratory. *Teaching of Psychology, 28,* 105–108.

### Assignment 2.2: Designing an Experiment

After students develop operational definitions, a working hypothesis, and identify their IVs and DVs, ask each research team to create an experiment that would test their hypothesis. Remind them that their experiment has to be very specific, so that any one of us could easily replicate their study. I prefer to have students work on this over the weekend with their group, giving them ample time and opportunity to develop a study that they will later share with the class. During the next class, engage students in a class discussion as each research team describes their study. Encourage other students to ask questions about each other's designs. This exercise is a great opportunity for students to freely express their ideas in a collegial, research-oriented way. I am always impressed with the variety of research ideas, creativity, and effort that students put into this exercise. At the end of the discussion, remind students how each group was at first given the same, vague topic, but now a variety of specific research ideas and experiments has emerged. Describe to them that this is not uncommon in psychological research, and this kind of thing leads to greater understanding of psychological constructs and phenomena. You may want to close by saying that throughout the rest of the course, they will see how different researchers investigate various psychological constructs and phenomena. And of course, reward them for their great efforts. . .research is hard work!

## ASSIGNMENTS—ADDITIONAL PH SUPPLEMENTS

## APS Reader: *Current Directions in Introductory Psychology*

### Assignment/APS Reader 2.3: What Have Psychologists Discovered About the Process of Scientific Discovery?

**By David Klahr and Herbert A. Simon (2001)**

This article describes four major approaches to the study of science—historical accounts of scientific discoveries, psychological experiments with nonscientists working on tasks related to scientific discoveries, direct observation of ongoing scientific laboratories, and computational modeling of scientific discovery processes—by viewing them through the lens of the theory of problem solving. The article compares and contrasts the different approaches, indicate their complementaries, and provide examples from each approach that converge on a set of principles of scientific discovery.

## DEBATES

### Debate 2.1: Is Milgram's Obedience Study Ethical?

This debate is available in Brent Hilfe's *Taking Sides (12th ed.)*. You may choose to have this debate later when you discuss Milgram's study in the social psychology unit.

Slife, B. (2001). *Taking sides: Clashing views on controversial psychological issues* (12th ed.). Guilford, CT: Dushkin Publishing Group.

### Debate 2.2: Is It Ethical to Use Animals in Psychological Research?

There currently exists a heated controversy over the use of animals in psychological research, and an in-depth consideration of this important issue would make an excellent introduction to the topic of research ethics. This debate raises the question of whether the benefits of animal research outweigh the moral costs. On one hand are animal-rights supporters who allege inhumane treatment of laboratory animals and argue that the welfare of humans should not be placed above that of animals. On the other hand are researchers and scientists who argue that animal research is necessary and beneficial for society and that strict laws and guidelines are in place to protect laboratory animals. Use the debate procedures suggested at the beginning of this manual (or develop your own) and assign students to research and defend the sides of this issue. Excellent background resources for this discussion can be found in *Taking Sides* (Issue 3), *American Psychologist*, *Psychological Science*, and *Newsweek* (full references are given below).

Devenport, L. D., & Devenport, J. A. (1990). The laboratory dilemma: A solution in our backyards. *Psychological Science, 1*, 215–216.

Johnson, D. (1990). Animal rights and human lives: Time for scientists to right the balance. *Psychological Science, 1*, 213–214.

Miller, N. E. (1991). Commentary on Ulrich: Need to check truthfulness of statements by opponents of animal research. *Psychological Science, 2*, 422–423.

Rollin, B. E. (1985). The moral status of research animals in psychology. *American Psychologist, 40*, 920–926.

Slife, B. (2001). *Taking sides: Clashing views on controversial psychological issues* (12th ed.). Guilford, CT: Dushkin Publishing Group.

Staff (1988, December 26). Of pain and progress. *Newsweek*, 50–59.

Ulrich, R. E. (1991). Animal rights, animal wrongs and the question of balance. *Psychological Science, 2*, 197–201.

## MULTIMEDIA RESOURCES

## VIDEO CLASSICS CD-ROM

### Video Classics 2.1: Controlling an Experiment with Konrad Lorenz

Interview with Konrad Lorenz

SYNOPSIS: Lorenz discusses some basic principles behind experimentation, observation, validation, and the importance of rigorous scientific controls. His remarks are in the context of ethology and unobtrusive observation; however, the principles he outlines apply generally to doing sound psychological research.

## Live!Psych

### Live!Psych 2.2: Observational Studies

### Live!Psych 2.3: Correlational Studies

### Live!Psych 2.4: Experimental Method

### Live!Psych 2.5: Statistics

SYNOPSIS: This collection of modules introduces students to the basics of research design and analysis. *The Experimental Method* illustrates the concepts of independent and dependent variables, confounds, and random assignment to conditions. *Correlational Studies* shows how to interpret positive and negative correlation coefficients, including examples of scatterplots. *Observational Studies* discusses the merits of using nonexperimental techniques, such as participant observation or naturalistic observation. The section on *Statistics* covers both descriptive and inferential statistics, including measures of central tendency and variability.

## LECTURE LAUNCHER

### Lecture Launcher 2.6: Theories and Hypotheses

The difference between theories and hypotheses is explained. Two applied scientists provide examples of how theories become revised in light of new information, and how this process furthers the accumulation of knowledge in a science. This segment provides a good starting point for helping students understand the scientific method. Whereas most students believe that scientific results either "prove" or "disprove" a hypothesis, in fact scientific explanations are in constant revision as new evidence emerges.

### Lecture Launcher 2.7: Elements of an Experiment

The basic elements of a scientific experiment are identified: independent and dependent variables, experimental and control groups. This very brief segment gives a clear definition of independent variables, dependent variables, experimental groups, and control groups. It is suitable for use as a starting point when elaborating on the design and conduct of experiments.

## WEB RESOURCES

### Super Web Sites

Methods in Behavioural Research
http://methods.fullerton.edu/
A huge collection of Web pages designed to go with Paul C. Cozby's book of the same name.

### Ethics

CPA Homepage
www.cpa.ca
The Canadian Psychological Association's page. Includes links to the CPA Code of Ethics as well as a number of valuable other resources for Canadian psychologists.

Canadian Psychological Association Code of Ethics
http://www.cpa.ca/cpasite/userfiles/Documents/Canadian%20Code%20of%20Ethics%20for%20Psycho.pdf

National Council on Ethics in Human Research (NCEHR) Homepage
http://www.ncehr-cnerh.org/en/
NCEHR's homepage has many valuable resources on human research protections in Canada.

APA Ethics Office: Ethics Information
http://www.apa.org/ethics
The American Psychological Association's page devoted to ethics. Includes the complete Ethics Code (1992) as well as current revision recommendations. The page also includes a link to APA's official statement for the use of animals in psychological research.

### Pseudoscience

Beyond Science?: Paper personality. (*Scientific American Frontiers*)
http://www.pbs.org/safarchive/4_class/45_pguides/pguide_802/4482_paper.html
This link provides the PBS Teaching Guide that accompanies the *Scientific American Frontiers*' program on pseudoscience. Included are various teaching activities, including one that helps you demonstrate the Barnum effect.
Pseudoscience in Stanford Encyclopedia of Philosophy
http://plato.stanford.edu/entries/pseudo-science/
This site is a good source of philosophical ideas. This is a good discussion of the difference between real science and pseudo science.

### Psychological Tests

Are You Too Anxious?
http://www.queendom.com/tests/access_page/index.htm?idRegTest=671
Online Anxiety Inventory from Cyberia Shrink

Reliability and Normative Data for the Online Anxiety Inventory
http://www.queendom.com/tests/index.htm/sts_anx.html

Depression Inventory from Cyberia Shrink
http://www.queendom.com/tests/access_page/index.htm?idRegTest=1123

Tests, Tests, Tests
http://www.queendom.com/tests/index.htm
A mother-lode of psychological tests established and maintained by "Cyberia Shrink."

### Statistics

Rice Virtual Lab in Statistics
http://onlinestatbook.com/rvls.html
Includes links to an online statistics textbook, simulations and demonstrations, case studies, and basic statistical analysis tools.

VassarStats

http://faculty.vassar.edu/lowry/VassarStats.html

Richard Lowry from Vassar College maintains this excellent site for statistical calculations. It also contains basic conceptual explanations of statistical concepts. This is a good site to get students calculating various statistics.

## VIDEO RESOURCES

### Prentice Hall / Films for the Humanities and Science Video Series

*Scientific Method* (1999, 25 min, FHS). This program examines the basic elements of the scientific method including defining and researching the problem, forming a hypothesis, using experiments and observations to gather information, analyzing the data, forming a conclusion, and communicating the results. Shows many practical day-to-day utilizations of the scientific method including the testing of new drugs and analyzing the performance of various types of sporting goods.

*The Scientific Method: Processes and Investigations* (2000, FHS). This CD-ROM looks at the way in which scientists work in exploring new areas of knowledge, or new aspects of existing knowledge. It presents students with scenarios and sets of data, and challenges them to investigate for themselves. The *Scientific Method* has a highly interactive design where the user plays an active (frequently a fun) part in the learning process rather than being a passive observer.

### Other Videos

*Against All Odds: 11. The Question of Causation* (1989, 30 min, ANN/CPB). The relationship between smoking and lung cancer is examined, and a study of admissions data illustrates Simpson's paradox.

*Against All Odds: 12. Experimental Design* (1989, 30 min, ANN/CPB). Distinguish between observational studies and experiments, and learn the basic principles of design, including comparison, randomization, and replication.

*Against All Odds: 14. Samples and Surveys* (1989, 30 min, ANN/CPB). Stratified random sampling is explained. A 1936 Gallup election poll yields information about undercoverage.

*Against All Odds: 26. Case Studies* (1989, 30 min, ANN/CPB). See planning data collection, collecting and picturing data, drawing inferences, and evaluating conclusions.

*Discovering Psychology: 2. Understanding Research* (2001, 30 min, ANN/CPB). This program examines the scientific method and the ways in which data are collected and analyzed—in the lab and in the field—with an emphasis on sharpening critical thinking in the interpretation of research findings. With Dr. Christina Maslach of the University of California, Berkeley, and Dr. Daryl Bem of Cornell University.

*Experimental Design* (Parts I and II, 1989, 30 min each, ANN/CPB). Observation, experimentation, randomization, control groups, and causality are explored in this 2-tape set.

*Experiments in Human Behaviour* (1985, 35 min, IM). This video uses several well-known studies to illustrate concepts such as independent variables, experimenter bias, or the differences between field and lab studies.

*How We Study Children* (1996, 24 min, IM). Observational and experimental techniques for gathering data from children are compared.

*Observation* (1993, 28 min, IM). The focus is on observing children, but a good primer on naturalistic observation in general.

*Protecting Human Subjects: Balancing Society's Mandates* (38 min, OPRR/NIH). Illustrates the basic ethical criteria used in evaluating research through following a research proposal through review by an Institutional Review Board (IRB).

*Protecting Human Subjects: Evolving Concern* (23 min, OPRR/NIH). Examines the historical developments that led to the current federal guidelines and programs to protect human subjects.

*Research Methods* (1990, 30 min, IM). Presents the basics of conducting sound research. The importance of solid theorizing combined with supporting data is emphasized.

*Research Methods for the Social Sciences* (1995, 33 min, IM). A variety of methods in a variety of social sciences are explored. Students should appreciate the basics of correlational, observational, and experimental research.

*The Scientific Method* (1988, 23 min, ANN/CPB). This Blue Ribbon winner at the American Film and Video Festival presents the research process from developing a hypothesis through testing it experimentally.

*Scientific American Frontiers: Season VIII: Beyond Science?, Episode 2 of 5.* (1997, 60 min, PBS). Two segments in this episode are particularly useful for a video and discussion of science versus pseudoscience: "Water, Water Everywhere" (running time: 12:12) and "Paper Personality" (running time: 8:46).

*Statistics and Psychology* (24 min, FHS). This recent video uses data from the Applied Psychology Unit of Cambridge University to demonstrate correlations and how they are used in the conduct of science.

*Two Research Styles* (1991, 24 min, IM). Experimentation and observation are compared using profiles of two research programs. A good introduction to the array of research strategies available to psychologists.

*Understanding Research* (1990, 30 min, IM). This video draws on examples from psychology to present the basics of scientific methodology.

*Using Samples* (20 min, FHS). The differences between samples and populations, and the differences between different types of sampling, are explored. Confidence intervals, variability, and standard errors are also presented.

*Why Use Statistics? Describing Data* (1996, 25 min, FHS). Differentiates between qualitative and quantitative data and explains various ways of presenting data. Also includes a discussion of measures of central tendency and measures of distribution.

## ONLINE VIDEOS

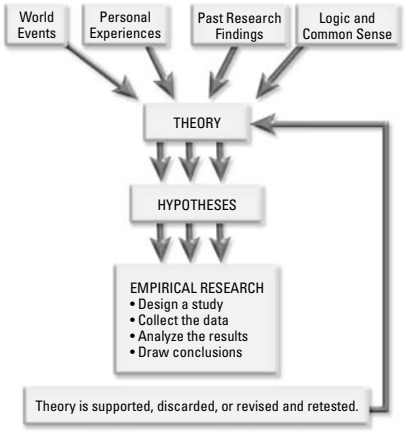
Peter Donnelly shows how stats fool juries
http://www.ted.com/talks/

Oxford mathematician Peter Donnelly reveals the common mistakes humans make in interpreting statistics — and the devastating impact these errors can have on the outcome of criminal trials.
peter_donnelly_shows_how_stats_fool_juries.html

## TRANSPARENCIES WITH LECTURE NOTES

### T5: The Research Process

**T5 The Research Process**



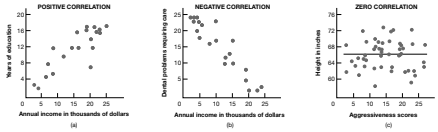

◊ The research process starts with idea generation. Ideas are generated from world events, personal experiences, past research findings, and logic and common sense. A general theory, which is an organized system of assumptions and principles that try to explain how certain phenomena are related, is formed from these ideas.

◊ From theory, a researcher will form a hypothesis. A hypothesis is a statement that tries to describe a behaviour. After the researcher has formed a hypothesis, an empirical research study is designed. The design of the study includes collecting the data, analyzing the results, and drawing conclusions for the analysis of the results.

◊ Then, the original theory of the study is either supported, discarded, or revised and retested based on the conclusions that were drawn. Once this step is complete, a new study with the revised or retested theory may be designed using the new theory as its basis for research.

## T6: Correlation

T6 Correlation




◊ A correlation study is one that looks at the strength of the relationship between two or more phenomena or variables. A correlation, or the relationship, is expressed to be either positive, negative, or zero. A positive correlation can mean that the high values of one variable are associated with high values of another. Or vice versa, the low values of one can be associated with the low values of another. A negative correlation means that the high values of one variable are associated with low values of another. And zero correlation means that there really is not a relationship between the two variables studied. It is important to note that although correlation studies can examine relationships which can then lead to predictions about behaviour, it cannot help the researcher draw conclusions regarding cause and effect.

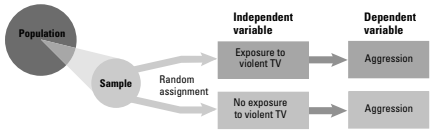
◊ Here you see this first graph showing a positive correlation between two variables, years of education and annual income. What that means is that generally the more years of education a person has, the greater their income. Each dot on the graph represents a participant in the study.

◊ The second graph shows a negative correlation between two variables, dental problems requiring care and annual income. What this means is that generally the more dental problems a person has, the lower his or her annual income tends to be. Conversely, the higher a person's income, the less dental problems they tend to have.

◊ The third graph shows a zero correlation between two variables, height and aggressiveness. This indicates that there is no relationship between how tall a person is and how aggressive he or she is.

## T7: Basic Model of an Experiment

T7 Basic Model of an Experiment




◊ Researchers using an experimental study design can control the situation being studied by manipulating the independent variable and studying the effects of the manipulation on the dependent variable. The independent variable is the variable that the researcher can shape or manipulate in order to see what effect it would have on the behaviour the researcher is trying to predict. The behaviour the researcher is trying to predict is the dependent variable in the study.

◊ Here you see a study about exposure to violence on TV and its effect on aggression. The researchers have a sample of participants that are drawn from the general population. The participants are then randomly assigned to two groups, those that have no exposure to violent TV and those who have. When a person is randomly assigned to a group, it just means that they have the same probability as any other of being assigned to that given group.

◊ The two groups are called the experimental and the control group. The control group of participants is those that have not been exposed to the same phenomenon as those that are in the experimental group. In this case, it is exposure to TV violence. It is this way that the independent variable gets manipulated. The researcher knows that in one group, the participants will have exposure to TV violence, and will know that in the second group they will have none.

◊ The next step then in this study is to measure to what extent these two groups are violent. Violent behaviour is the dependent variable or the variable the researcher is trying to predict. In this case, the researcher is trying to predict how violent a person is based on how much violence he or she watches on television.

## HANDOUTS

## Handout 2.1

**(a)**

### Zodiac Sign Dates

Aries (March 21–April 19)
Taurus (April 20–May 20)
Gemini (May 21–June 21)
Cancer (June 22–July 22)
Leo (July 23–Aug. 22)
Virgo (Aug. 23–Sept. 22)
Libra (Sept. 23–Oct. 22)
Scorpio (Oct. 23–Nov. 21)
Sagittarius (Nov. 22–Dec. 21)
Capricorn (Dec. 22–Jan. 19)
Aquarius (Jan. 20–Feb. 18)
Pisces (Feb. 19–Mar. 20)

**(b)**

### Zodiac Signs with Correct Answers

**E** Aries (March 21–April 19)
**J** Taurus (April 20–May 20)
**C** Gemini (May 21–June 21)
**A** Cancer (June 22–July 22)
**L** Leo (July 23–Aug. 22)
**H** Virgo (Aug. 23–Sept. 22)
**K** Libra (Sept. 23–Oct. 22)
**D** Scorpio (Oct. 23–Nov. 21)
**I** Sagittarius (Nov. 22–Dec. 21)
**F** Capricorn (Dec. 22–Jan. 19)
**B** Aquarius (Jan. 20–Feb. 18)
**G** Pisces (Feb. 19–Mar. 20)

## Handout 2.2

### Zodiac Personality Characteristics

Choose the letter of the personality characteristics that best describe you.

**A** sensitive, nurturing, compassionate, cautious, tactful, secretive, imaginative, shy

**B** creative, broad-minded, independent, studious, versatile, idealistic, unconventional, sincere

**C** intellectual, versatile, clever, curious, irritable, talkative, adventurous, changeable

**D** secretive, forceful, romantic, intolerant, tactless, intense, insightful, loyal

**E** idealistic, enthusiastic, arrogant, independent, daring, impatient, witty, quick-tempered

**F** ambitious, hardworking, cautious, practical, calm, aloof, possessive, tenacious

**G** warm, sensitive, artistic, undisciplined, emotional, compassionate, easygoing, adaptable

**H** critical, analytical, precise, intelligent, practical, thorough, discontented, industrious

**I** honest, impulsive, optimistic, nonchalant, outspoken, playful, restless, direct

**J** loyal, patient, conservative, stubborn, stable, truthful, self-indulgent, possessive

**K** cooperative, impartial, friendly, popular, intellectual, tactful, self-indulgent, sensitive

**L** extroverted, generous, authoritative, affectionate, extravagant, warmhearted, impulsive, optimistic